BLACK, DAVID R., Ph.D. Three Essays on Smoking Bans. (2010)
Directed by Dr. Peter M. Bearse. 114 pp.

This dissertation contains three essays, each on a different aspect of the economics of smoking bans and smoking control policy.

Essay One explores the link between cigarette excise taxes, state fiscal considerations, and attitudes towards smoking. Do legislatures use cigarette taxes only to generate revenue or also as a policy tool to control smoking? The paper shows that the level of cigarette excise tax does not seem to be related to anti-smoking sentiment. Signing the Master Settlement Agreement by the states and major tobacco firms seems to have been an impetus for states to raise cigarette taxes. States that enacted smoking ban legislation over the sample period were also more likely to turn to cigarette excise taxes in times of fiscal stress.

In Essay Two, the effects of complete smoking bans in restaurants and bars on the prevalence and intensity of smoking are examined. The results of the paper suggest that complete smoking bans have little impact on the prevalence of smoking and have a mixed impact on the intensity of cigarette consumption. While complete bar bans do reduce the number of cigarettes smoked, complete restaurant bans increase the average number of cigarettes smoked.

Essay Three uses micro-data at the household level to examine the effect that complete restaurant smoking bans have on the household's dining out expenditures. The essay finds that the bans have no discernable effect on the level of dining out expenditures for non-smoking and smoking households.

THREE ESSAYS ON SMOKING BANS.

by

David R. Black

A Dissertation Submitted to
the Faculty of The Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Greensboro
2010

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ACKNOWLEDGEMENTS

I want to acknowledge my dissertation advisor, Peter M. Bearse, and the rest of my committee, David C. Ribar, Albert N. Link, and Stephen K. Layson. Their comments and suggestions have improved my research and these essays.

I would also like to thank my mother for her words of encouragement during my studies, my father-in-law and mother-in-law for their support, and lastly, but most importantly, my wife for her support, encouragement, and understanding during this long process.

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CHAPTER I

INTRODUCTION

Chapter II of the dissertation explores the role that cigarette excise taxes play in smoking control policy. Since 2001, cigarette tax rates have increased along with the number and stringency of clean indoor air laws, while other sin tax rates have not increased. Have legislatures begun to use cigarette taxes as a tool to control smoking, or are they still primarily a means of generating revenue?

Some of the increase in cigarette taxes may have been spurred by the declining fiscal situation states faced in 2002 and 2003. Despite the rebound in state fiscal health after 2003, the increases in cigarette tax rates continued unabated through 2007. If the increase in cigarette taxes had been driven by a heightened need for revenue, other taxes that states raise in difficult economic times should have risen as well. While other sin taxes did increase from 1999 to 2007, the increases were much smaller than the cigarette excise tax increase. For example, during the 2001 to 2007 period, the tax rates on beer and gas rose 0.5 percent and 2.4 percent respectively compared to the 16.5 percent increase for cigarette taxes.

Why did cigarette tax rates continue to increase while other sin tax rates did not? One possible explanation is that growing smoking control sentiment within states drove the increase. If other measures of smoking control also increased at the same time, then perhaps states were using cigarette taxes as a means of smoking control. If, however,

other smoking control measures did not increase, then some other explanation for the continued rise in cigarette tax rates is needed.

One smoking control measure states can adopt is smoking bans. The number and severity of smoking bans increased after 2001. The increases in taxes and the number and severity of smoking bans suggest that the increase in cigarette tax rates and the increase in smoking bans could be related. Chapter One examines if the cigarette excise tax increases seen after 2001 were the result of state revenue needs, or were associated with the increase in the strength and number of smoking bans and anti-smoking sentiment, and a policy instrument to curb smoking.

The essay contributes to the literature by showing that states did not increase cigarette excise taxes to reduce the prevalence of smoking but rather because of the Master Settlement Agreement. In addition, states that have already passed complete smoking ban legislation turned more readily to increased cigarette taxes than those states that did not pass any new complete smoking ban legislation.

In Chapter III, the recent increase in complete statewide smoking bans in restaurants and bars had on smoking prevalence and intensity is investigated. While complete workplace smoking bans are thought to reduce the prevalence and intensity of smoking due to the large amount of time individuals spend at work, individuals spend significantly less time at restaurants and bars. In addition, because they can choose not to frequent restaurants and bars, the effect of the bans should presumably be smaller. However, because dining out and frequenting bars is a recreational activity, the desire to

participate in these activities may outweigh the negative impacts of the bans for smokers, and they may choose to refrain from smoking to dine out and visit bars.

The results of the essay indicate that absolute smoking bans in private worksites, restaurants, and bars appear to have little effect on smoking prevalence. The results for the intensity of consumption were mixed, with private worksite bans having no effect, restaurant bans increasing consumption, and bar bans reducing consumption.

Two possible explanations for the surprising result that complete restaurant bans increased the consumption of cigarettes are suggested. First, smokers give up dining out and eat at home. Income that was once spent on dining out was redirected to the consumption of other goods including cigarettes. The effect of restaurant smoking bans on the dining out behavior is addressed in Chapter IV. If in fact smokers do reduce their dining out expenditures, this would support the hypothesis that smokers are refraining from frequenting restaurants and instead are eating at home.

Another possible explanation could be the reaction of restaurants to complete bans. If restaurants are responding to complete bans with increased outdoor seating options, it may be that the bans did not reduce the amount of cigarettes that smokers consumed because instead of forcing smokers outside to smoke, the restaurants moved the dining out experience outside where the smokers could continue to smoke. If smokers previously would have refrained from smoking in mixed parties of smokers and non-smokers while indoors, they may not have felt such a compulsion sitting outside because they believed they were inconveniencing or harming their non-smoking friends less while outside.

Chapter IV explores the effect of complete restaurant smoking bans on dining out expenditures. Since the early 1990's a growing number of local governments and states have completely banned smoking in restaurants and bars. Proponents of smoking bans argue that government regulation is required to protect the health of workers and patrons in restaurants and bars because of externalities associated with second-hand smoke caused by the smoking of cigarettes. Opponents argue that smoking bans will reduce restaurant revenues and employment.

While previous studies of the effect of smoking bans on dining out expenditures have used aggregate data, such as employment and sales tax receipts or perceptions of restaurant proprietors and managers, none has investigated how individual consumers react to smoking bans. The disaggregated effects of smoking bans may be very different from the aggregate effect. Presumably, families with smokers decreased their expenditures on dining out in response to complete restaurant smoking bans, while families without smokers increased their expenditures on dining out.

The results of the essay indicate that complete restaurant smoking bans did not change the expenditures on dining out by non-smoking or smoking households. While the estimated coefficients conformed to expectations, the lack of precision in the estimates prevents any definitive conclusions from being drawn about the effect of smoking bans on dining out expenditures.

CHAPTER II

CIGARETTE EXCISE TAXES: REVENUE ONLY OR DOES ANTI-SMOKING SENTIMENT MATTER AS WELL?

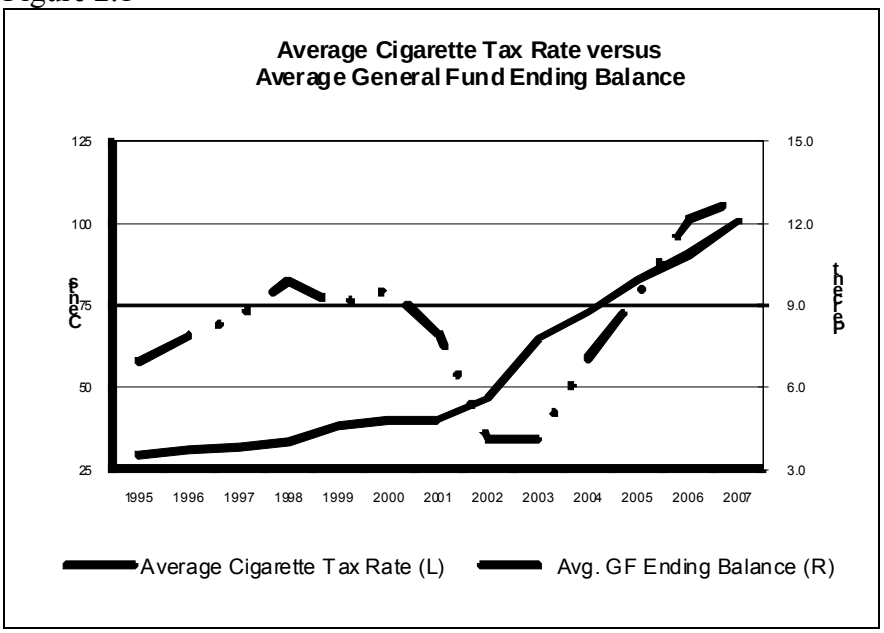
Introduction

Since 1921, when Iowa enacted the first cigarette tax[1], state legislatures have used cigarette excise taxes to raise revenue. In recent years, however, health advocacy and smoking prevention groups[2] have urged legislatures to raise cigarette taxes as part of comprehensive smoking prevention programs. Since 2001, cigarette tax rates have increased along with the number and stringency of clean indoor air laws, while other sin tax rates have not increased. Have legislatures begun to use cigarette taxes as a tool to control smoking, or are they still primarily a means of generating revenue?

From 1995 to 2001, the average state cigarette tax rate increased from 30 to 40 cents per pack, an annual rate of 5.3 percent. After 2001, cigarette excise tax rates increased rapidly; and by 2007, the average tax rate had reached one dollar per pack, an annual increase of 16.5 percent from 2001 to 2007. Some of the increases may have been spurred by the declining fiscal situation states faced in 2002 and 2003. As can be seen in Figure 2.1, states' general fund ending balances grew to above 9 percent in 2000, fell in 2001 and 2002, and did not begin to recover until 2004.

[1] The Tax Foundation website: http://www.taxfoundation.org/taxdata/topic/103.html
[2] The groups included the American Lung Association, American Heart Association, American Society of Clinical Oncology, the Campaign for Tobacco-Free Kids, and the Foundation for a Smokefree America.

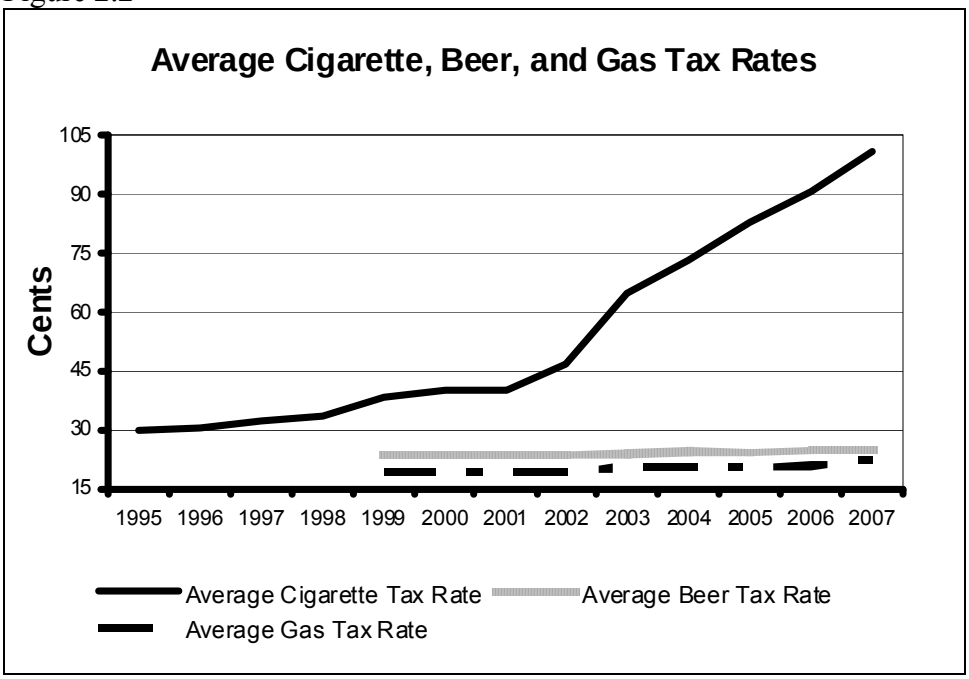
Figure 2.1



By 2006, ending balances were again above 10 percent on average. Despite the rebound in state fiscal health, the increases in cigarette tax rates continued unabated through 2007[3]. If the increase in cigarette taxes had been driven by a heightened need for revenue, other taxes that states raise in difficult economic times should have risen as well. Comparing the increase in tax rate for cigarettes to some other sin tax rates in Figure 2.2, it is apparent that while other taxes did increase from 1999 to 2007, the increases were much smaller than the cigarette excise tax increase. For example, during the 2001 to 2007 period, the tax rates on beer and gas rose 0.5 percent and 2.4 percent respectively compared to the 16.5 percent increase for cigarette taxes.

[3] Based on commentary from the National Association of Budget Officers Fiscal Survey of the States, various years. http://www.nasbo.org/publicationsReport.php.

Figure 2.2



The question arises, why did cigarette tax rates continue to increase while other sin tax rates did not? One possible explanation is that growing smoking control sentiment within states drove the increase. If other measures of smoking control also increased at the same time, then perhaps states were using cigarette taxes as a means of smoking control. If, however, other smoking control measures did not increase, then some other explanation for the continued rise in cigarette tax rates is needed.

One smoking control measure states can adopt is smoking bans. Figure 2.3 compares the average cigarette tax rate and an average of an index of state level smoking

bans[4]. As can be seen in the figure, the ban index (made up of the number and severity of bans in each state) also began a rapid increase after 2001. The two series follow similar paths, suggesting that the increase in cigarette tax rates and the increase in smoking bans could be related.

While the smoking ban index average increased from 2001 to 2007, fourteen of the 49 states[5] in the analysis did not change any smoking ban legislation over the sample period of 1995 to 2007. To look at the differences between the states that did change their smoking ban legislation and those that did not[6], each group will be examined separately[7].

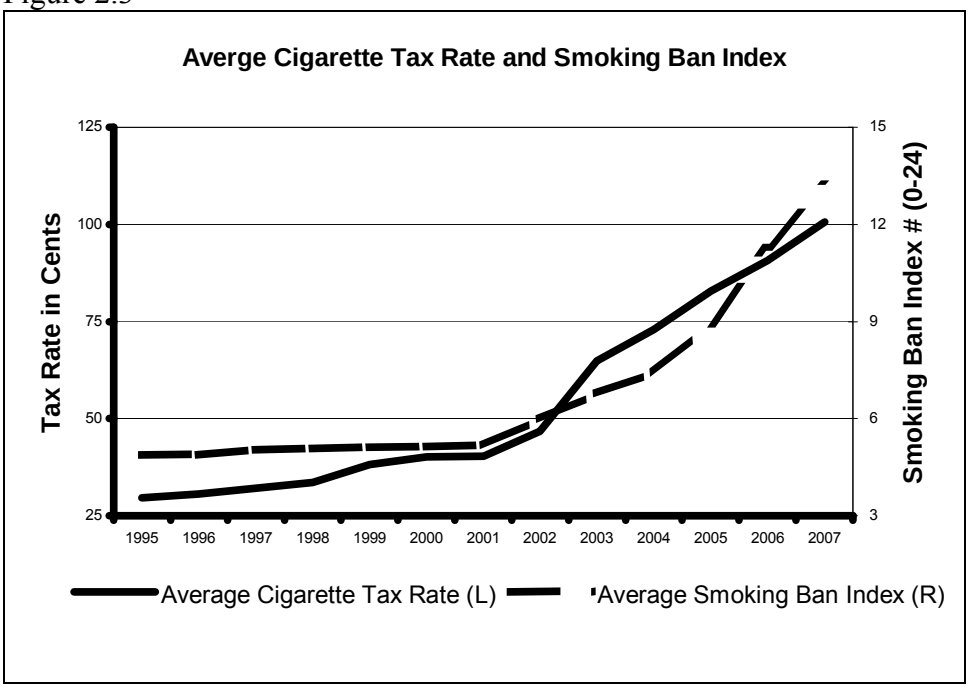
[4] The smoking ban index was calculated from the CDC's State System by assigning each type of smoking ban in place during the fourth quarter of each year in private work sites, restaurants, bars, enclosed spaces, hospitals, grocery stores, government buildings, and malls a strength score, and then summing up the total score for each state. The strength of each ban was measured as: No ban – 0, Smoking in Designated Areas Only – 1, Smoking in Separately Ventilated Areas Only – 2, Smoking Completely Banned – 3. The index could range from 0 to 24. The Cronbach's reliability score for the index was 0. 9178.

[5] Alaska is not included in the analysis for reasons discussed in the data section.

[6] The fourteen states were: Illinois, Iowa, Kansas, Kentucky, Maryland, Michigan, Missouri, North Carolina, Pennsylvania, South Carolina, Texas, West Virginia, Wisconsin, and Wyoming.

[7] The sample is being divided for two reasons, first, intuitively, legislatures that have not enacted any new smoking restrictions during the entire period of examination do not seem interested in reducing smoking prevalence in their state. Second, splitting the sample rather than interacting the variables reduces the number of potentially endogenous variables that need to be investigated.

Figure 2.3



This essay, examines if the cigarette excise tax increases seen after 2001 are the result of state revenue needs, or are associated with the increase in the strength and number of smoking bans and anti-smoking sentiment and a policy instrument to curb smoking. The essay contributes to the literature by showing that states did not increase cigarette excise taxes to reduce the prevalence of smoking, but rather because of the Master Settlement Agreement. In addition, states that have already passed complete smoking ban legislation turned more readily to increased cigarette taxes than those states that did not pass any new complete smoking ban legislation. A brief review of the relevant literature is presented next, followed by the modeling framework and data, the results, and finally, a brief discussion and interpretation of the results.

Relevant Literature

Within the economic literature on smoking, substantial work has been completed on evaluating the effectiveness of smoking bans as a deterrent to smoking and estimating the price elasticity of cigarettes, but only a few studies have looked at the determinants of the differences in cigarette excise tax rates between states. Research on smoking bans has shown they are an effective means of reducing smoking prevalence (Chaloupka and Grossman, 1996; Chaloupka and Wechsler, 1997; Evans et al., 1999; Ohsfeldt et al., 1998). With regard to cigarette excise taxes, nearly all of an excise tax increase is passed on to consumers through price increases (Keeler et al., 1996, and Stehr, 2007), making excise taxes an extremely effective way of increasing the price of cigarettes.

Numerous studies have been completed on the effect of cigarette price increases on smoking habits, including the decision to smoke and the quantity of cigarettes consumed. Most of the studies concluded that price increases were an effective means of reducing smoking, with overall price elasticities of demand generally in the range of -0.3 to -0.5 (Chaloupka and Warner, 2000). Some groups who are more price sensitive included blacks and Hispanics compared to whites, men compared to women, and those with lower incomes compared with those who have higher incomes (Townsend et al., 1994[8]; Farrelly, et al, 1998, Chaloupka and Pacula, 1999). Based on this body of research, excise tax increases are an effective means to reduce smoking prevalence and cigarette consumption.

[8] Townsend et al. concluded that women were more responsive to price than men, differing from the other studies mentioned.

Research studies into the determinants of state cigarette tax rates were more limited and include Benjamin and Dougan (1997), Hoover (2003), and Devereux et al. (2007). Benjamin and Dougan investigated how cigarette tax rates differed as the distance from North Carolina increased, as 60 percent of cigarette production is concentrated in North Carolina[9]. They found that, up to 800 miles, cigarette taxes increased as the distance from North Carolina increased because more distant states benefit from the intervening states efforts to combat smuggling. They found that for every 3 cents an intervening state raises its cigarette tax, a state can raise its own cigarette tax by 1 cent. Past 800 miles, transportation costs began to decrease demand for cigarettes and, hence, the optimal tax rate.

Hoover examined how non-revenue factors influenced the level of cigarette tax rates. Specifically, he investigated how the level of giving to the American Cancer Society and the Project ASSISST program impacted cigarette tax rates. He found that neither program had much of an impact. Some variables that were positively associated with the level of cigarette taxes in a state included the percentage of college graduates and the percentage of the population over age 65, while political conservatism in a state, the level of tobacco production, the percent of the population who are 18-24, and per capita consumption of cigarettes were all negatively associated with tax rates. One interesting finding of the paper was that the percent of the population 18-24 was negatively related to cigarette taxes. Presumably, one reason to raise cigarette taxes is because youth are more price sensitive consumers, and tax increases have been shown to

[9] Most other cigarette production occurs in Virginia and Kentucky.

be an effective means of reducing smoking prevalence among youth (Tauras and Chaloupka, 1999; Czart, Pacula, and Chaloupka, 2001).

The Devereux et al. paper examined horizontal and vertical cigarette excise tax competition between states and the federal government. They found that cigarette excise tax policy in a state was highly responsive to tax policy in neighboring states, while relatively unresponsive to federal cigarette excise tax rates. The paper models both cigarette excise tax rates and changes in the rate, because nominal rate changes do not occur frequently. In addition to the federal cigarette tax rate and neighboring states cigarette excise tax rates, the authors included national and state economic and demographic variables.

At the national level, the variables included gross domestic product, the national unemployment rate, and consumer price index. For each state, the authors utilized tobacco production in the state, per capita income, the state unemployment rate, federal grants, and the state income tax rate for the state economic variables. The demographic variables, total population and the percent of the population, both young and old, were included. Finally, several measures of the political climate in the state were added including the party of the governor, the proportion of Democrats in the House and in the Senate, a dummy variable indicating whether the current governor is term-limited, and an election year dummy. For the tax rate analysis, the significant variables included the neighbor states' tax rates; the state's own tax rate lagged one period and, in one specification, the amount of federal grants the state received and the election year dummy. For the tax change analysis, the level of neighboring states' taxes was

significant, as was inflation, the debt level of the state, the election year dummy, and states with Democrats in control. All increased the probability of an increase in cigarette tax rates.

Despite the interest in using cigarette excise taxes and smoking bans to reduce smoking prevalence, relatively little research has been done on the relationship between them. If the goal of cigarette taxes is to raise revenue, then smoking bans are substitutes because they reduce the prevalence of smoking and hence the amount of revenue a cigarette excise tax can raise. However, if the goal is to reduce smoking, then the two are compliments.

From a theoretical perspective, Prinz (2009) shows how democratic states can want to enact both cigarette taxes and smoking bans. Using a majority voting model, Prinz shows that if smokers are in the majority then cigarette tax rates will be set to zero. If non-smokers who never associate with smokers are in the majority, tax rates are greater than optimal and non-smokers appropriate rent from smokers. If non-smokers who associate with smokers are the decisive group, then tax rates are set so that tax revenues are equal to spillover costs. Prinz then proceeds to show that even if the cigarette tax rate is optimal, society may choose to impose smoking bans. By imposing smoking bans, the spillover costs due to smoking are reduced by decreasing the amount of second hand cigarette smoke non-smokers are exposed to regularly. Part of the reduction of spillover costs has been taken over by smoking bans, which reduces the optimal tax rate. If the tax rate remains the same, then the transfer of rent from smokers to non-smokers is increased.

Two empirical studies indirectly examined the relationship between cigarette taxes and smoking bans. In the first paper, Gallet, Hoover, and Lee (2006), were primary interested in the determinants of statewide smoking bans. They did include cigarette taxes in their model, theorizing that:

> . . . state-level tax rates on cigarettes are included to control for possible substitutability or complementarity between taxes and smoking bans. It may be, for example, that if states adopt a general anti-smoking position, taxes could be used in conjunction with smoking bans to reduce tobacco consumption. In this case, higher tax rates will correlate with a greater probability of adopting a smoking ban. Alliteratively, it may be that states are particularly keen on raising tax revenue and view taxes as competing with smoking bans. Therefore, if higher tax rates are adopted in an effort to raise tax revenue, then states will be less likely to adopt smoking bans, which reduce demand and tax revenue[10].

They found that cigarette taxes were not compliments to smoking bans and used to curb smoking, but rather are substitutes to smoking bans for the purpose of raising revenue. However, their analysis only examined through the year 2000, prior to the enactment of the more numerous and stringent smoking bans and large increases in cigarette excise tax rates.

Trogden and Sloan (2006) investigated the effect that the Master Settlement Agreement (MSA) between the states and major cigarette manufacturers had on cigarette excise taxes. Their primary finding was that cigarette excise taxes rose in 1998, the year the MSA was signed, by about 10 cents, likely due to the weakened political position of

[10] Gallet, Craig A., Hoover, Gary A., and Junsoo Lee. 2006, "Putting Out Fires: An Examination of the Determinants of State Clean Indoor-Air Laws." *Southern Economic Journal*, Volume 73, Issue 1, page 114

the tobacco industry. Cigarette excise tax rates then remained stable from 1999 to 2002. They also found that "Extensive clean air laws lead to lower excise taxes on cigarettes (substitutability), but basic clean air laws relative to no clean air laws lead to higher excise taxes (complementary)" (pg. 735).

Other variables that were positively associated with higher cigarette taxes included higher taxes in neighboring states; Democratic control of the state's legislature, lower general fund ending balances, and the percent of population aged 18-24. Factors associated with lower cigarette excise taxes included smoking prevalence, the presence of smoker protection laws, and higher per capita real income. The Trogden and Sloan paper covered the years 1990 through 2002, during which only eight states changed their clean air laws. These two studies generally concluded that smoking bans and cigarette taxes have not been used jointly to reduce smoking prevalence and intensity; however, they have all used data prior to the large upswing in states enacting stricter smoking bans and large increase in cigarette excise tax rates after 2002.

Modeling Framework

To determine if the recent increase in cigarette taxes was driven by revenue concerns or an increase in anti-smoking sentiment, state cigarette excise tax rates were regressed against several smoking relate variables, fiscal variables, and other control variables. The smoking variables included attitudes towards smoking bans and smoking prevalence. States with high levels of anti-smoking sentiment as measured by a smoking ban attitude index or that have a lower prevalence of smoking were expected to have

higher tax rates. The fiscal variables included the state's general fund ending balance and the maximum and minimum cigarette tax in adjacent states. States were expected to increase the level of the cigarette excise tax in response to deteriorating fiscal conditions and as surrounding states raised their cigarette tax rates. Finally, additional control variables included the quantity of tobacco grown in the state, a measure of political philosophy, and both pre- Master Settlement Agreement (MSA[11]) and post-MSA time trends[12].

The following equations were estimated using ordinary least squares (OLS) and OLS with fixed effects. Both equations were estimated with cluster robust standard errors:

$$(2.1) \quad y_{st} = X_{st}\beta + e_{st}$$

$$(2.2) \quad y_{st} = X_{st}\beta + u_s + e_{st}$$

where, y_{st} was the nominal cigarette tax rate per pack in cents, X_{st} was the matrix of explanatory variables, β was a vector of coefficients, e_{st} was the error term, and u_s was the state fixed effect. State fixed-effects were used to capture other sources of time persistent unobserved heterogeneity between states.

The independent variables included smoking prevalence. It is quite possible that smoking prevalence is endogenous and jointly determined with the cigarette excise tax

[11] "In 1998, the Attorneys General of 46 states signed the Master Settlement Agreement with the four largest tobacco companies in the United States to settle state suits to recover billions of dollars in costs associated with treating smoking-related illnesses. Four states - Florida, Minnesota, Mississippi, and Texas - settled their tobacco cases separately from the MSA states and are therefore not signatories to the MSA. The MSA created a broad array of restrictions on the advertising, marketing and promotion of cigarettes." National Association of Attorneys General Website - http://www.naag.org/tobacco.php

[12] The time trend was modeled using a spline with a kink point at 1999 since the MSA was signed in 1998.

rate. To account for this, the equations were re-estimated using instrumental variables techniques and the endogeneity of smoking prevalence variable was tested.

Both the pooled and fixed effects specifications were estimated using two sub-samples of states. Fourteen states did not change their smoking ban laws during the sample time frame. It seems plausible that these fourteen states had less interest in reducing the prevalence of smoking and were fundamentally different from the states that did enact a complete smoking ban change. Including these states with the states that did change their smoking ban laws assumes that the explanatory variables influence the cigarette excise tax rate in the two sets of states similarly.

To test if differences exist between these two sets of states, a dummy variable was included in equations 2.1 and 2.2 representing the non-change states. The non-change dummy variable was also fully interacted with all of the other explanatory variables. An F-test of the equality of the coefficients between the change states and non-changes states produced a test statistics of $F(10, 568) = 1.65$ in the pooled regression, and $F(9, 560) = 1.95$ in the fixed effects regression. The null that the coefficients on the ban change and non-change states are the same was rejected at the 10 percent level in the pooled model and at the 5 percent level in the fixed effects model. Therefore, the sample was split into the two different sub-samples.

To test for the presence of serial correlation, the test developed by Wooldridge (2002) for serial correlation in panel data sets as implemented by the STATA "xtserial" command was utilized. The test rejected the null hypothesis of no first order serial correlation with an F-statistic of: $F(1, 48) = 70.7$. To correct for the serial correlation, the

data were transformed using $x_t^* = x_t - (\rho * x_{t-1})$, where ρ varied by increments of 0.01 from –1 to 1. Then, for each increment of ρ, the data were retested for serial correlation. The F-statistic for each iteration was examined, and the ρ with the smallest F-statistic was used to transform the data for analysis. The final ρ was 0.68, at which point the H_0: of no serial correlation could not be rejected with an F-statistic of $F(1, 48) = 0.00$. All of the continuous variables were transformed using $x_t^* = x_t - (0.68 * x_{t-1})$, while indicator variables remained 0 or 1.

Data

The data for the study were drawn from the following sources. Cigarette Tax information came from "The Tax Burden on Tobacco, Historical Compilation, Volume 43, 2008". The fiscal condition variable came from the National Association of Budget Officers Fiscal Survey of the States. Attitudes towards smoking bans and household smoking policy data were collected from the Current Population Survey - Tobacco Use Supplement (CPS-TUS). The measure of conservatism in a state was obtained from the American Conservative Union (ACU). Tobacco production data came from the United States Department of Agriculture (USDA). Finally, the smoking prevalence and the health related instrument variables were all obtained from the Center for Disease Control's (CDC) Behavior Risk Factor Surveillance System. For most of the variables, data are available from 1995 through 2007. Data were collected for 49 states, as Alaska and the District of Columbia were excluded from the analysis[13].

[13] Alaska was excluded from the survey because of its unique revenue situation.

The dependant variable, the nominal cigarette excise tax per pack[14], was taken from "The Tax Burden on Tobacco, Historical Compilation, Volume 43, 2008", published by the consulting firm of Orzechowski and Walker. The Tax Burden contains a wealth of detailed information on state and federal excise tax rates, tobacco prices, and tobacco consumption.

Cigarette tax rates in the sample ranged from a low of 2.5 cents per pack to a high of $2.58 per pack. The average cigarette excise tax rate in 1994 was $0.26, while in 2007 it was $1.01. The largest tax rate increase was in New Jersey, which increased its cigarette tax rate by $2.18. During the sample, only 5 states did not increase their cigarette tax rate (Florida, Mississippi, Missouri, North Dakota, and South Carolina).

The adjacent state minimum and maximum cigarette tax rates were also taken from the Orzechowski and Walker publication. Adjacent state minimum and maximum cigarette taxes were included in the model because state legislatures are cognizant of the potential for smuggling if cigarette excise tax levels become too divergent and keep surrounding states' tax levels in mind when setting tax policy (Benjamin and Dougan, 1997; Trogden and Sloan, 2006).

The Fiscal Survey of States is published twice yearly by the National Association of State Budget Officers (NASBO) and the National Governors Association. Each survey contains both individual state and aggregate data on the states' general fund receipts, expenditures, and balances. While general fund receipts and expenditures do

[14] The nominal tax per pack was chosen as the dependant variable because state legislatures set the nominal tax rate per pack.

not represent all state spending, these funds are used to finance most broad-based state services. They play an important role in determining the fiscal health of the states and represent a reasonable measure of a state's fiscal health. The ending balance from the each state's general fund and rainy day funds was calculated as a percentage of total general fund expenditures and was used as the measure of fiscal health for each state. Due to the lag in passing and enacting legislation, general fund ending balances lagged one year were used.

General fund ending balances vary from -20 percent to 57 percent. In 1996, the average state general fund ending balance was 7.9 percent. The average grew to 9.9 percent during the prosperity of the late 1990s. The recession of 2001 and 2002 caused ending balances fall to a low of 4.1 percent in 2002 and 2003, before rebounding to 12.9 percent in 2007.

The main purpose of the CPS is to collect information on the employment status from approximately 57,000 surveyed households each month; however, the Census Bureau occasionally asks supplemental questions about other topics, including tobacco consumption and attitudes towards smoking and smoking control measures. The Tobacco Use Supplement (TUS) has been conducted approximately every three years, with the most recent TUS occurring in 2006 and 2007.

Along with questions about cigarette use, the TUS contains questions about the individuals' attitudes towards smoking bans in various locations including restaurants, bars, indoor sporting venues, and workplaces. Additionally, the respondent's home smoking policy was determined. DeCicca, et al. (2006), examined nine different

measures of attitudes towards smoking bans, restrictions on tobacco advertising, and home smoking policies from the TUS, and find that all nine derived from a common factor which they label "anti-smoking sentiment." Using the nine measures they constructed an index that measured attitudes towards smoking.

Because all nine questions were not asked in the more recent Tobacco Use Supplements, an index of attitudes towards smoking bans was created using the four available smoking ban attitude questions and the home smoking policy question for each individual in the survey. All of the individual attitude index numbers were averaged by state and year to derive state attitude index values. A complete description of the calculation of the index is presented in Appendix A. The CPS-TUS data was available for all years except 1997, 2000, 2004, and 2005. A linear extrapolation from the available years was used to estimate the smoking attitude index for the missing years[15].

In 1995, the average smoking ban attitude index was 11.8, with a minimum value of 10.8 and maximum of 12.7. By 2007, the average was 13.1; the minimum was 12.1; and the maximum was 13.9. If states were using cigarette excise taxes as a policy tool, higher smoking ban attitude index values would be associated with higher cigarette tax rates.

The political conservatism index was constructed by averaging the rankings given to every member of Congress each year by the ACU. Members were ranked based on their votes for 20 key issues each year. For every vote the ACU considers conservative, the member was awarded 5 points. Scores could range from 0 to 100, with 100 a perfect

[15] The sensitivity of the results to the interpolation of the data is presented in the Results section.

conservative score. Each state's house and senate members' scores were averaged, and then the house and senate scores were averaged together to derive the state score. The most liberal states according to the index included Hawaii, Massachusetts, and Vermont with average rankings under 10. The most conservative states were Idaho, Oklahoma, and Wyoming with average rankings above 90. The average ranking was 50.7 in 1995, which increased to 54.8 by 2002; was largely flat through 2005; and then fell again to 42.8 in 2007.

Tobacco production data were gathered from the United States Department of Agriculture, National Agricultural Statistics Service publication *Agricultural Statistics*. Production in 2007 was 778.6 million pounds of leaf tobacco. This was down from 2,444 million pounds in 1995. Tobacco production was dominated by two states, North Carolina and Kentucky, which together produced almost 75 percent of total production in 2007. South Carolina, Virginia, Georgia, and Tennessee made up most of the rest of the production, 22 percent. These six states together accounted for 96 percent of total leaf tobacco production in the United States. All together, tobacco production occurred in 16 states in the sample.

The BRFSS is a national health survey conducted annually by all of the states in conjunction with the CDC. The survey collects information on health risk behaviors, health practices, health care access, and general demographics about the respondents. In 2006, more than 350,000 adults were interviewed by phone. Variables used from the

BRFSS include state smoking prevalence, the percent of the state's population in good health[16], and the state's drinking prevalence.

Because smoking prevalence is potentially endogenous, instrumental variables techniques were used to account for the potential endogeneity. The following variables were possible instruments because "nearly all econometric studies of cigarette demand use a variety of factors to control for tastes, including gender, race, education, marital status, employment status, and religiosity" (Chaloupka and Warner, 2000, pg.1547). Smoking was more prevalent among males (Davis et al, 2007; and Tauras, 2006), whites compared to Hispanics, Asians, and blacks (Decker and Schwartz, 2000; Davis et al, 2007; and Tauras, 2006), and unmarried individuals versus those in a permanent relationship (Decker and Schwartz, 2000; and Tauras, 2006).

Additionally, the percent of the population reporting good health was a potential instrument because the Surgeon General has concluded that tobacco smoking is the "single greatest cause of avoidable morbidity and mortality in the United States" and "smoking generally diminishes the health of smokers" (Surgeon General, 2004, Executive Summary pg.1). Because smoking is so harmful to health, the percentage of individuals reporting good health should be inversely related to the prevalence of smoking. Data from the 2005 BRFSS showed that 18.2 percent of the interview subject who reported being in good, very good, or excellent health smoked, compared to 25.8 percent of the respondents who reported fair or poor health.

[16] The percent of the population reporting good health is actually the percent who reported good, very good, or excellent health, however the BRFSS's reported prevalence statistics combine these three categories together.

Finally, drinking prevalence was included as a potential instrument. Statistics from the 2008 National Survey on Drug Use and Health from the Substance Abuse and Mental Health Service Administration showed a strong correlation between alcohol and tobacco consumption. For non-binge current drinkers, 19.2 percent had smoked cigarettes in the past month compared to 16.1 percent for abstainers. The report also stated: "Use of illicit drugs and alcohol was more common among current cigarette smokers than among nonsmokers in 2008, as in prior years since 2002" (pg. 50). Additionally, studies have documented the increased use of tobacco among consumers of alcohol (Burton and Tiffany, 1997; and Gulliver et. al., 1995). Because tobacco use is more common among drinkers, states with a higher prevalence of drinking are also likely to have a higher prevalence of smoking.

The key requirement for the instruments is that they are correlated with the endogenous variable (smoking prevalence) but do not have a direct effect on the dependant variable, cigarette excise tax. Of the potential instruments, employment status and the educational attainment variables have been used in previous cigarette excise tax studies, so they can be ruled out as instruments.

In order to identify which of the potential instruments would be suitable, the remaining potential instruments together with the other control variables were all regressed against the cigarette excise tax variable and the smoking prevalence variable using fixed effects OLS[17]. The results of these regressions indicate that the percent of the population in good health and the percent of the population who regularly drink were

[17] The regression results for the instrument tests are available on request.

suitable instruments. Both were statistically significant in the regression on smoking prevalence but statistically insignificant in the regression on cigarette excise tax levels.

The percent of the population in permanent relationships was not used because it was significant in the cigarette tax regression on level, while the percent of the population male, and the percent of the population white were also not utilized because they were poor predictors for smoking prevalence. The religion variables were also not utilized due to lack of data. The final set of instruments included the percent of respondents in each state indicating they were in good health and the percent of the population that consumed alcohol. Tests for the validity of the instruments are reported in the Results section.

Table 2.1 presents the summary statistics for the variables used in the model, for all states, states with a smoking ban change, and for those states without a smoking ban change to illustrate some of the differences between the two sub-samples of states. The smoking ban data used in the introductory analysis was collected from the CDC State Tobacco Activities Tracking and Evaluation System website, while sales, gasoline, and alcohol excise tax rates were obtained from the Tax Foundation's website.

Table 2.1

Cigarette Excise Tax Rate Analysis: Summary Statistics

	All States		States with a Ban Change		States w/o a Ban Change	
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
Smoking Variables						
Cigarette Excise Tax Rate	56.2	47.0	63.4	48.5	38.0	37.2
Smoking Attitude Index	12.6	0.6	12.7	0.5	12.3	0.5
Smoking Prevalence	22.3	3.3	21.7	3.3	23.7	3.1
Fiscal Variables						
Minimum Adj. State Cigarette Excise Tax Rate	30.4	31.0	35.5	34.1	17.9	15.4
Maximum Adj. State Cigarette Excise Tax Rate	82.5	52.6	88.5	54.5	67.5	44.1
General Fund Ending Balance	8.6	7.1	7.9	6.5	10.1	8.3
Other Control Variables						
Tobacco Production (Millions of Pounds)	21.8	77.8	5.5	18.1	62.6	134.5
Conservative Index	51.7	26.7	47.5	27.0	62.4	22.8
Instruments for Smoking Prevalence						
Percent of Population Reporting Good Health	85.2	3.4	85.6	2.8	84.1	4.3
Percent of Population which Drinks Alcohol	52.9	10.1	54.1	9.6	49.9	10.8
N	588		420		168	

Results

The parameter estimates for the pooled and fixed effects regressions are presented in Table 2.2. The first two columns contain the results for the smoking ban change states and the non-change states are reported in the last two columns. F-tests of the joint significance of the fixed effects indicate the null hypothesis that all of the fixed effects are zero can be rejected in both the ban change and non-change states[18]. Therefore, the

[18] For the states with ban changes, the F-statistic was, F(34, 377) = 3.93, with an associated p-value of 0.00. For the states without ban changes, the F-statistic was F(13, 146) = 5.44 and a p-value of 0.00.

fixed effects estimates are preferred over the pooled estimates; however, the pooled estimates are presented to illustrate the effect of the unobserved heterogeneity between states.

For the smoking related variables, the smoking attitude index variable was positive and statistically significant in the pooled specification for the ban change states. The coefficient estimate indicates that a one-point increase in the index leads to an increase in the state's cigarette excise tax rate of 20.4 cents. However, in the fixed effects specification, the estimate for the coefficient is 6.2 and is no longer statistically significant. For the non-change states, the smoking ban attitude index variable was not statistically significant in either the pooled or fixed effects specification. In the pooled specification the coefficient estimate was 2.7, and in the fixed effects specification it was –0.5.

While the pooled results show that states with higher levels of acceptance for smoking bans have higher levels of cigarette excise taxes, once the unobserved heterogeneity between states is controlled for with the fixed effects, the estimates become inconclusive about the role that attitudes towards smoking bans within states play in influencing the level of cigarette taxation. Even though the estimated coefficient for the smoking attitude variable is positive, the standard error is large and the null hypothesis that the coefficient is zero cannot be rejected.

The coefficient estimate for the state smoking prevalence variable was negative, small, and not statistically significant in both the pooled and fixed effects specifications for the ban change states. In the states without ban changes, the smoking prevalence

variable was negative in both specifications and statistically significant at the 10 percent level in the pooled regression analysis (estimated coefficient of –1.6), however, it was not statistically significant in the fixed effects specification.

The lagged general-fund ending balance variable coefficient estimate was negative and statistically significant in both regressions for the ban change states, while in the non-change states the coefficient estimates were small and insignificant. The estimated coefficients in the change states were –0.8 in the pooled regression, and –0.7 in the fixed effects regression. The increase of 0.7 cents for a 1 percent decline in general-fund ending balances seems small compared to the 25 cents, 50 cents, or 75 cents that some states have raised their cigarette taxes. However, the average increase across all 49 states was 5.9 cents per year from 1996 to 2007. Compared to the average of 5.9 cents, the 0.7 cents is a much larger percentage increase at almost 12 percent. The results suggest those states that enacted new smoking ban laws were more willing to raise cigarette excise taxes in times of fiscal need than those states that did not enact any new smoking ban legislation.

The time trend variables explained much of the increase in cigarette tax rates. The pre-MSA time trend variable was not statistically significant in either of the ban change states regressions. For the non-change states, the pooled regression coefficient estimate was negative and statistically significant; however, the fixed effects coefficient estimate was positive and insignificant. The post-MSA time trend however was positive and statistically significant in all of the regressions, with an estimated coefficient of 2.9 in the ban change states and 3.1 in the non-change states. The statistical significance and

large magnitude of the post-MSA time trend indicates that after the Master Settlement Agreement was signed, all states increased their cigarette excise tax rates at a much faster rate than prior to the signing of the MSA.

The adjacent state minimum tax rate coefficient was positive in all specifications. The estimated coefficient was only significant at the 10 percent level in the ban change states pooled specification at 0.2. For the adjacent state maximum cigarette tax rate variable, only the ban change states' fixed effects estimate was statistically significant. The estimated coefficient was –0.1. The pooled estimate was also negative, but not significant. For the non-change states, both coefficient estimates were not statistically significant and small in magnitude.

These results suggest that states are not influenced by the lowest adjacent state tax rate. However the average change resulting from the trend variable was somewhat smaller if the highest adjacent state cigarette tax was changed. The size of the effect was small, at about –0.1 cent per 1 cent of increase in the adjacent state.

For the other control variables, the tobacco production variable was negative and statistically significant in both of the pooled regressions and positive and statistically significant in both of the fixed effects specifications, however, the size of the effects was small. In the ban change states, the estimated coefficient from the fixed effects regression was 0.4. A one million pound increase in the production of tobacco would lead to an increase in the cigarette excise tax of 0.4 cents. For the non-change states, the estimated coefficient was 0.03.

Table 2.2

Cigarette Excise Tax Rate: OLS and Fixed Effects OLS Analysis

Dependant Variable: Cigarette Excise Tax Rate		States with Ban Change		States w/o Ban Change	
		Specification		Specification	
Independent Variables		Pooled	Fixed Effects	Pooled	Fixed Effects
Smoking Variables					
Smoking Attitude Index	β	20.442**	6.175	2.650	-0.500
	se	(8.345)	(10.067)	(6.782)	(12.123)
Smoking Prevalence		-0.432	-0.018	-1.632*	-1.049
		(0.440)	(0.474)	(0.843)	(1.133)
Fiscal Variables					
Adj. State Min. Cigarette Excise Tax Rate		0.199*	0.103	0.440	0.049
		(0.113)	(0.106)	(0.388)	(0.251)
Adj. State Max Cigarette Excise Tax Rate		-0.019	-0.091**	0.021	-0.022
		(0.057)	(0.040)	(0.108)	(0.072)
Lagged General-fund Ending Balance		-0.838***	-0.655**	-0.069	0.052
		(0.290)	(0.254)	(0.262)	(0.254)
Other Control Variables					
Tobacco Production (Millions of Pounds)		-0.214**	0.388**	-0.047*	0.027*
		(0.081)	(0.155)	(0.023)	(0.013)
Conservative Ranking Index		-0.444***	-0.121	-0.166	0.282
		(0.113)	(0.150)	(0.131)	(0.165)
Pre-MSA Time Trend		-0.317	0.930	-1.248*	-0.426
		(0.960)	(0.943)	(0.628)	(0.645)
Post-MSA Time Trend		2.736**	2.850**	3.008*	3.089**
		(1.341)	(1.233)	(1.404)	(1.194)
Constant		-55.785*	-10.439	16.256	12.128
		(31.580)	(38.355)	(26.491)	(41.154)
r2		0.359	0.327	0.262	0.257
F		12.4	11.0	9.2	5.6
N		420	420	168	168

* p<0.10, ** p<0.05, *** p<0.01

The positive and statistically significant coefficient estimates in the fixed effects regressions were unexpected. For the ban change states, the positive coefficient can be explained by the fact that overall tobacco production increased from less than one million pounds in 1996 to over 7 million pounds in 2007 at the same time that cigarette excise taxes increased. For the states without ban changes, even though overall tobacco

production decreased, three states increased their cigarette excise tax rates at the same time tobacco production increased. North Carolina and Pennsylvania both increased their cigarette taxes in years in which tobacco production also increased, while Wisconsin increased its cigarette excise tax twice at the same time that tobacco production increased.

The conservative ranking index variable was negative in both of the ban change states regressions, but only statistically significant in the pooled regression. For the non-change states, the pooled regression coefficient estimate was negative while the fixed effects estimate was positive. Neither was statistically significant.

To check the sensitivity of the results to the interpolation of the smoking attitude variable, the regression equations were re-estimated dropping the interpolated observations for the smoking attitude index variable.[19]. Because only one of the years of remaining data was from prior to the MSA, the pre-MSA variable was dropped. The results are similar both with and without the observations in the model. The largest difference is that the post-MSA time trend is no longer statistically significant in the non-ban change states. The lagged general fund ending balances and post-MSA time trend variables retain the same signs and are both statistically significant for the ban change states. A table with the results is presented in Appendix B.

[19] Only five years of observations remain in the data set due to the serial correlation adjustment 1996, 1999, 2002, 2003, and 2007.

Instrumental Variables Results

To determine if the smoking prevalence variable was endogenous, instrumental variables were used to re-estimate the fixed effects models, treating smoking prevalence as endogenous. Instruments used were the percent of the state's population reporting being in good health and the state's drinking prevalence. Results for the fixed effects instrumental variable estimation for the cigarette tax rate level model are presented in Table 2.3.

To estimate the IV regressions, the xtivreg2 command in STATA was used. The estimation technique chosen was the Continuously Updated GMM Estimator (CUE-GMM) because the CUE performs better in the presence of weak instruments and is robust to heteroskedasticity (Hahn et. al., 2004).

Drinking prevalence data were missing for the years of 1996, 1998, and 2000. Because of the missing data, the serial correlation adjustment can only be made for the drinking prevalence variable for the years of 2002 through 2007. As such, the IV analysis was conducted using only the 2002 through 2007 data and the pre-MSA time trend variable was omitted from the analysis. The fixed effects regressions from Table 2.2 were re-estimated using only these years so that the results from the fixed effects for the full sample, fixed effects for the restricted sample, and IV fixed effects for the restricted sample can be compared.

For the fixed effects regressions, dropping the pre-2002 years of data did change the coefficient estimates and the statistical significance of several of the variables. The changes occurred for tobacco production, the political conservativism index, and the

post-MSA time trend. The tobacco production variable became insignificant in both the ban change states and non-change states regressions, the political conservativism index in the non-change states became statistically significant, and the post-MSA time trend coefficient in the non-change states also became non-significant. Overall, the loss of the pre-2002 data did not change the analysis.

Several tests were conducted to validate the instruments used. First, a test for identification of the model was conducted. The Kleibergen-Paap (2006) rk Lagrange Multiplier (LM) statistic was used to test for identification. Under the null for the test, the equation is under identified. The test statistics for the ban changes states was: $chi^2(2) = 7.84$, with a p-value of 0.019, and for the non-change states it was: $chi^2(2) = 5.39$, with an associated p-value of =0.068. The test rejects the null of under identification for the ban changes states at the 5 percent level, but only rejects the null at the 10 percent confidence level for the non-change states.

A test of the significance of the endogenous regression variables in the structural equation can be tested using the Anderson‐Rubin (AR) Wald test and Stock‐Wright (SW) LM tests. The AR test has both chi^2 and F-test versions. Both the AR and SW tests are tests of the null hypotheses that the endogenous regressors are irrelevant ($\beta=0$) and there are appropriate over identifying restrictions. For the ban change states, all three of the tests failed to reject the null, with test statistics of: AR Wald F-test, $F(2,34) = 0.03$, AR Wald chi^2 test, $chi^2(2) = 0.07$, and SW LM test, $chi^2(2) = 0.06$. The test statistics for the non-change states were: AR Wald F-test, $F(2,13) = 3.07$ with a p-value of 0.081, AR Wald chi^2 test, $chi^2(2) = 7.32$ with a p-value of 0.026, and SW LM test, $chi^2(2) = 4.19$

with a p-value of 0.123. While all three of the tests failed to reject the null hypothesis for the ban change states, only one of the tests failed to reject the null for the non-change states. These results indicate that either smoking prevalence was not endogenous in ban change states but was endogenous in the non-change states or the model was under identified in the non-change states, which was suggested by the test for model identification.

The correlation of the instruments with the error term in the equation of interest was tested using the Hansen's J statistic. The J test is appropriate when the data is heteroskedastic. The null of the test is that the instruments are valid and uncorrelated with the error term. In both specifications, the test failed to reject the null. For the change states, the test statistic was: $chi^2(1) = 0.06$, with a p-value of 0.801. For the non-change states, the test statistic was $chi^2(1) = 2.12$, with a p-value of 0.146.

Finally, the endogeneity of the smoking prevalence variable was tested. Using the -endog- option within the xtivreg2 command, the null for the test is that the suspected endogenous variable can be treated as exogenous. The endogeneity test implemented by xtivreg2 is the difference of two Sargan-Hansen statistics. The first statistic comes from an equation where the variable in question is treated as endogenous and the second statistic comes from an equation where the variable is treated as exogenous. In both cases, the test failed to reject the null. For the change states the test statistic was: $chi^2(1) = 0.04$ and a p-value of 0.844. The non-change states test statistic was: $chi^2(1) = 1.24$ with a p-value of 0.266.

Table 2.3

Cigarette Excise Tax Rate: Instrumental Variables Analysis

Dependant Variable: Cigarette Excise Tax Rate		States with Ban Change			States w/o Ban Change		
		Specification			Specification		
Independent Variables		Fixed Effects 96-07	Fixed Effects 02-07	IV Fixed Effects 02-07	Fixed Effects 96-07	Fixed Effects 02-07	IV Fixed Effects 02-07
Smoking Variables							
Smoking Attitude Index	β	6.175	2.739	2.007	-0.500	6.907	9.420
	se	(10.067)	(11.252)	(10.250)	(12.123)	(23.149)	(19.406)
Smoking Prevalence		-0.018	0.631	-0.127	-1.049	-0.274	8.039
		(0.474)	(0.908)	(4.044)	(1.133)	(2.422)	(6.539)
Fiscal Variables							
Adj. State Min. Cigarette Excise Tax Rate		0.103	-0.052	-0.050	0.049	-0.146	-0.284
		(0.106)	(0.114)	(0.116)	(0.251)	(0.178)	(0.267)
Adj. State Max Cigarette Excise Tax Rat		-0.091**	-0.142***	-0.140***	-0.022	-0.046	-0.077
		(0.040)	(0.041)	(0.039)	(0.072)	(0.077)	(0.070)
Lagged General-fund Ending Balance		-0.655**	-0.809**	-0.778**	0.052	0.199	0.456
		(0.254)	-0.318	-0.364	-0.254	-0.348	-0.412
Other Control Variables							
Tobacco Production (Millions of Pounds)		0.388**	-0.206	-0.241	0.027*	0.009	0.025
		(0.155)	(0.332)	(0.356)	(0.013)	(0.096)	(0.054)
Conservative Ranking Index		-0.121	-0.202	-0.170	0.282	0.613**	0.484*
		(0.150)	(0.235)	(0.241)	(0.165)	(0.281)	(0.250)
Pre-MSA Time Trend		0.930			-0.426		
		(0.943)			(0.645)		
Post-MSA Time Trend		2.850**	4.399***	4.228***	3.089**	3.593	5.152*
		(1.233)	(0.824)	(1.004)	(1.194)	(2.164)	(3.000)
Constant		-10.439	8.581		12.128	-34.204	
		(38.355)	(46.192)		(41.154)	(89.184)	
r2		0.327	0.124	0.122	0.257	0.148	-0.091
F		11.0	5.022	5.356	5.59	1.975	1.157
N		420	210	210	168	84	84

* p<0.10, ** p<0.05, *** p<0.01

The results of the instrumental variables regressions did not differ substantially from the main results. The coefficient on the lagged general fund ending balances variables was still negative and statistically significant in the ban changes states, and the post-MSA time trend variable coefficient was positive and statistically significant in both

the ban change and non-ban change states. Because the main results remain the same, the smoking prevalence was found to be exogenous in the ban changes states, and the instrumental variables results for the non-change states are uncertain, the fixed effects results remain the preferred specification.

Discussion and Summary

This analysis has examined the role that attitudes towards smoking bans, fiscal conditions, and other variables play in the determination of the level of cigarette taxation. The results indicate that once unobserved heterogeneity between states is controlled for, anti-smoking sentiment as measured by attitudes towards smoking bans was not an important determinant in the level of cigarette taxation.

However, to the extent that attitudes towards smoking bans help determine changes in smoking ban legislation, attitudes matter because states that have enacted new smoking ban legislation were more likely to raise their cigarette excise rate during periods of fiscal need. The cigarette tax rate in states that have not enacted new smoking ban legislation was unaffected by changes in general fund ending balances. It should be noted that the non-change states had higher average general fund ending balances and so may never have dropped below some ending balance critical threshold, which would have caused them to look at raising their cigarette tax rates.

By far the largest impact on cigarette tax rates appears to be the Master Settlement Agreement. The results show that cigarette excise taxes increased across all states, ban change and non-change, after the states and major tobacco companies entered into the

Master Settlement Agreement. Trogden and Sloan found a one-time 10-cent increase in cigarette taxes in 1998 and then a 3 period of flat taxes. While the overall average change in cigarette excise tax rates was 5.9 cents per year, in the non-ban change states the average was only 3.9 cents per year versus 6.7 in the change states. This analysis shows however that in the non-change states, the post-MSA time trend accounted for 3.1 of the 3.9 cents of annual increase, compared to 2.9 cents of the 6.7 cents of annual increase in the ban change states. As Trogden and Sloan suggested, it appears that the states took advantage of the political weakness of the tobacco companies after the MSA to increase cigarette taxes across the board.

While advocacy groups have urged state legislatures to raise cigarette taxes to reduce the prevalence of smoking, it appears that their pleas have "fallen on deaf ears" in the majority of states. While cigarette excise taxes have indeed risen substantially, with the possible exception of the few states that raised their tax rates $1.00 or more, the driving forces behind the increases have been the fiscal needs of some of the states and an overall acceptance of increased cigarette excise taxes after the Master Settlement Agreement.

Appendix A: Smoking Ban Attitude Index Calculation

Attitudes towards smoking bans are probed in most waves of the CPS-TUS. The CPS-TUS data was available for all years except 1997, 2000, 2003, 2004, and 2005. A linear extrapolation from the available years was used to estimate the smoking attitude index for the missing years.

Questions about attitudes towards smoking bans in restaurants, work areas, bars, and indoor sporting events are consistently asked. Possible answers to the questions are: "1-Allowed in all areas", "2-Allowed in some areas", or "3-Not allowed at all".

In addition, the respondent's home smoking policy is also probed, with the following responses: "1-No one is allowed to smoke anywhere INSIDE YOUR HOME", "2-Smoking is allowed in some places or at some time INSIDE YOUR HOME", "3-Smoking is permitted anywhere INSIDE YOUR HOME".

To construct the index, first the home smoking policy variable was recoded so that higher values reflected stronger anti-smoking sentiment: "1-Smoking is permitted anywhere INSIDE YOUR HOME", "2-Smoking is allowed in some places or at some time INSIDE YOUR HOME", and "3-No one is allowed to smoke anywhere INSIDE YOUR HOME".

The individual responses were summed, then averaged by state and year to derive a state attitude index for each year. The formula is to calculate an individual's attitude index is as follows:

Smoking Attitude Index = Restaurant Attitude + Work Area Attitude

+ Bar Attitude + Indoor Sporting Events Attitude

+ (4-Home Smoking Policy)

To test if these five questions measure the same idea, attitude towards smoking, Cronbach's alpha (reliability coefficient) was calculated. The reliability coefficient was 0.76, indicating that the 5 items all measured the same underlying attitude of the respondent.

Appendix B: Results without Interpolation of Smoking Ban Attitude Index

Cigarette Excise Tax Rate OLS and Fixed Effects OLS Analysis Without Interpolation of Smoking Ban Attitude Index Variable

Dependant Variable: Cigarette Excise Tax Rate		States with Ban Change		States w/o Ban Change	
		Specification		Specification	
Independent Variables		Pooled	Fixed Effects	Pooled	Fixed Effects
Smoking Variables					
Smoking Attitude Index	β	7.270	-6.654	1.838	-4.188
	se	(0.106)	(0.094)	(0.113)	(0.132)
Smoking Prevalence		-2.054**	-1.415	-1.424	-0.217
		(0.894)	(1.241)	(0.929)	(1.630)
Fiscal Variables					
Adj. State Min. Cigarette Excise Tax Rate		0.115	0.038	0.445	0.092
		(0.131)	(0.097)	(0.470)	(0.392)
Adj. State Max Cigarette Excise Tax Rate		-0.065	-0.173*	0.146	0.132
		(0.411)	(0.422)	(0.473)	(0.376)
Lagged General-fund Ending Balance		-1.153***	-0.893**	0.078	-0.129
		(9.400)	(12.385)	(9.262)	(23.219)
Other Control Variables					
Tobacco Production (Millions of Pounds)		-0.287**	0.311	-0.048	0.042
		(0.121)	(0.200)	(0.041)	(0.043)
Conservative Ranking Index		-0.404**	-0.017	0.010	0.199
		(0.171)	(0.246)	(0.211)	(0.320)
Pre-MSA Time Trend		0.000	0.000	0.000	0.000
		0.000	0.000	0.000	0.000
Post-MSA Time Trend		2.864***	4.962***	1.032	2.238
		(0.909)	(1.009)	(1.431)	(2.005)
Constant		11.979	56.979	9.594	18.826
		(39.851)	(53.739)	(31.581)	(80.320)
r2		0.341	0.356	0.281	0.269
F		10.7	6.2	8.2	2.8
N		175	175	70	70

* p<0.10, ** p<0.05, *** p<0.01

CHAPTER III

THE EFFECT OF COMPLETE SMOKING BANS IN BARS AND RESTAURANTS ON SMOKING PREVALENCE AND INTENSITY

Introduction

In 1995 Utah completely banned smoking in restaurants and in 1998 California completely banned smoking in restaurants and bars. No additional statewide complete smoking bans were enacted until 2002 when South Dakota completely banned smoking in workplaces, and Delaware completely banned smoking in workplaces, restaurants, and bars. Since 2002, the number of complete workplace, restaurant and bar smoking bans has increased significantly. By January 1, 2009, 22 states completely banned smoking in private workplaces, 28 states completely banned smoking in restaurants, and 22 states completely banned smoking in bars[20].

Numerous studies have investigated the effect of individual worksite smoking bans on the prevalence and intensity of cigarette use. The research has shown that bans enacted at worksites were effective in reducing both the prevalence and intensity of smoking. The effectiveness of worksite bans was attributed to the large amount of time that individuals spend in their workplaces (Evans et al., 1999). Studies further indicated

[20] The District of Columbia, which banned smoking in workplaces on April 3, 2006 and in restaurants and bars on January 1, 2007, is not counted in these totals.

that the effect of the bans increased the longer the workweek and the more restrictive the smoking ban.

But what effect has the recent increase in complete statewide smoking bans in restaurants and bars had on smoking prevalence and intensity? Because individuals spend significantly less time at restaurants and bars than they do at their worksites and can choose not to frequent restaurants and bars, the effect of the bans should presumably be smaller. However, because dining out and frequenting bars is a recreational activity, the desire to participate in these activities may outweigh the negative impacts of the bans for smokers, and they may choose to refrain from smoking to dine out and visit bars.

Using the Current Population Survey – Tobacco Use Supplements conducted from 1995 through 2007, this paper will examine the effect of the recent increase in the number of complete worksite, restaurant, and bar smoking bans. Subsequent sections of this paper include a brief literature review, a description of the methodology employed, a discussion of the data used, the results, and finally a discussion and summary.

The results suggest that complete smoking bans have little effect on smoking prevalence and have a mixed effect on smoking intensity. The essay also explores the effect that explicitly accounting for attitudes towards smoking bans through the addition of a smoking ban attitude index variable has on these results. The smoking ban attitude index variable will be used to control for the presence of sub-state smoking bans. The inclusion of the smoking ban attitude variable was found to have little effect on the estimated coefficients for the smoking ban variables, but it reduced the effect of the price of cigarettes on smoking participation and intensity of consumption. Finally, the essay

finds that smoking bans in bars and higher alcohol prices may be effective at reducing the consumption of cigarettes.

This essay contributes to the literature on smoking by examining the effect that complete smoking bans in social settings, bars and restaurants, has on smoking prevalence and intensity. It also shows that including a measure of attitudes toward smoking bans in the analysis reduces the effect that the price of cigarettes has on smoking prevalence and intensity.

Relevant Literature

Recent summaries of the effect of smoking bans on smoking can be found in Fichtenberg and Glantz (2002), Levy and Friend (2003), and Goel and Nelson (2006). Fichtenberg and Glantz reviewed 26 studies that looked at private worksites that had enacted smoking restrictions. Fichtenberg and Glantzs' main conclusion was that worksite bans reduced smoking prevalence by 3.8 percentage points and the average number of cigarettes smoked by 1.3 cigarettes. They also found that total bans were about twice as effective in reducing the prevalence of smoking as partial bans. The studies reviewed used survey data from the 1980's and early 1990's.

The review by Levy and Friend not only looked at worksite studies but also reviewed 18 studies that examined public clean air legislation. Their review of the worksite studies reached similar conclusions as the Fichtenberg and Glantz study. Levy and Friend found that extensive clean air laws were associated with lower smoking prevalence and cigarette consumption. Overall, they found that the presence of smoking

restrictions reduced the prevalence of smoking by 5 to 20 percent. However, all but one of the studies they examined used legislation enacted prior to 1994 when total bans were rare. Finally, Goel and Nelson reviewed 5 U.S. and 5 international studies of smoking control measures that used data primarily from the mid 1970s through the mid 1990s. They concluded, "territorial restrictions were effective in reducing smoking in most cases, and in only one case did we find the territorial restrictions to be ineffective" (pg. 340).

While the summary papers referenced above show that smoking bans are effective at reducing the prevalence and intensity of smoking, several individual studies are worth noting. Studies by Chaloupka (1992), Farelly et al. (1999), and Czart et al. (2001)[21] show that increased numbers of weak smoking bans alone will not decrease cigarette consumption, rather it is the severity of the smoking bans that matters.

The study by Chaloupka (1992) used the Second National Health and Nutrition Examination Survey data set and statewide smoking bans. The study found that "the passage of a clean indoor air law does have a negative impact on average cigarette consumption. However, the results suggest that increasing the restrictiveness of these laws, beyond some 'basic' level, does not appear to have a greater impact on cigarette consumption" (pg. 202). It is important be note that the definition of a "basic" level of smoking bans indicates the state regulated public smoking in four or more public places but does not include restaurants or private worksites. In contrast states' with "extensive"

[21] Both the Chaloupka and Farelly et al. studies are included in the Levy and Friend review, while the Fictenberg and Glantz review included the Farelly et al. study. The Czart et al. study was included in the review by Goel and Nelson.

bans also regulated the use of cigarettes in restaurants and private worksites, however, these were not complete smoking bans.

During the time frame referenced in Chaloupka's study, the smoking restrictions only consisted of designated smoking areas. In effect, the study showed that once a state adopted some limited smoking restrictions, expansion of those limited smoking restrictions to other public places did not further reduce cigarette consumption. Given the definition of the basic and extensive smoking ban variables, it may be that the smoking ban variables were detecting the effect of some unobserved variable such as "social attitudes" towards smoking.

Subsequently the Farelly et al. (1999) study used the Current Population Study – Tobacco Use Supplements (CPS-TUS) data from 1992 and 1993 and examined self-reported workplace smoking bans. A change from no smoking bans in the workplace to a complete smoking ban was estimated to reduce smoking prevalence by 5.7 percentage points and average daily consumption by 14 percent. When smoking was allowed in common areas, the effect of the workplace bans was reduced by roughly half. Prevalence was lowered by only 2.6 percentage points, and average daily consumption decreased by only 8 percent when smoking was allowed in common areas. Partial workplace bans had no effect on smoking prevalence, but decreased average daily consumption by roughly 3 percent.

Finally the Czart et al. (2001) study found that "campus prohibitions on smoking in all areas have a negative and marginally significant association with the level of smoking among current smokers relative to other types of restrictions but have no

significant impact on smoking participation. Only complete bans influence smoking behavior" (pg. 146).

To summarize the three studies, the study by Chaloupka suggests that extending less restrictive smoking bans to more locations will not reduce the consumption of cigarettes. The study by Farelly et al. suggests that more stringent smoking bans did reduce cigarette consumption. The Czart et al. paper similarly suggested that more stringent bans reduce cigarette consumption.

While the above studies have shown the effectiveness of smoking bans at reducing smoking prevalence and intensity, they did not account for unobserved heterogeneity, such as smoking sentiment, in their analysis. More recent work recognizes that unobserved heterogeneity like smoking sentiment, poses another complication when examining smoking bans it could influence both smoking behavior and tobacco policy. Tauras (2006) found that once state level unobserved heterogeneity was controlled for, the effect of smoking bans on smoking prevalence largely disappeared. However, smoking bans were still effective at reducing the number of cigarettes smoked. Tauras used the 1992-1993, 1995-1996, and 1998-1999 CPS-TUS and utilized 5 different types of statewide smoking bans measured on a continuous scale. The bans were examined both individually and aggregated into a smoking ban index, while unobserved heterogeneity was controlled for by using state effects.

While smoking bans were ineffective in reducing the incidence of smoking, they were effective in reducing average daily consumption. Price, however, had a statistically significant impact on both smoking prevalence and intensity. Based on the results,

Tauras concluded that price might be a more effective tool to reduce smoking prevalence than smoking bans.

While Tauras used state effects to capture the effect of smoking sentiment and other unobserved heterogeneity that might influence an individual's decision to smoke, this paper adds two additional covariates that attempt to control for attitudes towards smoking and smoking bans more directly. The two measures a smoking ban attitude index and the smoking prevalence rate within the state. The smoking ban attitude index variable will help control for the presence of sub-state bans, because states with more positive attitudes towards smoking bans are more likely to have more numerous sub-state smoking bans. The smoking prevalence variable will help control for other aspects of the smoking environment.

Building on the smoking literature, this paper adds the understanding of the effects of complete smoking bans. The essay finds that complete restaurant smoking bans increased the number of cigarettes smoked. Two possible explanations for the increase are suggested. Additionally, the paper finds that complete smoking bans in bars and higher alcohol prices reduced the consumption of cigarettes.

Modeling Framework

To model the demand for cigarettes, the standard utility maximization problem will be expanded to include smoking bans. Consumers maximize utility by consuming a good until the marginal cost of the good is equal to the marginal benefit of the good. The simplest models include income, price, and the prices of substitutes and compliments.

To help control for individual preferences when performing regression analysis, a vector of demographic characteristics is typically included. For this analysis, additional smoking related variables were added to the regression equation estimated. The main variables of interest, smoking bans, were included in the regression to control for the effect that the bans have on the consumption of cigarettes. Additional variables related to smoking included in the model are described in the data section.

Complete smoking bans prevent smokers from consuming cigarettes while they are in the establishment subject to the smoking ban by making smoking inconvenient by forcing smokers to an outside smoking area. Smoking bans "…reduce the smoker's opportunities to smoke or otherwise raise the "cost" of smoking" (Chaloupka, Frank J. and Warner, Kenneth E, 2000, pg. 1596).

For private workplace bans, individuals have few options to reduce the impact of the ban because most individuals need to work and all workplaces are subject to the ban. For the restaurant and bar smoking bans, individuals have more choice. While the smoking ban reduces the utility that smokers derive from dining out and drinking by preventing them from smoking while eating and drinking, individuals can choose to refrain from dining out by eating home cooked meals or consuming "take out" and by drinking alcohol at home. For smoking bans in restaurants and bars to reduce the consumption of cigarettes, the additional utility derived from dining out and drinking at bars must be greater than the loss of utility from not smoking in these establishments.

Empirically, when looking at the data on cigarette consumption, a large number of consumers choose not to consume cigarettes, thus consumption is equal to zero. This

leads to a cumulative distribution of cigarette consumption that has a mass point at zero representing individuals who choose not smoke and a continuous distribution representing the number of cigarettes smoked by those who choose to smoke.

Such mixed distributions are typically modeled in two parts[22]. First, for the participation decision, a probit or logit procedure is used to model the dichotomous decision to smoke or not to smoke. Second, ordinary least squares (OLS) or a generalized linear method (GLM) is used to estimate the intensity or quantity of cigarettes consumed, conditional on the individual first choosing to smoke.

If OLS is used for the second part of the model, the log of the number of cigarettes can be used in order to more closely approximate the normal distribution as the distribution of the number of cigarettes consumed tends to be skewed. However this leads to retransformation problems to return coefficients to the raw scale (Duan, 1983; Mullahy, 1998; Manning, 1998; and Manning and Mullahy, 2001).

As opposed to using OLS with the log of the dependant variable, a generalized linear model can also be employed. The advantage of using a GLM model is that GLM models directly estimate $ln\{E[Y \mid X]\}$, compared to OLS with a transformed dependant variable that estimates $E[ln(Y) \mid X]$ and requires retransforming. Unlike traditional linear models, a GLM model allows for the expected value of the response variable to depend on a linear predictor through a nonlinear link function and allows the response probability distribution to be one of the distributions from the exponential family.

[22] For example: Chaloupka and Groosman (1996); Farrelly, Evans and Sfekas (1999); Czart, Pacula, Chaloupka, and Wechsler (2001); Tauras (2004); and Tauras (2006).

For the participation decision a probit model was chosen:

(3.1) $\Pr(z_{cig} > 0 \mid P, w, SV, X) = \Phi(\alpha + \delta P + \eta w + \beta SV + \lambda X)$

where: $z_{cig} > 0$ is measured as someone who has smoked in the past 30 days; P (prices of cigarettes, compliments and substitutes), w (income), SV (smoking ban and other smoking related variables), and X (vector of demographic demand shifters) are vectors of explanatory variables; α, δ, η, λ, and β are coefficients to be estimated; and Φ is the standard normal cumulative distribution function.

To model the conditional demand, a Modified Park Test of the data with positive consumption of cigarettes was conducted. The test indicated that the raw scale variance was linearly related to the mean suggesting that a Poisson distribution for the data. Because the data showed a Poisson distribution, a Zero Truncated Poisson model was estimated:

(3.2) $g[E(z_{cig})] = \tau + \kappa P + \gamma w + \omega X + \nu SV, \;\; z_{cig} \sim$ Poisson and $z_{cig} > 0$

where z_{cig} represents the average number of cigarettes smoked in the past month conditional on cigarette consumption being positive, τ, κ, γ, ω, and ν are parameters to be estimated, and g [.] is a log-link function. The remaining variables are defined as above. Robust standard errors were calculated with clustering at the state level. Clustering at the state level relaxes the assumptions of independence of observations so that observations only have to be independent across states but not within states. Additionally, all regression equations included probability weights.

Both the smoking participation and intensity equations were estimated with and without the state smoking ban attitude index variable to assess the impact of adding this

variable on the results. In addition, because of the potential multicollinearity between the smoking ban variables, the participation and intensity equations were also estimated using a variable of smoking ban prevalence and severity. The regressions with the smoking ban index were also estimated with and without the state smoking ban attitude index variable. In total, eight regressions were run, four regressions for the participation equation and four regressions for the intensity equation.

Data

This study used data from a variety of sources that are described below. Only the two dependant variables and key independent variables are described in depth. For the smoking participation regression, the dependant variable was whether the individual smoked in past 30 days. The dependant variable for the intensity of consumption regression was the average number of cigarettes smoked per month.

The data sources for the variables used in this study include the Current Population Survey – Tobacco Use Supplements (CPS-TUS), ImpacTeen's Tobacco Control Policy and Prevalence Data[23], the publication "The Tax Burden on Tobacco – 2008," the Behavioral Risk Factor Surveillance System (BRFSS), Quarterly Census of Employment and Wages (QCEW), and the Consumer Price Index (CPI).

Both of the dependant variables, smoking status and number of cigarettes smoked, come from the CPS-TUS, as well as demographic characteristics of the individual. The Census Bureau conducts the Current Population Survey (CPS) monthly for the Bureau of

[23] The ImpactTeen tobacco control data can be found at: http://www.impacteen.org/tobaccodata.htm.

Labor Statistics. Roughly 57,000 households are surveyed each month. The main purpose of the CPS is to collect information on the employment status of those surveyed, however, in conjunction with the surveyed household's employment situation, demographic information such as age, sex, race, marital status, educational attainment, and family income is also collected[24].

Occasionally, the Census Bureau asks supplemental questions about additional topics, including tobacco consumption in the Tobacco Use Supplement. The tobacco consumption questions in the TUS include current smoking status, if the individual has smoked 100 or more cigarettes in their lifetime, and average number of cigarettes smoked per day. Additionally, questions about household and workplace smoking policies and attitudes towards smoking bans are also asked. The 1995-1996, 1998-1999, 2000, 2001-2002, 2003, and 2006-2007 waves of the CPS-TUS were used[25].

While the CPS/TUS asked about average daily consumption, this measure was converted to average number of cigarettes smoked per month. The change ensures comparability between the number of cigarettes smoked by occasional smokers and everyday smokers. For everyday smokers, the average number of cigarettes smoked was calculated as the average daily number of cigarettes smoked times 30, while for occasional smokers the monthly average was calculated as the number of days smoked in the past 30 times the average number of cigarettes smoked on those days. Although self-

[24] Detailed information about the demographic variables from the CPS is provided in Appendix B.
[25] Response rates for the 2006 and 2007 TUS were between 81-85 percent for self-and-proxy responses and 60-64 percent for self-response only, compared to roughly 91 percent for the basic monthly survey. Current Population Survey, January 2007: Tobacco Use Supplement File Technical Documentation CPS—07

reported smoking status questions are potentially subject to bias, studies by Vogt et al. (1977), Wagenknecht et al. (1992), Glynn et al. (1986), and Klesges et al. (1992), have shown that self-reported smoking status is reliable, with biochemical measures of smoking status agreeing with self-report status 85% to 95% of the time.

One final variable derived from the CPS-TUS was a smoking ban attitude index variable. DeCicca, et al. (2006), examined nine different measures of attitudes towards smoking bans, restrictions on tobacco advertising, and home smoking policies from the TUS, and found that all nine were derived from a common factor that they labeled "anti-smoking sentiment." Using the nine measures, they constructed an attitudes toward smoking index. Because all nine questions were not asked in the more recent TUSs, the smoking ban attitude index was created by using the four available questions about attitudes towards smoking bans and the home smoking policy question[26]. The smoking ban attitude index variable should help control for the presence of less than statewide smoking bans because states with more positive attitudes about smoking bans should be more likely to have more numerous and more severe local smoking bans.

Smoking ban data was obtained from the ImpactTeen Program's website. The ImpactTeen data included both complete and less restrictive (weak) smoking bans in force during the calendar year. The main reason for the use of the ImpactTeen data was to include both complete and weak smoking bans in the analysis. The ImapctTeen data rated the severity of smoking bans on a scale of 0 to 3, with 0 indicating no restrictions, a 3 indicating a complete ban, with 1 or 2 indicating a weaker form of ban such as separate

[26] Compete details about the construction of the state attitude index are given in Appendix A.

smoking areas without airflow separation or separately ventilated rooms. For each location type of ban, workplace, restaurant, or bar, two dummy variables were constructed, an absolute ban indicator and a weak ban indicator.

Because the inclusion of multiple types of similar smoking bans could lead to colliniarity problems, a weighted index of smoking bans to measure the overall severity of smoking restrictions within each state was also utilized. Adding the raw scale rankings for each type of ban created a weighted index of the prevalence and severity of the smoking bans. The weighted index has a minimum possible value of 0, representing no bans of any kind for private workplaces, restaurants, or bars, to a possible maximum of 9, representing complete bans in all three.

Also from the ImpactTeen data, a dummy variable for the minimum age of purchase for cigarettes was constructed. The majority of states have set the minimum age for purchase of tobacco products at 18 years of age; however, four states restrict the purchase of tobacco to individuals 19 and older[27].

Price data for cigarettes was obtained from the publication, "The Tax Burden on Tobacco, 2008." Prices represented the average price for a pack of 20 cigarettes, including generic brands, inclusive of state and federal excise taxes on November 1 of each year. To match prices more closely to the date of the CPS interview, monthly price data was calculated as a linear extrapolation between each November 1st price.

[27] Synar Amendment (Section 1926 of Title XIX of the Federal Public Health Service Act), passed in 1992 by Congress, places the responsibility of age limits on tobacco purchases on the states. Requires all 50 states and the District of Colombia to have and enforce laws that prohibit sales of tobacco to individuals less than 18 years of age. Only four states have an age requirement of 19 years, Alabama (1997), Alaska (2007), NJ (2006), and Utah (1998).

Smoking prevalence rates for each state were taken from the BRFSS. The BRFSS is a national health survey conducted annually by all of the States in conjunction with the Centers for Disease Control. The survey collects information on health risk behaviors, health practices, health care access and general demographics about the respondents[28].

The prices of restaurant meals and of alcohol at a bar were included because these goods are potential substitutes or compliments of smoking. Because price data for restaurant meals and for alcohol at a bar were not available, wage data from the Quarterly Census of Employment and Wages conducted by the Bureau of Labor Statistics (BLS) was used to generate price proxy variables. The average annual wage for Full Service Restaurants and for Drinking places (alcoholic beverages)[29] was utilized as a proxy for the price of restaurant meals and alcohol at a bar.

Average annual pay should provide a reasonable proxy for restaurant meal and alcohol at a bar prices. According to the National Restaurant Association, labor represented one-third of the total costs in restaurants[30]. Further, examining payroll and operating expenses from the 2007 Economic Census conducted by the Census Bureau, the ratio of payroll to expenses for combined Food services and drinking places sector was 0.448, showing that payroll represented roughly have of the expenses for the sector.

Several studies have found a correlation between the prices and wages, although the direction of the causation was mixed in the studies. Pu, Flaschel, and Chihying

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[28] The survey includes all 50 states and the District of Columbia. In 2006, more than 350,000 adults were interviewed by phone.
[29] NAICS Codes: 7221 – Full Service Restaurants, 7224 Drinking places (alcoholic beverages).
[30] National Restaurant Association, Restaurant Industry Operations Report, 2003

(2006) found that price inflation caused wage inflation in the United States' economy, while Ghali (1999) finds that the process ran from wages to prices. Aaronson (2001) looked specifically at the restaurant industries in the U.S. and Canada and also found that prices rose with wage increases. Card and Krueger (1994) determined that restaurants in New Jersey raised prices sufficiently to cover the cost of an increase in the minimum wage. Even though the direction of the causation was not certain, this also suggests that though imperfect, average annual pay is a reasonable proxy for prices at restaurants and for alcohol at bars, and should capture some of the variability in prices for these goods across time and states.

The Consumer Price Index – all urban consumers (CPI-U) all items index from the BLS was used to deflate all of the monetary measures into real dollars. The smoking prevalence, state smoking ban attitude index, purchase restrictions, price of cigarettes, the price of dining out, and the price of alcohol at bars were all treated as exogenous in the model because the actions and attitudes of any single individual are small in magnitude and unlikely to change these state level variables. In addition, all model specifications included state dummy variables to account for any time persistent unobserved heterogeneity.

Some descriptive statistics for the data are given in Table 3.1. For the smoking participation regression, there were a total of 782,846 observations. For the intensity of consumption regression, there were 160,253 observations that reported positive numbers of cigarettes smoked.

Table 3.1

Smoking Prevalence and Intensity Analysis: Summary Statistics

	All Individuals		Non-Smokers		Smokers	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Smoking Related Variables						
Smoking Status	0.206	0.404	0.000	0.000	1.000	0.000
Average Number of Cigarettes Smoked per Month	97.1	242.9	0.0	0.0	472.3	331.5
State Smoking Prevalence	0.223	0.033	0.222	0.033	0.228	0.032
Age 19 Purchase Restriction	0.029	0.166	0.030	0.171	0.022	0.148
State Smoking Ban Attitude Index	12.6	0.6	12.6	0.6	12.5	0.6
Real Price Of Cigarettes	1.74	0.45	1.75	0.45	1.70	0.44
Price of Dining Out	7,061	1,239	7,086	1,240	6,962	1,230
Price of Alcohol at Bars	6,099	995	6,114	998	6,043	982
Smoking Ban Variables						
Absolute Ban: Private Work Spaces	0.102	0.303	0.106	0.307	0.088	0.283
Absolute Ban: Restaurant	0.454	0.498	0.459	0.498	0.435	0.496
Absolute Ban: Bars	0.188	0.391	0.198	0.399	0.150	0.357
Weak Ban: Private Work Spaces	0.469	0.499	0.466	0.499	0.481	0.500
Weak Ban: Restaurant	0.116	0.320	0.122	0.328	0.089	0.285
Weak Ban: Bars	0.036	0.187	0.036	0.185	0.038	0.192
Weighted Ban Index	2.30	2.64	2.37	2.68	2.03	2.45
Other Control Variables						
Real Income	28,533	22,215	29,938	22,796	23,103	18,855
Unemployed	0.034	0.182	0.028	0.165	0.059	0.235
Not in Labor Force	0.328	0.469	0.343	0.475	0.268	0.443
Not a High School Graduate	0.170	0.376	0.163	0.370	0.197	0.398
Some College	0.268	0.443	0.265	0.441	0.283	0.450
College Graduate	0.250	0.433	0.284	0.451	0.119	0.324
Metro Area	0.741	0.438	0.748	0.434	0.713	0.452
Age	45.9	17.6	46.8	18.1	42.1	14.6
Married	0.575	0.494	0.601	0.490	0.477	0.499
Widowed	0.075	0.263	0.080	0.272	0.052	0.221
Divorced	0.136	0.343	0.114	0.317	0.224	0.417
Female	0.563	0.496	0.573	0.495	0.521	0.500
Black	0.080	0.271	0.080	0.272	0.079	0.270
Other Race	0.049	0.215	0.049	0.216	0.047	0.211
N	782,846		622,593		160,253	

By January 1, 2007, 21 states had enacted complete smoking bans in workplaces, 22 in restaurants, and 15 in bars. Of the sample, 10 percent of individuals were covered

by complete workplace smoking bans, 18 percent were covered by complete restaurant bans, and 11 percent were covered by complete bar bans. Given the number of workplace bans compared to the number of bar bans, the finding that more individuals are covered by complete bar bans than workplace bans is surprising. The finding results from California, with over 7 percent of the total sample, not having a complete workplace smoking ban and having a complete bar ban.

In the 1995-1996 CPS/TUS, only 1.1 percent, 9.9 percent, and 0.0 percent of individuals were covered by complete workplace, restaurant, and bar smoking bans respectively. By the 2006-2007 CPS/TUS the percentages were 35.2 percent, 42.9 percent, and 31.8 percent, a significant increase in the prevalence of complete smoking bans.

Twenty-one percent of the sample smoked, while the average number of cigarettes consumed per month was 97.3, however, when the sample is restricted to just smokers, the average number of cigarettes consumed per month jumps to 473.0. The average price per pack of cigarettes was $1.74 in constant (1982-84) dollars. The state smoking ban attitude index was 12.6 overall, and the state smoking prevalence rate for the sample was 22.3 percent.

Results

For the probit regression of smoking participation the results are presented in Table 3.2 and marginal effects are presented in Table 3.3. Results for the average number of cigarettes consumed regression are presented in Table 3.4 with marginal

effects presented in Table 3.5. In each table four columns of results are presented. The first two columns show the results for the analysis of individual bans, without the smoking ban attitude index and then with the smoking ban attitude index included. The next two columns show the results for the regressions with the weighted smoking ban index variable, first without and then with the smoking ban attitude index variable. The smoking ban variables are aligned at the top of the table, then the other smoking related variables, and finally the other demographic controls are at the bottom of the table. As a reminder, absolute bans completely ban smoking in the establishment, while weak bans include restrictions for separate smoking areas without airflow separation or separately ventilated rooms.

In the participation model with all of the individual bans, only the weak bar ban was statistically significant. Weak bar bans were negative and statically significant at the 0.5 percent level in the specification without the state smoking ban attitude index variable, and were insignificant in the specification with the state smoking ban attitude index variable. The estimated marginal effect of the weak bar ban variable was a reduction in the predicted probability of smoking by 1.4 points in the specification without the smoking ban attitude index.

For the regressions including the weighted ban index variable instead of each individual type of ban, the estimated coefficient in the regression without the smoking ban attitude index was statistically insignificant, however, the estimated coefficient in the regression with the smoking ban attitude index was statistically significant. While statistically significant, the marginal effect of the weighted ban index was small, with an

increase of 0.3 percentage points in the probability of smoking for each 1-point increase in the index.

The state smoking ban attitude index variable was negative and statistically significant at the 0.1 percent level in both specifications in which it was included. The estimated marginal effects for each point of increase in the index were a decrease in the probability of smoking by 4.6 percentage points in both the regression with individual bans and the weighted ban index.

Table 3.2

The Effect of Complete Smoking Bans on Smoking Prevalence

	All Bans		Ban Index	
Dependant Variable: Smoking Status	No Smoking Ban Attitude Index	Smoking Ban Attitude Index	No Smoking Ban Attitude Index	Smoking Ban Attitude Index
Smoking Ban Variables				
Absolute Ban: Private Work Spaces β	0.019	0.022		
Absolute Ban: Private Work Spaces se	(0.026)	(0.027)		
Absolute Ban: Restaurant	-0.006	0.000		
	(0.035)	(0.036)		
Absolute Ban: Bars	0.003	0.007		
	(0.018)	(0.014)		
Weak Ban: Private Work Spaces	0.008	0.005		
	(0.018)	(0.017)		
Weak Ban: Restaurant	0.009	0.002		
	(0.022)	(0.023)		
Weak Ban: Bars	-0.053**	-0.010		
	(0.021)	(0.019)		
Weighted Ban Index			0.001	0.003*
			(0.002)	(0.002)
Other Smoking Related Variables				
State Smoking Ban Attitude Index		-0.174***		-0.175***
		(0.021)		(0.022)
State Smoking Prevalence	0.006***	0.006***	0.006***	0.006***
	(0.002)	(0.002)	(0.002)	(0.002)
Real Price Of Cigarettes	-0.047**	-0.020	-0.049***	-0.022
	(0.021)	(0.024)	(0.019)	(0.021)
Price of Dining Out	-0.019	0.013	-0.020	0.013
	(0.042)	(0.017)	(0.043)	(0.018)
Price of Alcohol at Bars	-0.430***	-0.421***	-0.460***	-0.416***
	(0.123)	(0.120)	(0.109)	(0.106)
Age 19 Purchase Restriction	-0.061**	-0.047**	-0.061**	-0.046**
	(0.026)	(0.022)	(0.025)	(0.021)

Table 3.2 - Continued

The Effect of Complete Smoking Bans on Smoking Prevalence - Continued

	All Bans		Ban Index	
Dependant Variable: Smoking Status	No Smoking Ban Attitude Index	Smoking Ban Attitude Index	No Smoking Ban Attitude Index	Smoking Ban Attitude Index
Other Control Variables				
Real Family Income	-0.056***	-0.056***	-0.056***	-0.056***
	(0.003)	(0.003)	(0.003)	(0.003)
Not a High School Graduate	-0.074***	-0.074***	-0.074***	-0.075***
	(0.026)	(0.026)	(0.026)	(0.026)
Some College	-0.152***	-0.152***	-0.152***	-0.152***
	(0.011)	(0.011)	(0.011)	(0.011)
College Graduate	-0.569***	-0.569***	-0.569***	-0.569***
	(0.023)	(0.023)	(0.023)	(0.023)
Metro Area	-0.007	-0.007	-0.007	-0.007
	(0.017)	(0.017)	(0.017)	(0.017)
Age	-0.008***	-0.008***	-0.008***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.001)
Married	-0.021	-0.021	-0.021	-0.021
	(0.021)	(0.021)	(0.021)	(0.021)
Widowed	-0.002	-0.001	-0.002	-0.001
	(0.016)	(0.016)	(0.016)	(0.016)
Divorced	0.427***	0.427***	0.427***	0.427***
	(0.018)	(0.018)	(0.018)	(0.018)
Female	-0.160***	-0.160***	-0.160***	-0.160***
	(0.014)	(0.014)	(0.014)	(0.014)
Black	-0.191***	-0.191***	-0.191***	-0.191***
	(0.033)	(0.033)	(0.033)	(0.033)
Other Race	-0.063***	-0.063***	-0.063***	-0.063***
	(0.019)	(0.019)	(0.019)	(0.019)
Unemployed	0.232***	0.233***	0.233***	0.233***
	(0.011)	(0.011)	(0.011)	(0.011)
Not in Labor Force	-0.158***	-0.158***	-0.158***	-0.158***
	(0.011)	(0.011)	(0.011)	(0.011)
Constant	0.253**	2.260***	0.271**	2.276***
	(0.117)	(0.252)	(0.109)	(0.258)
Model Statistics				
chi2(28, 29, 24, 25)	46,757	46,465	43,219	55,285
P	0.000	0.000	0.000	0.000
N	782,846	782,846	782,846	782,846

* p<0.10, ** p<0.05, *** p<0.01

Smoking prevalence was positive and statistically significant at the 1 percent level in all regressions, with each one-percentage point increase in smoking prevalence in a state increasing the predicted probability of smoking by 0.2 percentage points. The estimated coefficient on the price of cigarettes was negative in all the specifications, but only statistically significant in the specifications without the smoking ban attitude index

variable. The estimated marginal effects of a $1.00 increase in price were decreases of 1.2 to 1.3 percentage points in the predicted probability of smoking. The price measure for restaurant meals in the participation regressions were not significant, however, the price proxy for alcohol at a bar was negative and statistically significant at the 1 percent level. Because the price measure for alcohol is a proxy measure, there is no meaningful marginal effect that could be calculated.

The minimum purchase age of 19 decreased the probability of smoking in every regression at the 5 percent significance level. The marginal effect of an increase in the legal minimum age of purchase was a decrease of between 1.2 and 1.6 percentage points. Income was negative and statistically significant at the 1 percent level in all of the regressions. The marginal effects indicate every $10,000 increase in real income decreased the probability of smoking by 1.5 percentage points. For the other demographic control variables, the results were similar to previous studies.

The results from the conditional demand equations show that complete private bans were negatively related to consumption, but the result wasn't statistically significant with or without the ban attitude index. Surprisingly, the estimated coefficient for the complete restaurant ban variable was positive and statistically significant at the 10 percent level in both regressions. Complete bar bans decreased consumption and were statistically significant at the 5 percent level in the regression without the ban attitude index and at the 1 percent level when the ban attitude index was included.

Table 3.3

Marginal Effect of Complete Smoking Bans on Smoking Prevalence

	All Bans		Ban Index	
Dependant Variable: Smoking Status	No Smoking Ban Attitude Index	Smoking Ban Attitude Index	No Smoking Ban Attitude Index	Smoking Ban Attitude Index
Smoking Ban Variables				
Absolute Ban: Private Work Spaces β	0.005	0.006		
Absolute Ban: Private Work Spaces se	(0.007)	(0.007)		
Absolute Ban: Restaurant	-0.002	0.000		
	(0.009)	(0.010)		
Absolute Ban: Bars	0.001	0.002		
	(0.005)	(0.004)		
Weak Ban: Private Work Spaces	0.002	0.001		
	(0.005)	(0.005)		
Weak Ban: Restaurant	0.003	0.001		
	(0.006)	(0.006)		
Weak Ban: Bars	-0.014**	-0.003		
	(0.006)	(0.005)		
Weighted Ban Index			0.000	0.001*
			(0.000)	(0.000)
Other Smoking Related Variables				
State Smoking Ban Attitude Index		-0.046***		-0.046***
		(0.006)		(0.006)
State Smoking Prevalence	0.002***	0.002***	0.002***	0.002***
	(0.001)	(0.000)	(0.001)	(0.000)
Real Price Of Cigarettes	-0.012**	-0.005	-0.013***	-0.006
	(0.005)	(0.006)	(0.005)	(0.006)
Price of Dining Out				
Price of Alcohol at Bars				
Age 19 Purchase Restriction	-0.016**	-0.012**	-0.016**	-0.012**
	(0.007)	(0.006)	(0.007)	(0.006)
Real Income	-0.015***	-0.015***	-0.015***	-0.015***
	(0.001)	(0.001)	(0.001)	(0.001)

* p<0.10, ** p<0.05, *** p<0.01

For the weak bans, both the private worksite and restaurant ban variables were positive but not statistically significant. The estimated coefficient on the weak bar ban variable was negative and statistically significant at the 1 percent level.

The average marginal effect of a complete restaurant smoking ban was an increase of between 32.4 and 33.7 cigarettes per month. The decrease in consumption from complete bar bans was between 20.2 and 21.0 cigarettes per month, while a weak bar ban was predicted to decrease consumption between 22.8 and 30.1 cigarettes per

month. The smoking ban attitude index variable was negative and statistically significant at the 1 percent level. The marginal effect of an increase in the smoking ban attitude index of one-point was a reduction in consumption of 31.5 to 31.8 cigarettes per month.

Table 3.4

The Effect of Complete Smoking Bans on the Average Number of Cigarettes Smoked per Month by Smokers

		All Bans		Ban Index	
Dependant Variable: Average Number of Cigarettes Smoked		No Smoking Ban Attitude Index	Smoking Ban Attitude Index	No Smoking Ban Attitude Index	Smoking Ban Attitude Index
Smoking Ban Variables					
Absolute Ban: Private Work Spaces	β	-0.010	-0.009		
	se	(0.027)	(0.026)		
Absolute Ban: Restaurant		0.069*	0.072*		
		(0.039)	(0.038)		
Absolute Ban: Bars		-0.045**	-0.043***		
		(0.018)	(0.016)		
Weak Ban: Private Work Spaces		0.012	0.011		
		(0.020)	(0.019)		
Weak Ban: Restaurant		0.014	0.012		
		(0.027)	(0.025)		
Weak Ban: Bars		-0.064***	-0.048***		
		(0.018)	(0.017)		
Weighted Ban Index				0.001	0.002
				(0.003)	(0.003)
Other Smoking Related Variables					
State Smoking Ban Attitude Index			-0.068***		-0.067***
			(0.023)		(0.023)
State Smoking Prevalence		0.004*	0.004*	0.004**	0.004**
		(0.002)	(0.002)	(0.002)	(0.002)
Real Price Of Cigarettes		-0.042*	-0.032	-0.052**	-0.042
		(0.024)	(0.027)	(0.023)	(0.026)
Price of Dining Out		-0.005	0.006	-0.010	0.002
		(0.039)	(0.028)	(0.043)	(0.033)
Price of Alcohol at Bars		-0.057	-0.049	-0.053	-0.032
		(0.114)	(0.112)	(0.109)	(0.107)
Age 19 Purchase Restriction		0.060**	0.065**	0.062**	0.068***
		(0.028)	(0.026)	(0.027)	(0.025)

Table 3.4 - Continued

The Effect of Complete Smoking Bans on the Average Number of Cigarettes Smoked per Month by Smokers - Continued

Dependant Variable: Average Number of Cigarettes Smoked	All Bans		Ban Index	
	No Smoking Ban Attitude Index	Smoking Ban Attitude Index		No Smoking Ban Attitude Index
Other Control Variables				
Real Family Income	-0.005**	-0.005**	-0.005**	-0.005**
	(0.003)	(0.003)	(0.003)	(0.003)
Not a High School Graduate	-0.009	-0.009	-0.009	-0.009
	(0.018)	(0.018)	(0.018)	(0.018)
Some College	-0.077***	-0.076***	-0.077***	-0.076***
	(0.007)	(0.007)	(0.007)	(0.007)
College Graduate	-0.264***	-0.264***	-0.264***	-0.264***
	(0.011)	(0.011)	(0.011)	(0.011)
Metro Area	-0.056***	-0.056***	-0.056***	-0.056***
	(0.010)	(0.010)	(0.010)	(0.010)
Age	0.007***	0.007***	0.007***	0.007***
	0.000	0.000	0.000	0.000
Married	0.078***	0.078***	0.078***	0.078***
	(0.009)	(0.009)	(0.009)	(0.009)
Widowed	-0.024*	-0.024*	-0.024*	-0.024*
	(0.012)	(0.012)	(0.012)	(0.012)
Divorced	0.153***	0.153***	0.153***	0.153***
	(0.006)	(0.006)	(0.006)	(0.006)
Female	-0.185***	-0.185***	-0.185***	-0.185***
	(0.006)	(0.006)	(0.006)	(0.006)
Black	-0.379***	-0.379***	-0.379***	-0.379***
	(0.022)	(0.022)	(0.022)	(0.022)
Other Race	-0.172***	-0.171***	-0.171***	-0.171***
	(0.017)	(0.017)	(0.017)	(0.017)
Unemployed	0.031***	0.032***	0.031***	0.032***
	(0.008)	(0.008)	(0.008)	(0.008)
Not in Labor Force	0.008	0.008	0.008	0.008
	(0.008)	(0.008)	(0.008)	(0.008)
Constant	6.153***	6.932***	6.162***	6.925***
	(0.097)	(0.274)	(0.102)	(0.278)
Model Statistics				
chi2(28, 29, 24, 25)	18,202	26,312	15,906	19,240
P	0.000	0.000	0.000	0.000
N	160,253	160,253	160,253	160,253

* p<0.10, ** p<0.05, *** p<0.01

For the smoking prevalence variable the coefficient was positive and significant at the 10 percent level in the regressions with the individual bans and at the 5 percent level in the regressions with the weighted ban index variable. A one-percentage point increase in the prevalence of smoking increased the number of cigarettes smoked by between 1.7 and 1.8 cigarettes per month.

The cigarette price variable was negative in all four of the specifications, although it was only statistically significant in the regressions without the smoking ban attitude index variable. The marginal effect of an increase in the price of cigarettes was a reduction in consumption of between 20.0 and 24.3 cigarettes per month for each dollar of increase in the cigarette price.

The coefficients for price of dining out and for alcohol at a bar were generally negative, however none were statistically significant. The minimum age of 19 purchase restriction was positive and statistically significant at the 5 percent level. The marginal effect of raising the minimum purchase age to 19 was an increase in the monthly average consumption of cigarettes between 29.3 and 30 cigarettes. The coefficient for the real income variable was negative and statistically significant at the 5 percent level. An increase of $10,000 decreased consumption by only 2.5 cigarettes per month.

The significant and positive finding for the weighted ban index in the prevalence regression and lack of statistical significance of the ban index in the intensity equation is problematic. Previous studies have shown that smoking bans were effective at reducing consumption of cigarettes.

Table 3.5

Marginal Effect of Complete Smoking Bans on the Average Number of Cigarettes Smoked per Month by Smokers

Dependant Variable: Average Number of Cigarettes Smoked		All Bans		Ban Index	
		No Smoking Ban Attitude Index	Smoking Ban Attitude Index	No Smoking Ban Attitude Index	Smoking Ban Attitude Index
Smoking Ban Variables					
Absolute Ban: Private Work Spaces	β	-4.495	-4.267		
	se	(12.777)	(12.254)		
Absolute Ban: Restaurant		32.381*	33.715*		
		(18.372)	(17.715)		
Absolute Ban: Bars		-21.015**	-20.222***		
		(8.233)	(7.569)		
Weak Ban: Private Work Spaces		5.746	4.979		
		(9.608)	(8.992)		
Weak Ban: Restaurant		6.781	5.469		
		(8.409)	(11.927)		
Weak Ban: Bars		-30.061***	-22.729***		
		(8.409)	(8.135)		
Weighted Ban Index				0.411	0.777
				(1.249)	(1.227)
Other Smoking Related Variables					
State Smoking Ban Attitude Index			-31.804***		-31.481***
			(10.711)		(10.811)
State Smoking Prevalence		1.716*	1.752*	1.799**	1.804**
		(0.920)	(0.938)	(0.898)	(0.879)
Real Price Of Cigarettes		-19.936*	-15.213	-24.339**	-19.572
		(11.441)	(12.538)	(10.712)	(12.024)
Price of Dining Out					
Price of Alcohol at Bars					
Age 19 Purchase Restriction		27.977**	30.412**	29.309**	31.955***
		(12.953)	(12.155)	(12.591)	(11.812)
Real Family Income		-2.466**	-2.466**	-2.466**	-2.469**
		(1.246)	(1.244)	(1.245)	(1.243)

* p<0.10, ** p<0.05, *** p<0.01

Because the complete restaurant ban increased the consumption of cigarettes as opposed to reducing consumption, a new weighted smoking ban index was constructed that excluded restaurant bans. The regressions were reestimated with the new weighted index and the restaurant bans, and the results are presented in Table 3.6.

Table 3.6

Regression Results: Restaurant Bans Removed from Weighted Ban Index

		Probit Regression on Smoking Status		Zero Truncated Poisson Regression on Avg. Number of Cigarettes Smoked	
		No Smoking Ban Attitude Index	Smoking Ban Attitude Index	No Smoking Ban Attitude Index	Smoking Ban Attitude Index
Smoking Ban Variables					
Absolute Ban: Restaurant	β	0.001	0.010	0.084**	0.087**
	se	(0.039)	(0.036)	(0.040)	(0.038)
Weak Ban: Restaurant		0.006	0.002	0.028	0.026
		(0.019)	(0.018)	(0.020)	(0.019)
Weighted Ban Index		0.001	0.003	-0.012**	-0.011**
		0.001	0.003	(0.006)	(0.006)
Other Smoking Related Variables					
State Smoking Ban Attitude Index			-0.175***		-0.070***
			(0.022)		(0.023)
State Smoking Prevalence		0.006***	0.006***	0.004*	0.004*
		(0.002)	(0.002)	(0.002)	(0.002)
Real Price Of Cigarettes		-0.048**	-0.021	-0.047*	-0.037
		(0.019)	(0.021)	(0.024)	(0.026)
Price of Dining Out		-0.018	0.013	-0.005	0.006
		(0.041)	(0.018)	(0.038)	(0.028)
Price of Alcohol at Bars		-0.447***	-0.418***	-0.075	-0.061
		(0.106)	(0.108)	(0.115)	(0.111)
Age 19 Purchase Restriction		-0.060**	-0.046**	0.055*	0.061*
		(0.026)	(0.022)	(0.033)	(0.031)
Other Control Variables					
Real Family Income		-0.056***	-0.056***	-0.005**	-0.005**
		(0.003)	(0.003)	(0.003)	(0.003)
Model Statistics					
chi2(26, 27, 26, 27)		47,537	55,432	15,000	17,317
P		0.000	0.000	0.000	0.000
N		783,742	783,742	160,253	160,253
* p<0.10, ** p<0.05, *** p<0.01					

The restaurant bans and the new weighted ban index without the restaurants included were all insignificant in the probit regression on smoking prevalence. However, in the zero truncated Poisson regression on the average number of cigarettes smoked, the absolute restaurant ban was positive as before, but the new weighted ban index was negative and statistically significant. It is likely that prior studies were unaffected by the

increase in consumption due to complete restaurant bans as they used data from prior to the widespread adoption of complete restaurant smoking bans.

Discussion and Summary

The results of this study indicate that absolute smoking bans in private worksites, restaurants, and bars appear to have little effect on smoking prevalence. The results for the intensity of consumption were mixed, with private worksite bans having no effect, restaurant bans increasing consumption, and bar bans reducing consumption. The lack of statistical significance for the statewide workplace bans is likely due to the prevalence of smoking bans implemented by private worksites and/or counties and municipalities prior to the implementation of the statewide ban.

Of the weak bans, only weak bar bans had any effect on the prevalence of smoking or the intensity of consumption of cigarettes. However, these bans are rare, with only 3 states, Georgia, Missouri, and Nebraska having some type of weak bar smoking ban. It is unclear why weak bans would have a larger effect on the intensity of smoking than absolute bans when previous research has shown that complete bans are more effective at reducing consumption. This result needs further investigation and should be viewed with caution.

Two possible explanations for the surprising result that complete restaurant bans increased the consumption of cigarettes seem plausible. First, smokers' give up dining out and eat at home. Income that was once spent on dining out would be redirected to the consumption of other goods including cigarettes. The effect of restaurant smoking bans

on the dining out behavior is addressed in Chapter Three. If in fact smokers do reduce their dining out expenditures, this would support the hypothesis that smokers are refraining from frequenting restaurants and instead are eating at home.

Another possible explanation could be the reaction of restaurants to complete bans. Recently, Adams and Cotti (2007) found that restaurant employment was unchanged or grew slightly in counties with restaurant smoking bans, with the largest increases found in those areas of the country where the weather permits outdoor seating. If restaurants are responding to complete bans with increased outdoor seating options, it may be that the bans did not reduce the amount of cigarettes that smokers consumed because instead of forcing smokers outside to smoke, the restaurants moved the dining out experience outside where the smokers could continue to smoke. If smokers previously would have refrained from smoking in mixed parties of smokers and non-smokers while indoors, they may not have felt such a compulsion sitting outside because they believed they were inconveniencing or harming their non-smoking friends less while outside.

In the absence of the smoking ban attitude index variable, cigarette prices both reduced the prevalence and intensity of smoking, although as expected, the effect was small. The price elasticity calculated from the regression with all of the independent bans was –0.11, which is lower than the range of –0.25 to –0.47 found in the seven studies reviewed by Goel and Nelson (2006). The reduction of the size of the coefficient estimate and statistical significance for the cigarette price variable in the presence of the smoking attitude index variable was likely due to the fact that the two variables are

highly correlated ($\rho = 0.73$). Both variables increased rapidly after the signing of the Master Settlement Agreement between the states' Attorneys General and the major tobacco companies in 1998.

The addition of the smoking ban attitude index variable to control for sub-state smoking bans altered the estimated coefficients on the smoking ban variables slightly, and only the weak bar smoking ban variable's statistical significance changed, becoming insignificant. The smoking attitude index variable had a larger impact on the coefficient estimate for the price of cigarettes, which became smaller and insignificant in every regression in which the attitude index was included.

The effect of the other price variables indicates that the price of restaurant meals has no effect on cigarette consumption. The price of alcohol at bars was negatively related to the consumption of cigarettes, both the prevalence and intensity of consumption, although only the prevalence estimates were statistically significant. Alcohol should be regarded as a compliment to smoking. The minimum age purchase restriction results reduced the prevalence of smoking but increased the average monthly consumption. The increase in average consumption was likely due to a decrease in prevalence among younger smokers who typically smoke less. Prevalence rates fell 3.0 percentage points from 23.2 percent to 20.2 percent among individuals less than 19 in the states which implemented the higher age limit, compared to a decrease of 2.6 percentage points, from 22.5 percent to 19.9 percent, for those aged 19 and older. These results should be viewed with caution, as only a very small portion of the sample was under 19 and resided in states that implemented higher minimum age purchase legislation.

The conclusions of the paper are that complete smoking bans appear to have no impact on the prevalence of smoking, and have a mixed impact on the intensity of cigarette consumption. While complete bar bans do reduce the number of cigarettes smoked, complete restaurant bans have the opposite effect, increasing the number of cigarettes smoked on average. Complete private worksite bans did not have an effect on consumption, however, a state's overall severity of smoking restrictions as measured by weighted index of private and bar bans did show that bans reduce consumption.

Appendix A: Smoking Ban Attitude Index Calculation

Attitudes towards smoking bans are probed in most waves of the CPS-TUS. The CPS-TUS data was available for all years except 1997, 2000, 2003, 2004, and 2005. A linear extrapolation from the available years was used to estimate the smoking attitude index for the missing years.

Questions about attitudes towards smoking bans in restaurants, work areas, bars, and indoor sporting events are consistently asked. Possible answers to the questions are: "1-Allowed in all areas", "2-Allowed in some areas", or "3-Not allowed at all".

In addition, the respondent's home smoking policy is also probed, with the following responses: "1-No one is allowed to smoke anywhere INSIDE YOUR HOME", "2-Smoking is allowed in some places or at some time INSIDE YOUR HOME", "3-Smoking is permitted anywhere INSIDE YOUR HOME".

To construct the index, first the home smoking policy variable was recoded so that higher values reflected stronger anti-smoking sentiment: "1-Smoking is permitted anywhere INSIDE YOUR HOME", "2-Smoking is allowed in some places or at some time INSIDE YOUR HOME", and "3-No one is allowed to smoke anywhere INSIDE YOUR HOME".

The individual responses were summed, then averaged by state and year to derive a state attitude index for each year. The formula is to calculate an individual's attitude index is as follows:

Smoking Attitude Index = Restaurant Attitude + Work Area Attitude

+ Bar Attitude + Indoor Sporting Events Attitude

+ (4-Home Smoking Policy)

To test if these five questions measure the same idea, attitude towards smoking, Cronbach's alpha (reliability coefficient) was calculated. The reliability coefficient was 0.76, indicating that the 5 items all measured the same underlying attitude of the respondent.

Appendix B: Demographic Variables from the Current Population Survey Utilized

Real Income	
Education	Not A High School Graduate Some College College Graduate High School Graduate - Reference Category
Metro Area	Metro Non-Metro – Reference Category
Age	
Marital Status	Married Widowed Divorced Single - Reference Category
Female	Male – Reference Category
Race	Black Other Race White - Reference Category
Employment Status	Unemployed Not In Labor Force Employed - Reference Category
CPS/TUS Survey Wave	2006-2007 Survey 2003 Survey 2001-2002 Survey 1998-1999 Survey 1995-1996 Survey - Reference Category

CHAPTER IV

THE EFFECT OF COMPLETE SMOKING BANS IN RESTAURANTS ON DINING OUT EXPENDITURES

Introduction

Since the early 1990's a growing number of local governments and states have completely banned smoking in restaurants and bars. Proponents of smoking bans argue that government regulation is required to protect the health of workers and patrons in restaurants and bars because of externalities associated with second-hand smoke caused by the smoking of cigarettes. Opponents argue that smoking bans will reduce restaurant revenues and employment.

Surveys of owners and managers of restaurants and bars indicated that they believed they would lose business if smoking bans were enacted. However, when the economic effect of smoking bans has been examined by using sales tax collections or employment levels, either no effect or a small positive effect from the bans was found. One potential explanation for these contradictory results is that any loss in business due to smokers was offset by increases in business due to non-smokers.

While previous studies of the effect of smoking bans on dining out expenditures have used aggregate data, such as employment and sales tax receipts or perceptions of restaurant proprietors and managers, none has investigated how individual consumers

react to smoking bans. The disaggregated effects of smoking bans may be very different from the aggregate effect.

Using household level micro data from the Panel Study of Income Dynamics (PSID), the paper examines how smoking bans alter expenditures on food away from home. By separating the sample and estimating separate regressions for households with smokers and without, the paper will attempt to identify differences in the responses to the smoking bans between the non-smoker and smoker households. Presumably, households with smokers decreased their expenditures on dining out in response to complete restaurant smoking bans, while households without smokers increased their expenditures on dining out.

This essay contributes to the literature by using household data for the first time to explore the presumably different effect that smoking bans have on households with smokers and those households that contain only non-smokers. Additionally it introduces a readily available measure to control for the price of dining out.

The paper is organized as follows; first a review of the literature on the effect of smoking bans on dining out expenditures is presented. Then, because the essay will be using household data, a review of the food away from home literature is presented, followed by the modeling framework. The data are described, followed by the results, with a discussion and summary section concluding the paper.

Literature Review – The Effect of Smoking Bans on Dining Out Expenditures

In the last 15 years, numerous states, counties, and municipalities, have implemented complete smoking bans in restaurants. The bans have prompted fierce debates. Opponents of smoking bans argued the bans would significantly lower revenues and profits of restaurants and in turn reduce employment in the food service sector, while proponents argued that the workers' health would improve and the negative impacts of the bans would be small or non-existent.

Studies done utilizing restaurant managers and owners' opinions showed that they believed complete smoking bans negatively impact their businesses (Dunham and Marlow, 2000; Sollars and Ingram, 1999; and The Craig Group, Inc, 1998). This perception of economic losses from smoking bans was due in part to an early study done by the Beverly Hills Restaurant Association (BHRA). The BHRA commissioned a survey of its member restaurants on the effect of a local ban on smoking in 1987. Survey respondents reported a 30% decline in sales. This same number later appeared in a survey of restaurants in Bellflower, a Los Angeles suburb. The Tobacco Institute, a tobacco industry research group, then promoted the results of the Bellflower survey in numerous restaurant trade publications[31]. However, based on administrative data, sales in Beverly Hills dropped by 6.7% according to sales tax data while in Bellflower they increased by 2.4%.

Early investigations of the effects of smoking bans that used data such as sales tax receipts or employment data showed either no impact or slight increases in business

[31] "Self-Serving Surveys: The 30% Myth", Consumer Reports, May, 1994

(Glantz and Smith, 1994 and 1997; Glantz and Charlesworth, 1999; Hyland and Cummings, 1999; Cremieux and Ouellette, 2001; Hyland, 2002). Recently, Adams and Cotti (2007) found that restaurant employment was unchanged or grew slightly in counties with complete restaurant smoking bans, with the largest increases found in those areas of the country where the weather permits outdoor seating.

Scollo et al., 2003, examined the relationship between the findings of studies and the funding source for the study. Of the studies funded by government, health related organizations, or independent market research organizations, none found a negative economic impact compared to 94 percent of studies funded by tobacco companies or affiliated groups that found a negative economic impact. In addition, the studies that found a negative impact were 4 times as likely to use a subjective outcome measure and 20 times more likely to be non-peer reviewed.

Previous studies into the effect of complete restaurant smoking bans used aggregate data such as employment and sales tax receipts, or perceptions of restaurant proprietors and managers. However, no studies have looked at the effect of smoking bans on the individual consumer unit. The disaggregated effects of smoking bans on individual households may be very different from the aggregate effect. One clue in support of this hypothesis that non-smokers and smokers react differently to smoking bans comes from the 2004 Zagat New York City Dining Guide Survey. The survey included a question about how New York City's restaurant smoking ban had changed the survey respondent's dining out frequency. It found that 4 percent of diners were eating out less because of the city's ban on smoking in public places, 23 percent said that they

were eating out more often, and 73 percent said that the ban had not changed their dining patterns[32].

Presumably smokers dine out less because smoking bans reduce the enjoyment that they experience from dining out, while non-smokers dine out more often because the bans reduce the health risks due to second hand smoke and increase their enjoyment of the dining out experience. These two populations should react differently to the presence of a smoking ban, which would help explain the conflicting results from the surveys of manager and proprietors, and objective data. If non-smokers increased their expenditures on dining out by as much as, or more than smokers reduced their expenditures, the aggregate data will show no effect or a slight increases, but restaurants with a higher percentage of smokers may have seen declines in business that the aggregate data failed to show.

Literature Review – Modeling Food Away From Home Expenditures

The modeling of Food Away From Home (FAFH) expenditures has a long history in the agricultural economics literature. The FAFH literature has typically used the Becker (1965) and Michael and Becker (1973) models of household production as their theoretical basis. Within the household production framework, households use their income, non-market time, and purchased commodities to produce household activities and goods, including FAFH.

[32] *2004 Zagat New York City Dining Guide Survey*, New York, NY: Zagat Survey, LLC, 2003

To date, the FAFH literature has never focused on the role that smoking bans play in dining out. Rather, emphasis has been on other aspects such as; the increased role that women play in the workforce and its effect on the decision to purchase FAFH (Kinsey, 1983; Lee and Brown, 1986; Yen, 1993; Keng and Lin, 2005), the effect that demographic variables have had on the consumption of FAFH (McKracken and Brandt, 1987; and Byrne, Capps, and Saha, 1996), the consumption of FAFH in other countries (Mihalopoulos and Demoussis, 2001; Keng and Lin, 2005; Mutlu and Gracia, 2006; and Angulo, Gil, and Mur, 2007), the effect that health concerns have had on FAFH (Binkley, 2006), and the increased consumption of FAFH among seniors (Jang, Ham, and Hong, 2007).

Variables used in the study of FAFH included measures of income, a value of time measures, and demographic variables[33]. A price measure for FAFH has not been included in most models as it was generally unavailable. Because most FAFH studies have used cross sectional data, the authors typically assumed that prices did not change over the relatively short period of time in which the data were gathered, and that any differences in price could be controlled for by the inclusion of regional, state, or other control variables. Even when multiple years of FAFH consumption data were available, studies have not included price as an explanatory variable. Of the two studies that used multiple years of data, Byrne, Capps, and Saha utilized repeated cross sectional data and did not include prices. Rather, they assumed that all prices changed at the same rate and

[33] Additional detail on the effects of the demographic variables on the purchase of FAFH is given in Appendix B.

that other descriptive variables would adequately control for price differences. Angulo, Gil, and Mur utilized a panel data set, however, they did not include an explicit measure of prices in their analysis.

Modeling Framework

In order to understand how complete smoking bans may effect the dining out decision of smokers and non-smokers, it is important to understand why individuals choose to dine out and why individuals smoke, so that the possible channels through which smoking bans could effect the dining out decision are understood. First, why do individuals dine out? Individuals and households dine out primarily for convenience, as a recreational and social activity, due to a desire to experience a new type of food, or because they are traveling or on vacation[34].

Some of the major reasons individuals begin to smoke include parental and peer influences (Flay et. al., 1994), lower levels of education and religiosity (Kendler et. al., 1999), and weight concerns among females (French et. al., 1994). In addition, depression and anxiety symptoms increase an individual's susceptibility to peer smoking influences (Patton et. al., 1998). Once individuals begin to smoke, it is extremely difficult to quit due to the addictive nature of nicotine (US DHHS, Office of the Surgeon General, 1988).

For smokers, the complete smoking ban forces the smoker to make a series of choices. The smoker could quit smoking and eliminate the constraint imposed by the

[34] Food Trends 2000 study, Strategic Foodservice Solutions.

smoking ban. However, based on the results from Chapter 2, this appears to be an unlikely choice as restaurant-smoking bans had no effect on the decision to smoke.

If the smoker chooses to continue to smoke, the smoker can frequent restaurants and refrain from smoking, in which case their expenditures would likely remain the same. This would be the case for smokers for whom dining out was a social activity and the desire for the social interaction was sufficient to cause the smoker to abstain from smoking for short periods of time.

The smoker can also choose not to frequent restaurants, but rather dine at home and consume home cooked meals, prepared meals from the grocery store, or "takeout". If this were the case, then restaurant smoking bans would reduce the expenditures of smokers on FAFH.

An additional possibility suggested by Adams and Cotti was that restaurants respond to the imposition of smoking bans by increasing the availability of outdoor seating. If restaurants adapt to the imposition of smoking bans by increasing the amount of outdoor seating not subject to the smoking ban, then this would also result in the FAFH expenditures of smokers to remain steady.

For non-smokers, the imposition of a smoking ban does not change the non-smoker's decision to smoke at the restaurant, but only the dining out decision. The imposition of a smoking ban eliminates the presence of second hand smoke in the restaurant and the risks associated with the second hand smoke. It should also increase the non-smokers enjoyment of the dining out experience. This effect would tend to increase the non-smoker's expenditures on FAFH. However, if the non-smoker dines out

as a social activity with friends who smoke, the imposition of a complete ban may cause the non-smoker to dine out less to enjoy the company of their friends if the smokers choose not to dine out.

To model FAFH expenditures by the household, the paper utilizes an empirical model similar to what previous studies into FAFH have used, however, the model is adapted to analyze the impact that smoking bans have on FAFH. In addition to the income, value of time, and demographic descriptors included in previous studies, this study adds a measure for the price of restaurant meals, and most importantly, the smoking status of the household and an indicator for the presence of complete restaurant smoking bans.

As detailed in the literature review section, prior studies into FAFH have used the household production framework, in which households purchase goods, and together with time and effort provided by the household, produce experiences from which they derive utility. For food consumption, households have two options, the household can purchase uncooked food and prepare meals at home, or purchase food "ready to eat" at restaurants[35]. Eating at home and dining out provide two different experiences for the household. Meals consumed at home are cheaper and possibly more nutritious, however FAFH may be faster, more convenient, and provide a more enjoyable experience than eating at home.

Because the effect of the smoking ban variable is thought to differ between smokers and non-smokers, and the decision to smoke is potentially endogenous, an

[35] A third option, "take out" is not considered food away from home.

endogenous switching regression is estimated. Households first choose to be a non-smoking or smoking household, and then choose their level of FAFH expenditures.

For the endogenous switching regression, the STATA "movestay" command was utilized. The movestay command uses the full-information maximum likelihood method (FIML) to simultaneously fit the binary selection equation and the continuous regressions of the model in order to yield consistent standard errors. Even though the model is identified through nonlinearities, the addition of instruments aids in model identification. In the binary selection equation, the decision to smoke is modeled as a function of:

$$(4.1) \quad \Pr(smoke > 0 \mid p_{cig}, SV, Z) = \Phi(\tau + \omega p_{cig} + \gamma SV + \eta Z)$$

where: $smoke > 0$ is measured as someone who has smoked in the past 30 days resides in the household; p_{cig} is the price of cigarettes, SV represents non-restaurant smoking bans, and Z is a vector of dummy variables of religious participation. The parameters to be estimated are τ, ω, γ, and η, and Φ is the standard normal cumulative distribution function.

The empirical model estimated using OLS for expenditures is:

$$(4.2) \quad \log(e_{fafh}) = \alpha + \beta V + \delta p_{fafh} + \Pi SB + \lambda \mathbf{D} + \varepsilon$$

where: $log(e_{fafh})$ is the log of food expenditures away from home, V represents income, p_{fafh} is the log of the price of FAFH, SB is a matrix of smoking variables including smoking bans, D is the other demographic and environmental characteristics, and ε is the error term. The parameters to be estimated are, α, β, δ, Π, and λ.

Rather than expenditures, the log of expenditures was used as the dependant variable for two reasons, first, the distribution of the expenditure variable is positively

skewed, and second, the interpretation of the coefficients is more straightforward. Because price and income have also been log transformed, the coefficients on the price and income variables are interpreted as elasticities and the coefficients on the other variables in the model are interpreted as the percent change in FAFH expenditures for a 1-unit change in the explanatory variable.

Because of the panel nature of the data, the STATA "xtserial" command was used to test the data for serial correlation. The command implements the test for serial correlation in panel data sets developed by Wooldridge (2002). The test rejected the null hypothesis of no serial correlation with an F-statistic of: $F(1, 3614) = 22.92$ for the non-smoking sample and $F(1, 1184) = 9.87$ for the smoking sample.

To correct for the serial correlation, the following method was utilized. First, the data were transformed using $x_t^* = x_t - (\rho * x_{t-1})$ where ρ varied by increments of 0.1 from –1 to 1. Then, for each increment of ρ the data were retested for serial correlation. The ρ with the smallest F-statistic was then used as the starting point for the next iteration where the data were transformed in increments of 0.01 from 0.1 below to 0.1 above the best ρ from the first stage. The final ρ was 0.11, and all of the continuous variables were transformed using $x_t^* = x_t - (0.1 * x_{t-1})$, while indicator variables remained 0 or 1. After the transformation, testing the data using the Wooldridge method, the H_0: of no serial correlation could not be rejected, with $F(1, 2652) = 0.02$ for the non-smoking sample and $F(1, 759) = 0.002$ for the smoking sample.

Data

The dependant variable in the model was food expenditures away from home. The main independent variables included a complete restaurant smoking ban variable and a state smoking ban attitude variable,[36] the log of the price of FAFH, the log of household income,[37] and food stamp participation as measures of income. Additional control variables included were demographic variables such as the age of the head of household, marital status of the head of household, if head of household has a college degree, sex of the head of household, if the head of household is non-white, Body Mass Index of the head of household, if a member of the household drank alcohol, the size of household, and urbanization dummies. Indicator variables for the presence of a mom at home and the head of household employed were used as measures of the time available, and finally a time trend was included.

The following additional variables were used in the selection equation to aid in identification of the model, the presence of a complete workplace smoking ban, a complete bar smoking ban, the price of cigarettes, an indicator for household health, and dummy variables to indicate self identified membership in a religious group[38]. These variables were chosen because smoking bans and price have been shown to reduce the prevalence of smoking (Fichtenberg and Glantz, 2002; Levy and Friend, 2003; Goel and Nelson, 2006; and Tauras, 2006), and "nearly all econometric studies of cigarette demand

[36] The smoking ban attitude variable is included in the model to control for the presence of less than statewide smoking bans because states with high anti-smoking sentiment are likely to have more numerous local smoking bans.
[37] Household income was used rather than wage rates as it provided a single measure of the money resources available to the household, as opposed to potentially multiple wage rates.
[38] The possible groups were Catholic, Protestant, Jewish, and other.

use a variety of factors to control for tastes, including gender, race, education, marital status, employment status, and religiosity" (Chaloupka and Warner, 2000, pg. 1547). Because many of the demographic variables cited by Chaloupka and Warner were included in the expenditures equation, they were not included in the selection equation.

The reported health of the head and wife was used because the Surgeon General has concluded that tobacco smoking is the "single greatest cause of avoidable morbidity and mortality in the United States" and "smoking generally diminishes the health of smokers" (Surgeon General, 2004, Executive Summary pg.1). Because smoking is so harmful to health, the reported health of the head and wife should be inversely related to the probability of smoking. Additionally, data from the 2005 BRFSS showed that 18.2 percent of the interview subjects who reported being in good, very good, or excellent health smoked, compared to 25.8 percent of the respondents who reported fair or poor health.

The data for the study come from the PSID, the Bureau of Labor Statistics (BLS), the *Americans for Nonsmokers' Rights* (ANR), the Current Population Survey – Tobacco Use Supplement (CPS-TUS), the Behavioral Risk Factor Surveillance Survey (BRFSS), and the "The Tax Burden On Tobacco, Historical Compilation Volume 43, 2008".

The PSID was used for the household level variables including the amount of dining out expenditures, household income, household composition and demographics, and geographic characteristics. From the BLS data, the dining out price variable was constructed. Smoking bans were obtained from the ANR, smoking attitudes were

obtained from the CPS-TUS, and smoking prevalence from the BRFSS. Finally, cigarette prices were obtained from the "Tax Burden on Tobacco" publication.

The PSID is a longitudinal study of men, women, and children and the household units in which they reside, and is representative when survey design in taken into account. It has been conducted annually from 1968 until 1997, and biannually in odd numbered years since, with 2007 the most recent data available.

This study uses the 1999 through 2007 waves of the PSID for a total of 5 waves of data spanning a 9-year time span. After adjusting for the serial correlation, only 4 waves of data were available as the first wave was lost in the correction procedure. In 2007 roughly 8,300 households participated in the PSID. The response rate for the PSID has generally been between 94 and 98 percent[39]. The study is conducted by the Survey Research Center, Institute for Social Research, University of Michigan.

Although the main purpose of the PSID is to collect income and employment information, data on a variety of other items has also been collected. The key piece of information for this study collected by the PSID was dining out expenditures. In addition, the PSID provides information about the participants' demographics, employment status, income, health behaviors, and educational attainment. Participants' state of residence and Beale-Urbanicity code was also included in the data.

The data on restaurant expenditures was collected as part of the Food section of the PSID. In the Food section, participants were asked about how much they spent on

[39] Gouskova, Elena, and Robert F. Schoeni, July 2007, "Comparing Estimates of Family Income in the Panel Study of Income Dynamics and the March Current Population Survey, 1968-2005." Institute for Social Research, University of Michigan

food consumed at home, delivered, and dining out. Dining out expenditures included lunches during the workweek, but did not include food consumed at school or work. Respondents were not to include delivered food, such as pizza, or already prepared food to be consumed at home such as take-out. Special events such as parties and wedding receptions were also not included in the total.

The actual question about the cost of food away from home in the PSID was composed of two parts. The first part asked the respondent about the amount spent, "About how much do you (and everyone else in your family) spend eating out?" and the second part recorded the time frame for the amount spent given in response to the first question, day, week, two weeks, month, or year. The data from the PSID on dining out expenditures are similar to the dining out data in the Consumer Expenditure Survey (CEX). Blundell, Pistaferri, and Preston, 2005, compared the expenditure data in the PSID to the CEX, and note that trends in food expenditures, food at home and away from home, were all very similar and that the means varied by roughly $200. In addition, Charles et al., (2006), showed that "estimates of expenditures in most broad categories align closely in the PSID and CE despite substantial differences in their instruments and design features" (pg.8).

Another key variable taken from the PSID was smoking participation. The PSID asked several questions about smoking habits including: "Did you ever smoke cigarettes?" and "Do you smoke cigarettes?" If the reply was positive, a follow-up question of "On the average, how many cigarettes per day do you smoke?" was asked.

Smoking ban data was obtained from the ANR, a national lobbying organization that promotes smoke free workplaces and public spaces. The ANR provided a list of all complete restaurant smoking bans at the state level including the effective date of the ban. The ANR ban data were chosen instead of the ImpactTeen smoking ban data used in Chapter Two because 10 of the complete restaurant smoking bans went into effect during the middle of a PSID survey year. The smoking ban dummy variable was created by comparing the interview date of the PSID observation to the effective date of any restaurant smoking ban for the state. If the enactment date of the ban was more than 30 days prior to the interview, then a smoking ban was considered in force. By January 1, 2007, 19 states had enacted complete smoking bans in restaurants. Complete workplace and bar ban indicator variables were construed in the same way for use in the selection equation of the endogenous switching regression.

From the CPS-TUS, a smoking sentiment variable was constructed. The Census Bureau conducts the Current Population Survey (CPS) monthly for the Bureau of Labor Statistics. Roughly 57,000 households are surveyed each month. The main purpose of the CPS is to collect information on the employment status of those surveyed, however, occasionally, the Census Bureau asks supplemental questions about other topics, including tobacco consumption and attitudes.

DeCicca, et al. (2006), examined nine different measures of attitudes towards smoking bans, restrictions on tobacco advertising, and home smoking policies from the TUS, and found that all nine derive from a common factor that they label "anti-smoking sentiment." Using the nine measures they constructed an index of attitudes towards

smoking. Because all nine questions were not asked in the more recent Tobacco Use Supplements, the smoking ban attitude index was created by using the four available questions about attitudes towards smoking bans and the home smoking policy question[40]. The smoking ban attitude variable should help control for the presence of less than statewide smoking bans and private restaurant smoking bans because states with high anti-smoking sentiment are also more likely to have more numerous local smoking bans.

Smoking prevalence rates for each state were taken from the BRFSS. The BRFSS is a national health survey conducted annually by all of the States in conjunction with the CDC. The survey collects information on health risk behaviors, health practices, health care access and general demographics about the respondents[41].

Price data on cigarettes was obtained from the publication, "The Tax Burden on Tobacco, 2008." Prices represent the average price for a pack of 20 cigarettes, including generic brands, inclusive of state and federal excise taxes on November 1 of each year. To match prices more closely to the date of the CPS interview, monthly price data was calculated as a linear extrapolation between each November 1st price.

Because price data for dining out is unavailable, the average annual wage for Full Service Restaurants[42] from the Bureau of Labor Statistics was used as a proxy for the price of restaurant meals. Average annual pay should provide a reasonable measure of restaurant meal prices, because labor represents one-third of the total costs in

[40] Compete details about the construction of the state attitude index are given in Appendix A.
[41] The BRFSS survey included all 50 states and the District of Columbia. In 2006, more than 350,000 adults were interviewed by phone.
[42] NAICS Codes: 7221 – Full Service Restaurants

restaurants[43]. Further, examining payroll and operating expenses from the 2007 Economic Census conducted by the Census Bureau, the ratio of payroll to expenses for combined Food services and drinking places sector was 0.448, showing that payroll represented roughly have of the expenses for the sector.

Several studies have found correlation between the wages and prices, although the direction of the causation was mixed in the studies. Pu, Flaschel, and Chihying (2006) find that price inflation caused wage inflation in the United States' economy, while Ghali (1999) found that the process ran from wages to prices. Aaronson (2001) looked specifically at the restaurant industries in the U.S. and Canada and also found that prices rose with wage increases. Card and Krueger (1994) determined that restaurants in New Jersey raised prices sufficiently to cover the cost of an increase in the minimum wage. Even though the direction of the causation may be in doubt, this suggests that while imperfect, average annual pay is a reasonable proxy for prices and should capture some of the variability in prices for FAFH across time and states. Using the average annual pay and an average cost of $32.60 for a meal at a restaurant in 2005 nationally, [44] a cost for each state was calculated in order to scale the price appropriately.

The Consumer Price Index – All Urban Consumers (CPI-U) all items index from the Bureau of Labor Statistics was used to deflate all of the monetary measures into real dollars. In all, there were a total of 38,516 observations in the PSID from 1999 to 2007. After adjusting for serial correlation and missing data, a total of 20,675 observations that

[43] National Restaurant Association, Restaurant Industry Operations Report, 2003
[44] *Zagat's 2006 America's Top Restaurants Survey,*as reported by CNN Money at: http://money.cnn.com/2005/12/22/pf/meals_averagecost/index.htm

reported expenditures on FAFH and were used in the switching regression analysis while 4,113 observations reported no expenditures on FAFH[45]. Of the observations with reported dining out expenditures, 15,334 of the observations were in households in which no household member smoked and 5,341 observations were in households in which at least one member of the household smoked.

Table 4.1 contains descriptive means of the variables for the entire sample and for smokers and non-smokers. The mean expenditure on dining out was $1,990 in real 2001 dollars. Non-smokers spent more than smokers on FAFH, the difference was $2,046 versus $1,831. Part of the difference in expenditures could have been due to non-smokers lived in higher priced areas. For all households, the mean price was $26.04, while for non-smoker households it was $26.24 and $25.46 for households with smokers.

Almost twenty percent of households lived in a state with a complete restaurant smoking ban. In 2001, only 10,0 percent of households lived in states with complete restaurant smoking bans, but the percentage rose to 35.1 percent in 2007. Non-smoker households were more likely to live in states with complete restaurant smoking bans than households with smokers, at 21.7 percent versus 14.5 percent. The state smoking ban attitude was nearly equal between non-smokers and smokers, at 12.9 overall and for the nonsmokers, and 12.8 for the smokers. From 2001 to 2007, the smoking ban attitude index increased from 12.5 in 2001 to 13.1 in 2007, meaning that support for smoking bans grew over the time period.

[45] The 4,113 observations with zero reported food away from home expenditures represented 16.6% of the observations.

Table 4.1

Food Away From Home: Summary Statistics

	All Observations		Non-Smokers		Smokers	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Dining Out Variables						
Expend on FAFH ($2001)	1,990	1,981	2,046	2,049	1,831	1,763
Price of Dining Out ($2001)	26.04	3.93	26.24	3.95	25.46	3.83
Smoking Related Variables						
Complete Smoking Ban: Restaurant	0.199	0.399	0.217	0.412	0.145	0.353
St. Smoking Ban Attitude Index	12.9	0.5	12.9	0.5	12.8	0.5
Income Variables						
Household Income ($2001)	66,532	92,516	70,850	101,226	54,135	59,231
Household on Food Stamps	0.063	0.243	0.050	0.218	0.100	0.300
Value of Time Variables						
Stay at home mom in household	0.138	0.345	0.141	0.348	0.128	0.334
Head Employed	0.782	0.413	0.778	0.416	0.796	0.403
Demographic Variables						
Age of Head of Household	46.0	15.0	47.2	15.6	42.8	12.6
Head of Household Married	0.593	0.491	0.612	0.487	0.541	0.498
Head College Degree	0.286	0.452	0.329	0.470	0.164	0.370
Head Male	0.760	0.427	0.756	0.429	0.771	0.420
Head Non-White	0.351	0.477	0.347	0.476	0.363	0.481
Head - Body Mass Index	28.1	5.3	28.3	5.4	27.4	5.1
Household Member Drinks	0.693	0.461	0.666	0.472	0.770	0.421
Household Size	2.8	1.4	2.8	1.4	2.8	1.5
Metro area	0.414	0.492	0.428	0.495	0.372	0.483
Large city	0.250	0.433	0.250	0.433	0.249	0.432
Medium City	0.076	0.265	0.078	0.268	0.072	0.258
Adjacent City	0.106	0.308	0.101	0.301	0.121	0.326
Rural	0.030	0.170	0.028	0.164	0.036	0.186
Rural	2.374	0.939	2.325	0.942	2.518	0.917
Instruments for Smoking Status						
Complete Smoking Ban: Work Places	0.095	0.293	0.100	0.300	0.079	0.270
Complete Smoking Ban: Bar	0.158	0.365	0.174	0.379	0.114	0.318
Cigarette Price (2001 cents)	357	59	358	59	354	58
State Smoking Prevalence	0.218	0.035	0.216	0.035	0.223	0.033
Household Health	2.4	0.9	2.3	0.9	2.5	0.9
Catholic	0.194	0.396	0.201	0.401	0.174	0.379
Protestant	0.622	0.485	0.622	0.485	0.623	0.485
Other Religion	0.024	0.218	0.022	0.210	0.029	0.240
Jewish	0.022	0.146	0.026	0.160	0.008	0.090
N	20,675		15,334		5,341	

Results

Results of the expenditure on FAFH analysis are presented in Table 4.2. Results for the smoking ban variables are discussed first, then the price and income variables, and finally all of the other variables are only very briefly discussed.

The model was statistically significant, with a Wald test of the joint significance of the explanatory variables that rejects the null that all of variables were equal to zero with a test statistic of Wald $chi^2(21)=1,323$. Additionally, the correlation coefficients ρ_0 and ρ_1 were both positive and statistically significant different from zero. Because ρ_0 and ρ_1 were significantly different from zero, this indicates that the error term in the decision to smoke equation is correlated with the error term in the FAFH expenditure equation. The positive sign on the coefficient for the ρ_1 term indicates that the same unobservables that cause someone in the household to choose to smoke, also cause that household to have higher expenditures on FAFH than the average household conditional on all other variables. The opposite it true for the households with only non-smokers, the unobservable factors that cause them to be a non-smoking household also lower their expenditures compared to an average household conditional on all other variables. Households with smokers would be higher than average spenders as both a non-smoking household and as a smoking household.

For the smoking ban variable, the estimated coefficient on the complete restaurant smoking ban variable was positive and insignificant for the non-smoking households at 0.012. Because the dependent variable was the log of expenditures, the coefficient represents the percent change in expenditures when a smoking ban went into effect. For

the smoking households, the estimated coefficient was a negative 4.3 percent, which was also insignificant.

Table 4.2

Food Away From Home: Regression Results

	Endogenous Switching Regression	
Dependant Variable: Log(Expenditures on FAFH)	Non-Smokers	Smokers
Smoking Related Variables		
Restaurant Smoking Ban	0.012	-0.043
	(0.028)	(0.045)
St. Smoking Attitude	-0.153***	-0.086*
	(0.032)	(0.048)
Price and Income Related Variables		
Price	0.334***	0.551***
	(0.089)	(0.140)
Household Income	0.189***	0.140***
	(0.017)	(0.020)
Food Stamp Participation	-0.308***	-0.405***
	(0.040)	(0.048)
Value of Time Variables		
Mom at home	-0.056**	-0.039
	(0.024)	(0.039)
Head of Household Employed	0.103***	0.071*
	(0.025)	(0.037)
Demographic Variables		
Age - Head of Household	-0.001	-0.008***
	(0.001)	(0.001)
Head of Household Married	-0.074***	-0.051
	(0.028)	(0.038)
Head of Household - College Grad	0.078***	0.130***
	(0.021)	(0.042)
Head of Household Male	0.289***	0.264***
	(0.029)	(0.040)
Head Non-white	-0.065***	-0.036
	(0.021)	(0.032)
BMI - Head of Household	0.004**	0.004
	(0.002)	(0.003)
Household Member Drinks Alcohol	0.114***	0.061*
	(0.018)	(0.032)
Household Size	0.017**	0.018
	(0.008)	(0.012)

Table 4.2 - Continued

Food Away From Home: Regression Results - Continued

Dependant Variable: Log(Expenditures on FAFH)	Endogenous Switching Regression	
	Non-Smokers	Smokers
Urbanization Variables		
Metro Area	0.128***	0.232***
	(0.031)	(0.047)
Large City	0.085***	0.146***
	(0.031)	(0.047)
Medium City	0.018	0.069
	(0.040)	(0.065)
Adjacent to Metro	-0.014	0.024
	(0.034)	(0.055)
Rural	-0.059	-0.061
	(0.065)	(0.085)
Other Variables		
Time Trend	0.004	0.015***
	(0.003)	(0.006)
Constant	-2.349	-26.758**
	(6.223)	(10.985)
ρ	0.834***	0.284***
	(0.012)	(0.062)
Model Statistics		
Wald $chi^2(21)$	1,323.2	
p	0.000	
N (20,675 total)	15,334	5,341

* p<0.10, ** p<0.05, *** p<0.01

The state smoking ban attitude index variable was negative and statistically significant for both non-smoking and smoking households, with estimated coefficients of -0.153 and -0.086 respectively. For non-smoking households, the price of dining out proxy variable was a positive 0.334 and statistically significant at the 1 percent level, while for smoking households it was also statistically significant at the 10 percent level at a positive 0.551.

For the measures of income, the estimated coefficients on income were 0.189 and 0.140 for non-smoking and smoking households, and statistically significant at the 1 percent level in both. Food stamp program participation was negatively associated with

expenditures at –0.308 and –0.405 and significant at the 0.1 percent level. The results for the value of time variables were as expected. The mom at home variable was negative for both groups, but only statistically significant for the non-smokers. As expected, the head employed variable was positive and significant for both non-smokers and smokers.

To check the sensitivity of the analysis, regressions were reestimated for the early years and the last years of the data. First, the analysis was restricted to 2001-2005 and then to 2003-2007. Results for the smoking ban variable and the state smoking ban attitude index variable are presented in Table 4.3.

Table 4.3

Food Away From Home: Regression Results – Specification Checks

Dependant Variable: log(Dining Out Expend)	Non-Smokers	Smokers
Base Results		
Restaurant Smoking Ban	0.012	-0.043
	-0.028	-0.045
St. Smoking Ban Attitude Index	-0.153***	-0.086*
	-0.032	-0.048
Data from 1999 - 2005 utilized		
Restaurant Smoking Ban	0.008	-0.055
	-0.029	-0.049
St. Smoking Ban Attitude Index	-0.176***	-0.128**
	-0.037	-0.056
Data from 2001 - 2007 utilized		
Restaurant Smoking Ban	0.031	0.058
	-0.036	-0.061
St. Smoking Ban Attitude Index	-0.155***	-0.130**
	-0.036	-0.056

* p<0.10, ** p<0.05, *** p<0.01

When the sample was limited to just the years 2001-2005 and to 2003-2007, the results differed somewhat between the modified regression and the base specification. In the 2001-2005 specification, the coefficients were slightly different in magnitude;

however, they were all of the same sign and significance. For the 2003-2007 sample, the coefficient estimate on smoking bans for the non-smoking households was larger but still not statistically significant. For the non-smoking households, the coefficient changed to positive but was still insignificant.

Discussion and Summary

Based on the results from Table 4.2, it appears that complete restaurant smoking bans do not change the expenditures on FAFH of non-smoking or smoking households. While the estimated coefficients conformed to expectations, the lack of precision in the estimates prevents any conclusions from being drawn about the effect of smoking bans. However, in related research, the results from an OLS fixed effects approach show negative and statistically significant effect of complete restaurant smoking bans on FAFH expenditures[46]. The results for the state smoking ban attitude index indicated that a 1-point increase in the smoking ban attitude index reduces the amount that non-smokers spend on dining out by 15.3 percent and of smokers by –8.6%.

In this examination of the decision to dine out, it appears that smoking bans have little overall effect on expenditures for food away from home. The estimated coefficients for the smoking ban variable were positive for non-smoking households and negative for smoking households, but the errors associated with the estimates were large enough that random chance as a driver of the results could not be ruled out.

[46] The working paper with the OLS fixed effects results is available on request.

The results of the essay do not definitively conclude that smoking bans have no effect on dining out. However, the essay provides a method, coupled with additional data on local smoking bans, which could improve the precision of the results and provide a more definitive answer.

Appendix A: Smoking Ban Attitude Index Calculation

Attitudes towards smoking bans are probed in most waves of the CPS-TUS. The CPS-TUS data was available for all years except 1997, 2000, 2003, 2004, and 2005. A linear extrapolation from the available years was used to estimate the smoking attitude index for the missing years. Questions about attitudes towards smoking bans in restaurants, work areas, bars, and indoor sporting events are consistently asked. Respondents are asked to choose from, "Smoking should be " - "1) Allowed in all areas", "2) Allowed in some areas", or "3) Not allowed at all".

In addition, the respondent's home smoking policy is also probed, with the following responses: "1-No one is allowed to smoke anywhere INSIDE YOUR HOME", "2-Smoking is allowed in some places or at some time INSIDE YOUR HOME", "3-Smoking is permitted anywhere INSIDE YOUR HOME".

To construct the index, first the home smoking policy variable was recoded so that higher values reflected stronger anti-smoking sentiment: "1-Smoking is permitted anywhere INSIDE YOUR HOME", "2-Smoking is allowed in some places or at some time INSIDE YOUR HOME", and "3-No one is allowed to smoke anywhere INSIDE YOUR HOME".

The individual responses were summed to form the smoking attitude index. The formula is to calculate an individual's attitude index is as follows:

Smoking Attitude Index = Restaurant Attitude + Work Area Attitude

+ Bar Attitude + Indoor Sporting Events Attitude

+ (4-Home Smoking Policy)

To derive the state smoking attitude index, the individual attitude indexes were averaged by state and year to derive a state attitude index for each year. Each state attitude index could theoretically range from 5 to 15, with 5 indicating that every individual in the state allowed smoking in every area of their home and believed that smoking should be allowed in all areas of restaurants, work places, bars and indoor sporting events. In contrast, a state attitude index of 15 would indicate that every individual doesn't allow smoking in their home at all and believes that smoking should be banned in restaurants, work places, bars and indoor sporting events.

To test if these five questions measure the same idea, attitude towards smoking, Cronbach's alpha (reliability coefficient) was calculated. The reliability coefficient was 0.76, indicating that the 5 items all measured the same underlying attitude of the respondent.

Appendix B: Expanded Discussion of Demographic variables used in FAFH Literature

Demographic variables typically utilized in food away from home (FAFH) studies included: an income measure, demographic variables such as; age of the head of household, marital status, education, the sex of head, race, size of family, measures of the time available to the household, and some sort of location measure such as metro versus non-metro. Additionally, some researchers have focused on how measures related to health, such as body mass index and health and nutrition concerns influence FAFH consumption.

Without exception, income has been shown to increase the amount of FAFH purchased (Kinsey; Lee and Brown; McKracken and Brandt; Yen; Byrne, Capps, and Saha; Mihalopoulos and Demoussis; Keng and Lin; Binkley; Mutlu and Gracia; Angulo, Gil, and Mur; and Jang, Ham, and Hong). The effect of employment or value of time was less clear on the level of dining out, with most studies finding no effect, however, Yen and then Keng and Lin did find that a working household head was associated with higher levels of FAFH consumption.

Demographic characteristics also influenced the level of dining out expenditures as well. Whites consumed more FAFH than minorities. (Lee and Brown; McCracken and Brandt; Yen; Byrne, Capps, and Saha; Binkley; and Jang, Ham, and Hong). The effect of education on the dining out expenditures was been mixed, with Lee and Brown, and Yen, finding it decreased the level of expenditures while Mihalopoulos and Demoussis; Keng and Lin; and Jang, Ham, and Hong all found that educational attainment increased FAFH expenditures.

Dining out expenditures increased as the size of the household increased (Mihalopoulos and Demoussis; Keng and Lin; Jang, Ham, and Hong; McKracken and Brandt; and Byrne, Capps, and Saha). The effect of family structure on FAFH expenditures was unclear, with Byrne, Capps, and Saha finding higher expenditures for married families and Lee and Brown and then Mihalopoulos and Demoussis finding a negative relationship between marriage and FAFH expenditures. Byrne, Capps, and Saha, and Mihalopoulos and Demoussis found the presence of children decreased dining out expenditures, while Keng and Lin and Mutlu and Gracia found no effect.

For the urbanocity and regional variables, Lee and Brown: Keng and Lin; Byrne, Capps, and Saha; Muthi and Garcia; and Angulo, Gil, and Mur all found that households in urban areas spent more on FAFH, while Mihalopoulos and Demoussis find that Greek consumers in urban areas spent less on FAFH. Regional effects also matter, as Lee and Brown: Yen; Keng and Lin; and Byrne, Capps, and Saha find regional differences in the expenditure level for FAFH.

Finally, Binkley included measures of health status and preferences such as body mass index (BMI), frequency of exercise, and measures of nutritional knowledge when examining dining out. He found that higher BMIs are both consistent with an increase in the number of times individuals frequented both fast food and table restaurants. Individuals who were more health conscience tended to dine out less at fast food restaurants, but table service was largely unaffected.

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