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The Economic Impact of State Cigarette
Taxes and Smoke-free Air Policies on
Convenience Stores

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Convenience Stores**

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Executive Summary

The effectiveness of higher tobacco taxes and comprehensive smoke-free air policies in reducing tobacco use and non-smokers' exposure to tobacco smoke has been well documented. Raising tobacco taxes and enacting comprehensive smoke-free air policies prevent youth from taking up tobacco use, promote quitting among current users, keep former users from restarting, and reduce consumption among those who continue to use tobacco products. Indeed, tobacco tax and smoke-free air policies are two of the most effective policy tools state and local policy-makers can implement in order to reduce the economic and health costs imposed on state and local governments by cigarette smoking and other tobacco product use. Not surprisingly, tobacco companies and related organizations have argued against such policies, often making false or overstated claims about the adverse economic impact of higher tobacco taxes and stronger smoke-free air policies.

In the past few years, as many state and local policy-makers have considered increasing tobacco taxes to curb youth and adult tobacco use while at the same time generating additional tax revenues to fill budget gaps, tobacco companies and related organizations began arguing against tobacco taxes by claiming that higher cigarette taxes hurt the business of convenience stores. The central thesis of this argument was higher cigarette tax reduces the sales of cigarettes in convenience stores, and therefore negatively affect convenience stores' business.

This study is the first to investigate the economic impact of state cigarette taxes and smoke-free air policies on convenience stores. Specifically, we examine the impact of state cigarette taxes and state smoke-free air policies on the number of convenience stores per capita using multivariate econometric models. The number of convenience store per capita is determined by the entry of new stores and exit of existing stores, both of which are ultimately determined by the profits of convenience stores. Our analysis was based on Dun & Bradstreet Marketplace Gold data, which provide the business count estimates for convenience stores for the time period from

1997 to 2009. In addition, data on state cigarette taxes and smoke-free air policies, and other tobacco control measures, as well as state level economic indicators were compiled from various sources, including the Bridging the Gap/ImpacTeen project's State Tobacco Control Policy Surveillance system, Federal Reserve Bank of St Louis's FRED database, and U.S. Energy Information Administration's State Energy Data System (SEDS).

Our analysis shares the characteristics of other studies on the similar topics that have been determined to be methodologically sound and rigorous. We estimated a number of alternative models to determine the robustness of our results. Specifically, we tested whether our results are sensitive to inclusion/exclusion of gas stations in convenience stores, whether they are sensitive to inclusion of other tobacco control measures, gasoline price, and state level economic indicators in the models.

Using multivariate regression techniques, our analysis shows that higher cigarette taxes and stronger smoke-free air policies have had no negative impact on number of convenience stores, a proxy of the entry of new stores and exit of existing stores, which is determined by convenience store profits. In fact, our analysis indicates that higher cigarette taxes are positively associated with the number of convenience stores, with an increase in cigarette excise tax of \$1 estimated to increase the number of convenience stores per 1 million people by 11 stores. Our results are consistent with findings from a large and growing set of peer reviewed studies that show over-shifting of cigarette excise tax to consumer prices, which could increase retail profits.

Our findings clearly counter tobacco industry and related organizations' claims that higher cigarette taxes and stronger comprehensive smoke-free policies have a negative economic impact on convenience stores. The results of our analysis indicate that higher cigarette taxes and stronger smoke-free air policies have had no negative economic impact on convenience stores. Our study provides new evidence to state and local policy makers on the economic benefits of raising cigarette taxes and enacting smoke-free air policies.

The Economic Impact of State Cigarette Taxes and Smoke-free Air Policies on Convenience Stores

Abstract

This study investigates the economic impact of state cigarette taxes and smoke-free air policies on convenience stores. Specifically, we examine whether increasing cigarette taxes and/or enacting stronger smoke-free air policies will reduce number of convenience stores per capita in a state. Our analyses show that the number of convenience stores is positively correlated with state cigarette taxes. One explanation for this comes from studies that find cigarette taxes are over-shifted, leading to larger increases in consumer prices than the tax increase, which could potentially increase profits at the retail level. In addition, we found smoke-free air policies do not have negative impacts on convenience stores. Our results are robust across different model specifications and exclusion/inclusion of other tobacco control policies. Additionally, our results are robust with regard to a broad definition of convenience stores which includes gas stations.

Introduction

Since the publication of the first Surgeon General's Report on Smoking and Health in 1964, considerable progress has been made in reducing tobacco use in the U.S. Adult smoking prevalence has dropped from more than 40% among all adults in early 1960s, when more than half of men and more than 30% of women smoked, to 20.6% in 2009 among all adults (23.5% among men and 17.9% among women (CDC 2007; CDC 2010). Much of this progress can be attributed to increasing awareness of the negative health consequences of smoking and exposure to secondhand smoke among the general public, and to the adoption and strengthening of tobacco control policies at the federal, state and local levels (Chaloupka 2010). An extensive literature demonstrates that higher tobacco taxes and comprehensive smoke-free air policies are effective in reducing tobacco use, as well as non-smokers' exposure to tobacco smoke (Jha and Chaloupka, 1999, 2000; National Cancer Institute, 2000; Task Force on Community Preventive Services, 2001, 2005; USDHHS, 2006). These policies are effective in preventing youth from taking up tobacco use, promoting quitting among smokers, keeping former smokers from restarting, and reducing consumption among those who continue to use tobacco.

Inflation-adjusted cigarette taxes have more than tripled since the early 1980s, and significant taxes have been adopted in several localities. Since 2002, 47 states, DC, and several U.S. territories have increased their cigarette tax rates more than 100 times (Campaign for Tobacco Free Kids, 2010). As of August 1, 2010, the average state cigarette excise tax was \$1.45 per pack. In addition, since mid-1990s, a total of 35 states and the District of Columbia have adopted laws that require 100 percent smoke-free workplaces and/or restaurants and/or bars (23 of these states had laws in effect that require 100 percent smoke-free workplaces, restaurants, and bars as of October 1, 2010,) (Americans for Nonsmokers' Rights Foundation (ANRF), 2010a).

Moreover, according to ANRF, 902 municipalities currently have a 100 percent smoke-free air provision in effect at the local level in workplaces and/or restaurants and/or bars (430 municipalities require workplaces, restaurants, and bars to be 100 percent smoke-free). It's estimated that as of October 1, 2010, 73.9 percent, 62.2 percent, and 63.4 percent of the total US population was covered by a state or local policy making restaurants, workplaces, and bars, respectively smoke-free (ANRF, 2010b).

Not surprisingly, tobacco companies and related organizations have argued against these tobacco control policies, often making false or overstated claims about the adverse economic impact of higher tobacco taxes, stronger smoke-free air policies, and other tobacco control measures. Over the years, a series of exaggerated and/or false claims have been made by tobacco companies and related organizations, such as stronger tobacco control policies and program result in substantial job losses; higher cigarette taxes reduce government tax revenues; tax evasion and avoidance negate the impact of tax increase; cigarette tax increases negatively affect low income population, and smoke-free air policies hurt hospitality industry (including restaurants, bars, hotels, and tourism). All of these claims have been shown to be misleading, overstated, or false by a large number of peer-reviewed scientific studies that use sophisticated methodology and objective measures of economic activities (see, for example, Chaloupka, 2006; Eriksen and Chaloupka, 2007; Hyland et al., 2006; IARC, 2009; Jha and Chaloupka, 1999, 2000; Merriman, et al., 2000; USDHHS, 2006).

In the past few years, while many state and local policy-makers were considering increasing tobacco taxes to curb youth smoking, tobacco companies and related organizations began

arguing against higher tobacco taxes, claiming that higher taxes hurt the business of convenience stores¹. This argument has gained popularity recently as a number of states considered raising cigarette tax rates to generate additional tax revenues for state governments facing budget crises. Indeed, a simple Google search using keywords “cigarette tax hurt convenience store” generated 20,400 results as of Feb 20, 2011. The central thesis of this argument is that higher cigarette tax reduces the sales of cigarettes in convenience stores, and therefore negatively affects convenience store’s business.

There are several flaws with this argument. First, it ignores the impact of the huge price-reducing promotion by tobacco industry. In recent years, more than 85% of tobacco industry’s annual marketing spending, which was more than \$12 billion annually, was used on marketing activities that directly reduced cigarette prices, e.g. price discounts, coupons, retail value added promotions involving free cigarettes, and distribution of free samples (FTC, 2009). These price-related promotions were used to soften the impact of state and federal tax increases, as a result, the sale of cigarettes may or may not decline depends on how much tax increase will be offset by tobacco industry’s price reduction promotions. Second, while higher cigarette taxes reduce cigarette consumption, hence reducing sales of cigarettes, this doesn’t mean that the higher taxes will reduce total sales in a convenience store. Money previously spent on tobacco products will be spent on other goods and services, such as gasoline, coffee, etc., creating alternative sales, and as a result, total sales may or may not be affected by higher cigarette tax. Third, as standard

¹ See, for example, (1) National Association of Convenience Stores (NACS online): “NY Tobacco Tax Hike Will Hurt Convenience Stores”, online at <http://www.nacsonline.com/NACS/News/Daily/Pages/ND0623104.aspx>, accessed on Feb 20, 2011. (2) Convenience Store News: “Texas Cigarette Tax Hurts Retailers”, online at <http://www.csnews.com/top-story-texas-cigarette-tax-hurts-retailers-42575.html>, accessed on Feb 20, 2011. (3) Cigaretterevue.com: “Cigarette tax hikes hurt small businesses more than smokers”, online at <http://www.cigarettesreviews.com/cigarette-tax-hikes-hurt-small-businesses-more-than-smokers>, accessed on Feb 20, 2011.

economic theory states, the success of a convenience store depends on its profits, not sales. The profits of a convenience store may well be increased when cigarette tax increase was over-shifted to consumers, meaning the tax increase was passed through to consumer prices at a rate higher than one-for-one. Indeed, substantial evidence from the scientific literature that examines the relationship between cigarette tax and retail price points to this direction. For example, Sumner and Ward (1981), Keeler et al. (1996), Delipalla and O'Donnell (2001) and Hanson and Sullivan (2009) all find evidence that cigarette excise taxes are over-shifted. Sullivan (2008) estimated that a \$1 increase in the state cigarette excise tax increases cigarette prices by \$1.10 to \$1.13. With over-shifting of cigarette tax, the profits of a convenience could increase, and therefore implies that higher cigarette tax may have a positive impact on convenience store business.

In the context of this debate, it's important to empirically investigate the economic impact of state cigarette tax on convenience stores. While conceptually it's straightforward to examine the profits of convenience stores, due to the limited availability of those data, it was difficult to conduct such research empirically. To address this issue, in this study, we look at the impact of state cigarette taxes and state smoke-free air policies on convenience stores by examining their impact on the number of convenience store per capita in a state. The number of convenience store per capita is determined by the entry of new stores and exit of existing stores, both of which are ultimately determined by the profits of convenience stores. To the best of our knowledge, no peer reviewed studies have examined the economic impact of state cigarette excise taxes and smoke-free air polices on convenience stores. Our results will thus provide empirical evidence to inform the current debate. Our analyses reveal that state cigarette excise taxes are positively correlated with number of convenience stores per capita in a state. The positive correlation is

robust across different model specifications, and inclusion/exclusion of other tobacco control measures and gas prices. The positive impact of higher cigarette tax on number of convenience stores is also robust with regard to inclusion of gas stations as convenience stores. Our results also show that state smoke-free air policies do not correlate with number of convenience stores, again this finding is robust regardless of model specifications and inclusion/exclusion of other variables in the model.

Data

The dependent variable in our analysis – the number of convenience stores per 1 million people in a state - is constructed from Dun & Bradstreet (D&B) Marketplace Gold data. D&B Marketplace data provide business count estimates for a specific industry. The classification of industry in D&B Marketplace data is based on standard industrial classification (SIC) codes. An SIC code is a 4-digit code used by the US Department of Commerce to organize all industry types in the US according to its primary activity. D&B Marketplace data refined the industry classifications by appending up to 4 additional digits to the standard 4-digit SIC code to capture more detailed and specific business definitions. A business is self-classified into 8-digit primary SIC category in D&B Marketplace data. Several secondary 8-digit SIC categories can be specified for a business in addition to its primary SIC category in situations when a business participates in additional industries. Primary 8-digit SIC codes were used to estimate convenience store counts for 50 states and D.C. in US. Annual state level estimates were constructed for the time period from 1997 to 2009.

To accurately measure the count of convenience stores, we used two sets of definitions. The first one is a narrow definition that captures only the stores that self classified under SIC code 541102, which include convenience stores, both chain and independent. The second one broadens the first definition to include gas stations that self classified under SIC code 554199, which include both gas service stations and gas filling stations. In addition, we also conducted analyses that look only at gas stations. The total number of store in a state in a given year was then divided by the total population in that state and year, multiplied by 1 million, to generate the dependent variables that were used in the analysis.

The key explanatory variables in this study are the state cigarette excise tax rate and smoke-free air policies. These data are taken from the Bridging the Gap/ImpacTeen project's State Tobacco Control Policy Surveillance system which tracks state level tobacco control policies, such as price/tax/funding, youth access laws, smoke-free air laws, and smoke-free air preemption, as well as state smoking prevalence.

The state cigarette excise tax is an annual average of cigarette excise tax rates within a state in a given year. If there were changes in a state's cigarette excise tax rate in a given year, it is the weighted average of old tax rate and new tax rate, with their corresponding effective periods as the weights. For example, if a state's cigarette excise tax rate was increased from \$1 to \$1.5 on July 1, 2000, state cigarette excise tax rate for this state in 2000 used in our analysis will be \$1.25. State cigarette excise tax rates, as well as other income and price variables, are adjusted by Consumer Price Index (CPI) published by the Bureau of Labor Statistics to account for inflation. To ease interpretation, 2009 was used as the reference year.

State smoke-free air (SFA) policies are captured by two SFA indices. The narrow SFA index captures state SFA laws and preemption at private workplaces, restaurants, and bars. The broad SFA index captures state SFA laws and preemption at government buildings or workplaces, child care centers, health care facilities, recreational facilities, public transit, shopping malls, hotels, public and private schools, in addition to SFA laws and preemption at private workplaces, restaurants, and bars. For SFA laws, each venue was coded using a value from 0 – 3, with 0 indicating no SFA laws; 1 indicating restrict smoking to designated smoking areas (DSAs) or require separate ventilation with exemptions for locations of a certain size; 2 indicating that smoking was restricted to separately ventilated areas or a ban with exemptions for certain locations where only a restriction applies; and 3 indicating a comprehensive smoke-free policy that bans smoking at all times. In addition, to account for state preemption of stronger local policies, a dichotomous variable was used for each venue with 0 indicating no preemption and 1 indicating with preemption. The SFA index was constructed by summing up the SFA values of all relevant venues and subtracting the total values of preemption in all relevant venues. The timing of the effective date of the policy is taken into account when constructing the SFA and preemption variables, as a result, the actual value of the SFA index may not be an integer.

In order to capture the impact of gas prices on convenience stores, we used the state level motor gas prices in the transportation sector estimates from the State Energy Data System (SEDS), which is provided by U.S. Energy Information Administration. Prices are retail prices (usually service station prices). Prices were expressed using Btu prices, which are computed by converting the physical unit prices in dollars per gallon to dollars per barrel (42 gallons per

barrel). The prices are then converted to dollars per million Btu by using a variable annual factor. More details on the gas price variable can be found at U.S. Energy Information Administration's website². Gas price data are available only for the 1997-2008 period, as a result, analyses involving gas prices were only done for the period 1997-2008.

Additionally, state economic indicators, such as personal income and unemployment rates were obtained from Federal Reserve Bank of St Louis's FRED database.

Finally, we created mutually exclusive but all-inclusive dichotomous indicators for each state, and each year. The dichotomous state indicators capture all time-invariant state-level unobserved heterogeneity. The year indicators account for overall trends and year specific heterogeneity in number of convenience stores over time.

Statistical Methods

We employed fixed-effects regression techniques in the analyses. These fixed effects control for state-specific and year-specific determinants of the number of convenience stores. The fixed effects approach amounts to including a dichotomous indicator for each state (less one) and each year (less one) as explanatory variables in the models. This assumes that the differences across state, over time, and in different years not captured by the other covariates included in the model, can be fully captured by the state and year fixed effects. Specifically, we estimate the following pooled cross-sectional time series multivariate equation:

² http://www.eia.doe.gov/emeu/states/sep_prices/notes/pr_petrol.pdf

$$Y_{it} = \text{TAX}_{it}\beta + \text{SFA}_{it}\lambda + \text{ECONOMIC}_{it}\delta + s_i + y_t + e_{it}. \quad (1)$$

Y represents one of the three dependent variables (number of convenience stores, number of gas stations, and combined number of convenience stores and gas stations) for state i, in year t. TAX is the state cigarette excise tax rate in state i and in year t. SFA is a variable that captures the existence of a comprehensive smoke-free policy in state i, in year t. ECONOMIC are economic indicators, such as real personal income and unemployment rate in state i, in year t. Finally, s represents the state fixed effects and y the year fixed effects. e is the idiosyncratic error term. The parameters are estimated using linear regression, to account of the nature of dependent variables (counts), poisson and negative binomial regressions are also used. The results are similar when poisson and negative binomial regressions are used. As a result, in the following sections of this paper, only the results from linear regression are discussed.

Results

Summary statistics are presented in the Appendix table. The average number of convenience stores per 1 million people in a state is 220 for the period from 1997 to 2009. Figure 1 shows the time trend of number of convenience stores. Despite declines around 2000 and 2007, the overall trend was upwards, with the average number of convenience stores per capita in a state increasing from 207 in 1997 to 230 in 2009. The average number of gas stations in a state in our study period is 259. Average real state cigarette excise tax rate is 79 cents (in 2009 dollar), and the average smoke-free air index is 11. Figure 2 and Figure 3 show the time trend of state cigarette excise tax rates and smoke-free air index. Average state cigarette excise tax rates have gone up from 47 cents in 1997 to 127 cents in 2009, reflecting the tax increases in states since

1997. The smoke-free air policy index increased from 5 in 1997 to 22 in 2009, reflecting the increasingly strong smoke-free air policies across states. In addition, during the same time period, gasoline prices saw significant increases (see Figure 4). The Btu price has gone up from \$13 per million Btu in 1997 to \$26 per million Btu in 2008.

Regression results are summarized in Tables 1 through 3. Table 1 presents the analysis for convenience stores, Table 2 presents the analysis for gas stations, and Table 3 presents the analysis for the combined number of convenience stores and gas stations. In each table, we present 4 sets of regressions. Model 1 looks at the impact of the state cigarette excise tax alone, and Model 2 looks at the impact of state cigarette excise tax when smoke-free air policies are entered into regression. Model 3 is similar to Model 1, and Model 4 is similar to Model 2, with the differences being that the first two models excluded the gas price, while the last two included the gas price in the analysis.

Results in Table 1 show that the state cigarette excise tax is positively associated with the number of convenience stores. This association is highly significant ($p < .001$) in all model specifications and the magnitude of the estimated coefficient is stable across different models. These estimates imply that an increase in a state's cigarette excise tax rate is associated with an increase in the number of convenience stores in that state. Based on the estimated coefficients for the cigarette excise tax, an increase in the tax rate of \$1 per pack will be associated with an increase in number of convenience stores per 1 million people by 11.

Smoke-free air policies do not appear to be correlated with number of convenience stores. The estimated coefficients of smoke-free air index are positive, however, they are not statistically significant. Real per capita income has a positive impact on number of convenience stores. The correlation between real per capita income and number of convenience stores are highly significant, indicating an increase in real per capita income will increase number of convenience stores. Gas price has a negative impact on number of convenience stores, as indicated by the negative coefficients before the gas price variable; however, the estimated coefficients of gas price are not statistically significant.

Table 2 presents the results for gas stations. Neither the state cigarette excise tax nor smoke-free air policies have any impact on number of gas stations. The estimated coefficients are not statistically significant for both state excise tax and smoke-free air index. The estimated coefficients for gas price are negative; however, they are not statistically significant either. Real per capita income is negatively correlated with number of gas stations.

Table 3 summarizes the analysis for the combined number of convenience stores and gas stations. In this analysis, the state cigarette excise tax is again positively associated with the number of convenience stores, broadly defined to include gas stations, and the estimated coefficients are highly significant ($p < 0.01$). The magnitude of the estimated coefficients for state cigarette excise tax is similar to that in the analysis in Table 1, with an increase in cigarette excise tax rate by \$1 per pack being associated with an increase in number of convenience stores per 1 million people, broadly defined, by about 11 stores.

Smoke-free air policies do not have any impact on number of broadly defined convenience stores, as shown by the insignificant coefficients in Table 3. The gas price was negatively associated with number of convenience stores, however, this association is not statistically significant. Real per capita income is positively correlated with number of convenience stores, broadly defined, but the correlation is not statistically significant.

To assess the robustness of our results, we alternatively employed poisson and negative binomial regression methods to examine the impact of state cigarette excise taxes and smoke-free air policies on the number of convenience stores. The results from those analyses mirror those discussed in the previous paragraphs. In addition, we also use a narrowly defined SFA index which includes only smoke-free air policies at private workplaces, restaurants, and bars. Again, the results are similar to what we described earlier in this section. Furthermore, we included a measure of state tobacco control funding to our analysis to see whether inclusion of other state tobacco control efforts would make a difference; again, the results are almost the same whether state tobacco control funding was included or not. Finally, we included the state unemployment rate to capture aspects of the state economic environment that were not captured by state per capita income; again, the results for cigarette excise tax and smoke-free air policies are unchanged.

Conclusions

Opponents of higher cigarette excise taxes and comprehensive smoke-free air policies claim that raising cigarette tax and enacting smoke-free air policies will hurt convenience stores and drive convenience stores out of business. Using multivariate regression techniques, our study concludes that higher cigarette taxes and stronger smoke-free air policies have had no negative impact on number of convenience stores, a proxy that reflects the entry of new stores and exit of existing stores, which is ultimately determined by convenience store profits. In fact, our analysis shows that higher cigarette taxes are positively associated with the number of convenience stores, with an increase in the cigarette excise tax of \$1 estimated to be associated with an increase of 11 convenience stores per million people. Our results are consistent with findings from several peer reviewed studies that find an over-shifting of cigarette excise taxes to consumer prices, which could increase retail profits.

These findings clearly counter tobacco industry and related organizations' claims that higher cigarette taxes and stronger comprehensive smoke-free policies have a negative economic impact on convenience stores. Our results provide new evidence to state and local policy makers on the economic benefits of raising cigarette taxes and enacting smoke-free air policies.

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Table 1
Convenience Stores Per Capita

Variable	Model 1	Model 2	Model 3	Model 4
Real Per Capita Income	0.00223*** (0.000545)	0.00213*** (0.000570)	0.00243*** (0.000609)	0.00234*** (0.000637)
Real State Cigarette Tax	0.113*** (0.0270)	0.110*** (0.0273)	0.122*** (0.0313)	0.120*** (0.0315)
Smoke-Free Air Policy Index		0.141 (0.113)		0.133 (0.132)
Real Gas Price			-1.988 (2.282)	-1.779 (2.250)
Alaska	99.59*** (9.946)	97.95*** (10.38)	101.0*** (10.93)	99.57*** (11.34)
Arizona	-150.3*** (8.662)	-151.5*** (8.803)	-142.5*** (8.459)	-144.1*** (8.641)
Arkansas	-89.98*** (8.109)	-92.84*** (8.945)	-86.21*** (8.577)	-88.82*** (9.378)
California	78.11*** (10.52)	75.33*** (11.29)	81.22*** (11.58)	78.87*** (12.27)
Colorado	-176.4*** (6.327)	-179.6*** (7.266)	-175.1*** (7.070)	-178.4*** (8.086)
Connecticut	-105.8*** (5.229)	-107.8*** (5.743)	-104.4*** (5.559)	-106.2*** (6.016)
Delaware	-156.3*** (7.705)	-155.5*** (7.847)	-156.4*** (9.066)	-155.8*** (9.128)
District of Columbia	-78.64*** (6.740)	-81.64*** (7.345)	-78.01*** (7.017)	-80.74*** (7.633)
Florida	-166.5*** (11.28)	-167.0*** (11.23)	-166.6*** (12.41)	-167.0*** (12.29)
Georgia	-35.52*** (6.128)	-37.36*** (6.702)	-35.62*** (6.911)	-37.08*** (7.412)
Hawaii	76.77*** (9.158)	74.49*** (9.703)	77.68*** (10.45)	76.03*** (10.85)
Idaho	-132.9*** (7.575)	-135.1*** (8.088)	-125.0*** (10.03)	-127.5*** (10.37)
Illinois	-72.85*** (9.688)	-75.94*** (10.66)	-66.82*** (10.26)	-69.74*** (11.23)
Indiana	-151.3*** (6.648)	-152.2*** (6.701)	-152.2*** (6.880)	-152.7*** (6.912)
Iowa	-87.88*** (7.207)	-88.94*** (7.515)	-86.01*** (7.838)	-86.89*** (8.117)
Kansas	95.00*** (7.950)	94.24*** (8.218)	96.69*** (8.641)	96.44*** (8.767)
Kentucky	-7.176 (6.852)	-9.322 (7.404)	-5.931 (7.499)	-7.886 (8.062)
Louisiana	5.219 (8.727)	4.016 (9.084)	8.425 (9.549)	7.316 (9.897)
Maine	80.87*** (9.285)	78.69*** (9.999)	84.34*** (10.13)	82.62*** (10.73)
Maryland	21.51** (7.801)	18.37* (8.727)	25.59** (8.278)	22.55* (9.253)
Massachusetts	-138.5*** (5.644)	-142.3*** (6.659)	-137.5*** (6.035)	-141.1*** (7.219)

Michigan	-91.57*** (8.721)	-93.57*** (8.707)	-93.61*** (9.182)	-95.47*** (9.113)
Minnesota	-109.6*** (7.352)	-111.0*** (7.760)	-109.7*** (7.773)	-111.0*** (8.157)
Mississippi	-99.79*** (5.222)	-102.1*** (5.844)	-98.16*** (5.494)	-100.2*** (6.080)
Missouri	178.4*** (11.08)	176.7*** (11.50)	182.2*** (12.07)	180.7*** (12.51)
Montana	5.393 (7.011)	2.698 (7.848)	5.643 (7.869)	3.268 (8.695)
Nebraska	-1.467 (11.26)	-3.973 (11.80)	6.238 (11.78)	3.745 (12.37)
Nevada	-15.00* (7.191)	-17.11* (7.820)	-15.90* (7.247)	-17.75* (7.951)
New Hampshire	-113.3*** (9.205)	-113.7*** (8.997)	-112.6*** (9.975)	-112.9*** (9.733)
New Jersey	-41.76*** (6.071)	-43.49*** (6.473)	-40.93*** (6.416)	-42.61*** (6.835)
New Mexico	-168.8*** (6.919)	-169.5*** (6.926)	-172.1*** (7.659)	-172.4*** (7.660)
New York	-68.33*** (8.910)	-70.34*** (9.522)	-64.28*** (9.651)	-66.00*** (10.19)
North Carolina	-176.1*** (5.782)	-178.9*** (6.334)	-176.2*** (6.176)	-178.9*** (6.756)
North Dakota	80.60*** (7.326)	80.85*** (7.389)	81.44*** (7.741)	81.73*** (7.756)
Ohio	-31.69*** (7.588)	-34.42*** (8.352)	-29.12*** (8.334)	-31.69*** (8.105)
Oklahoma	-104.6*** (6.972)	-106.9*** (7.653)	-103.1*** (7.335)	-105.1*** (7.979)
Oregon	93.89*** (10.35)	92.57*** (10.71)	96.52*** (11.48)	95.53*** (11.79)
Pennsylvania	-103.5*** (7.328)	-104.9*** (7.754)	-99.86*** (8.254)	-101.5*** (8.656)
Rhode Island	-92.78*** (6.297)	-92.55*** (6.404)	-91.82*** (6.630)	-91.46*** (6.695)
South Carolina	-79.48*** (11.04)	-81.96*** (11.35)	-78.37*** (11.67)	-80.80*** (11.95)
South Dakota	144.5*** (9.409)	143.7*** (9.624)	146.3*** (10.43)	145.9*** (10.56)
Tennessee	42.23*** (10.85)	41.19*** (11.08)	41.12*** (11.03)	40.14*** (11.23)
Texas	27.64** (8.404)	27.72** (8.454)	30.05** (9.088)	30.27*** (9.089)
Utah	20.74** (7.483)	19.79* (7.685)	22.03** (8.180)	21.22* (8.365)
Vermont	-108.4*** (9.293)	-111.7*** (10.20)	-104.7*** (9.961)	-107.8*** (10.94)
Virginia	11.48 (7.155)	7.551 (8.288)	15.31* (7.537)	11.47 (8.832)
Washington	-32.19*** (7.337)	-31.49*** (7.537)	-34.10*** (7.650)	-33.34*** (7.767)
West Virginia	-126.4*** (6.134)	-128.4*** (6.552)	-124.5*** (7.105)	-126.5*** (7.435)
Wisconsin	53.28***	51.64***	55.38***	53.68***

	(10.91)	(11.47)	(11.62)	(12.18)
Wyoming	-100.4*** (6.986)	-102.1*** (7.510)	-97.97*** (7.522)	-99.83*** (8.073)
year_1998	5.055 (3.922)	5.184 (3.927)	0.666 (5.779)	1.217 (5.753)
year_1999	1.880 (3.767)	2.021 (3.778)	-1.147 (4.370)	-0.738 (4.378)
year_2000	-7.149 (3.942)	-6.918 (3.953)	-4.665 (5.457)	-4.768 (5.405)
year_2001	3.646 (3.931)	3.890 (3.952)	3.994 (4.260)	4.123 (4.260)
year_2002	13.05*** (3.787)	13.27*** (3.807)	11.27** (3.851)	11.59** (3.891)
year_2003	6.186 (3.735)	6.279 (3.747)	7.321 (4.824)	7.183 (4.773)
year_2004	11.28** (4.031)	11.20** (4.033)	16.57 (9.184)	15.81 (9.023)
year_2005	3.552 (4.309)	3.389 (4.298)	14.66 (15.77)	13.19 (15.48)
year_2006	-12.49* (5.135)	-12.96* (5.084)	2.223 (20.39)	0.0629 (20.00)
year_2007	-17.23** (5.634)	-18.25** (5.554)	-0.322 (23.36)	-3.252 (22.92)
year_2008	-4.815 (5.373)	-6.178 (5.342)	17.46 (29.05)	13.65 (28.59)
year_2009	0.981 (5.257)	-0.598 (5.218)		
Constant	269.2*** (16.75)	271.9*** (17.42)	288.2*** (34.92)	288.3*** (34.69)

Robust standard errors in parentheses; *** p<0.001, ** p<0.01, * p<0.05; Real values adjusted to 2009 dollars. The reference state for the state fixed effect is Alabama. The reference year for year fixed effects is 1997.

Table 2

Gas Stations per Capita

Variable	Model 1	Model 2	Model 3	Model 4
Real Per Capita Income	-0.00192** (0.000640)	-0.00198** (0.000644)	-0.00178** (0.000647)	-0.00188** (0.000650)
Real State Cigarette Tax	-0.00891 (0.0231)	-0.0105 (0.0231)	-0.00721 (0.0253)	-0.00932 (0.0253)
Smoke-Free Air Policy Index		0.0809 (0.0987)		0.129 (0.0986)
Real Gas Price			-2.092 (1.764)	-1.888 (1.786)
Alaska	-122.0*** (9.817)	-122.9*** (9.916)	-127.3*** (9.416)	-128.7*** (9.489)
Arizona	-222.1*** (7.947)	-222.8*** (7.961)	-220.2*** (8.955)	-221.7*** (8.961)
Arkansas	-323.0*** (8.483)	-324.6*** (8.723)	-323.6*** (8.585)	-326.1*** (8.779)
California	-192.8*** (11.90)	-194.4*** (12.08)	-192.8*** (12.05)	-195.0*** (12.20)
Colorado	-275.0*** (7.653)	-276.9*** (7.929)	-276.5*** (8.483)	-279.7*** (8.677)
Connecticut	-218.7*** (7.018)	-219.9*** (7.010)	-218.8*** (7.463)	-220.5*** (7.343)
Delaware	-144.4*** (10.97)	-144.0*** (10.86)	-146.5*** (11.92)	-146.0*** (11.66)
District of Columbia	-253.7*** (6.915)	-255.5*** (7.060)	-255.5*** (7.212)	-258.2*** (7.247)
Florida	-236.0*** (12.73)	-236.3*** (12.56)	-242.3*** (13.15)	-242.7*** (12.82)
Georgia	-243.7*** (8.710)	-244.8*** (8.736)	-249.7*** (8.861)	-251.1*** (8.772)
Hawaii	-246.9*** (8.413)	-248.3*** (8.424)	-254.2*** (8.785)	-255.8*** (8.691)
Idaho	-280.4*** (7.369)	-281.7*** (7.447)	-275.8*** (9.646)	-278.2*** (9.711)
Illinois	-207.4*** (9.428)	-209.1*** (9.679)	-204.8*** (9.330)	-207.6*** (9.610)
Indiana	-228.8*** (7.244)	-229.3*** (7.112)	-231.9*** (7.529)	-232.4*** (7.331)
Iowa	-203.2*** (8.347)	-203.8*** (8.337)	-206.3*** (8.442)	-207.2*** (8.432)
Kansas	-164.5*** (13.51)	-165.0*** (13.45)	-162.7*** (13.54)	-162.9*** (13.45)
Kentucky	-188.1*** (7.873)	-189.3*** (7.892)	-189.6*** (7.951)	-191.5*** (7.932)
Louisiana	-157.0*** (9.881)	-157.7*** (9.845)	-157.2*** (9.847)	-158.3*** (9.806)
Maine	-200.0*** (9.156)	-201.2*** (9.288)	-202.0*** (9.343)	-203.7*** (9.436)
Maryland	-192.1*** (8.064)	-193.9*** (8.376)	-191.1*** (8.284)	-194.1*** (8.571)
Massachusetts	-224.3***	-226.5***	-227.3***	-230.8***

	(7.773)	(8.031)	(8.201)	(8.274)
Michigan	-160.9*** (8.643)	-162.1*** (8.541)	-163.1*** (9.250)	-164.9*** (8.948)
Minnesota	-198.0*** (8.698)	-198.8*** (8.766)	-201.9*** (8.876)	-203.1*** (8.921)
Mississippi	-184.8*** (7.505)	-186.2*** (7.544)	-187.3*** (7.842)	-189.3*** (7.772)
Missouri	-166.6*** (10.90)	-167.6*** (10.98)	-169.5*** (10.86)	-171.0*** (10.95)
Montana	-188.5*** (8.418)	-190.1*** (8.525)	-191.9*** (8.625)	-194.2*** (8.684)
Nebraska	-151.2*** (10.52)	-152.6*** (10.64)	-148.0*** (10.67)	-150.5*** (10.78)
Nevada	-131.2*** (10.62)	-132.4*** (10.69)	-129.3*** (10.37)	-131.1*** (10.45)
New Hampshire	-324.2*** (7.243)	-324.5*** (7.052)	-324.7*** (8.025)	-325.1*** (7.759)
New Jersey	-196.4*** (7.143)	-197.4*** (7.098)	-196.7*** (7.436)	-198.4*** (7.287)
New Mexico	-156.4*** (9.261)	-156.9*** (9.105)	-161.3*** (9.654)	-161.7*** (9.364)
New York	-177.0*** (9.517)	-178.2*** (9.623)	-177.4*** (9.561)	-179.1*** (9.658)
North Carolina	-246.3*** (7.808)	-247.9*** (7.893)	-249.1*** (8.245)	-251.7*** (8.139)
North Dakota	-241.2*** (7.754)	-241.0*** (7.678)	-242.9*** (7.733)	-242.6*** (7.639)
Ohio	-70.03*** (9.139)	-71.60*** (9.303)	-68.66*** (9.287)	-71.16*** (9.450)
Oklahoma	-200.3*** (8.201)	-201.7*** (8.314)	-202.6*** (8.320)	-204.5*** (8.377)
Oregon	-177.6*** (10.32)	-178.4*** (10.37)	-180.3*** (10.78)	-181.2*** (10.83)
Pennsylvania	-235.8*** (7.498)	-236.6*** (7.501)	-234.5*** (8.113)	-236.1*** (8.099)
Rhode Island	-227.6*** (7.079)	-227.5*** (6.991)	-229.5*** (7.349)	-229.1*** (7.235)
South Carolina	-176.8*** (7.714)	-178.2*** (7.851)	-176.1*** (8.232)	-178.5*** (8.271)
South Dakota	-241.3*** (9.064)	-241.8*** (9.029)	-245.4*** (9.070)	-245.8*** (9.028)
Tennessee	-34.05*** (10.29)	-34.65*** (10.33)	-31.83** (10.44)	-32.79** (10.49)
Texas	-200.0*** (8.129)	-199.9*** (8.067)	-203.7*** (8.021)	-203.5*** (7.944)
Utah	-250.9*** (7.364)	-251.4*** (7.322)	-253.8*** (7.475)	-254.6*** (7.404)
Vermont	-229.1*** (9.441)	-231.0*** (9.722)	-229.2*** (9.410)	-232.3*** (9.725)
Virginia	-108.8*** (7.689)	-111.1*** (8.093)	-108.6*** (7.986)	-112.3*** (8.343)
Washington	-230.5*** (7.493)	-230.1*** (7.466)	-234.6*** (7.766)	-233.9*** (7.728)
West Virginia	-260.7*** (8.297)	-261.8*** (8.330)	-261.1*** (9.521)	-263.0*** (9.467)

Wisconsin	-199.0*** (9.970)	-200.0*** (10.01)	-198.3*** (10.00)	-200.0*** (10.07)
Wyoming	-165.0*** (7.467)	-166.0*** (7.488)	-165.6*** (7.744)	-167.4*** (7.733)
year_1998	-5.326 (4.121)	-5.252 (4.119)	-9.789 (5.327)	-9.252 (5.352)
year_1999	-18.74*** (4.075)	-18.65*** (4.074)	-21.72*** (4.520)	-21.32*** (4.526)
year_2000	-32.78*** (4.157)	-32.65*** (4.154)	-29.87*** (4.756)	-29.97*** (4.753)
year_2001	-23.36*** (4.401)	-23.22*** (4.397)	-22.67*** (4.302)	-22.55*** (4.285)
year_2002	-17.23*** (4.502)	-17.11*** (4.497)	-18.70*** (4.475)	-18.40*** (4.463)
year_2003	-36.13*** (4.335)	-36.08*** (4.323)	-34.38*** (4.583)	-34.51*** (4.564)
year_2004	-41.54*** (4.748)	-41.58*** (4.731)	-35.29*** (7.399)	-36.02*** (7.436)
year_2005	-55.55*** (5.059)	-55.65*** (5.041)	-43.06*** (12.21)	-44.49*** (12.33)
year_2006	-52.31*** (5.708)	-52.58*** (5.683)	-35.90* (15.69)	-38.01* (15.86)
year_2007	-61.29*** (6.051)	-61.87*** (6.059)	-42.45* (17.51)	-45.31* (17.80)
year_2008	-57.72*** (5.984)	-58.50*** (6.040)	-33.22 (22.56)	-36.94 (22.91)
year_2009	-57.12*** (5.862)	-58.02*** (5.826)		
Constant	441.9*** (18.31)	443.4*** (18.41)	461.4*** (30.16)	461.4*** (30.14)

Robust standard errors in parentheses; *** p<0.001, ** p<0.01, * p<0.05; Real values adjusted to 2009 dollars. The reference state for the state fixed effect is Alabama. The reference year for year fixed effects is 1997.

Table 3

Combined Convenience Stores and Gas Stations Per Capita

Variable	Model 1	Model 2	Model 3	Model 4
Real Per Capita Income	0.000306 (0.000740)	0.000150 (0.000764)	0.000651 (0.000831)	0.000456 (0.000853)
Real State Cigarette Tax	0.104** (0.0358)	0.1000** (0.0360)	0.115** (0.0410)	0.111** (0.0411)
Smoke-Free Air Policy Index		0.222 (0.164)		0.262 (0.172)
Real Gas Price			-4.079 (2.428)	-3.667 (2.352)
Alaska	-22.40 (14.67)	-24.98 (15.20)	-26.34 (15.73)	-29.10 (16.24)
Arizona	-372.4*** (12.07)	-374.3*** (12.19)	-362.6*** (12.82)	-365.8*** (12.79)
Arkansas	-412.9*** (13.02)	-417.4*** (14.04)	-409.8*** (13.93)	-414.9*** (14.79)
California	-114.7*** (18.03)	-119.0*** (18.82)	-111.5*** (19.49)	-116.2*** (20.18)
Colorado	-451.4*** (11.81)	-456.6*** (12.88)	-451.6*** (12.94)	-458.1*** (13.85)
Connecticut	-324.4*** (10.15)	-327.7*** (10.58)	-323.2*** (11.09)	-326.7*** (11.30)
Delaware	-300.8*** (12.69)	-299.5*** (12.41)	-303.0*** (14.54)	-301.8*** (14.08)
District of Columbia	-332.4*** (11.06)	-337.1*** (11.74)	-333.5*** (11.82)	-338.9*** (12.29)
Florida	-402.5*** (14.11)	-403.3*** (13.67)	-408.8*** (16.34)	-409.8*** (15.67)
Georgia	-279.3*** (11.50)	-282.1*** (11.95)	-285.3*** (12.62)	-288.2*** (12.98)
Hawaii	-170.2*** (12.31)	-173.8*** (13.05)	-176.6*** (14.14)	-179.8*** (14.80)
Idaho	-413.4*** (12.23)	-416.8*** (12.78)	-400.7*** (14.59)	-405.7*** (14.74)
Illinois	-280.2*** (15.75)	-285.1*** (16.88)	-271.6*** (16.51)	-277.4*** (17.58)
Indiana	-380.2*** (12.02)	-381.5*** (11.88)	-384.1*** (12.66)	-385.1*** (12.48)
Iowa	-291.1*** (12.49)	-292.7*** (12.75)	-292.3*** (13.67)	-294.1*** (13.94)
Kansas	-69.53*** (15.45)	-70.73*** (15.60)	-65.98*** (15.97)	-66.49*** (15.96)
Kentucky	-195.3*** (11.73)	-198.6*** (12.27)	-195.5*** (12.74)	-199.4*** (13.30)
Louisiana	-151.8*** (14.92)	-153.7*** (15.16)	-148.8*** (16.22)	-151.0*** (16.50)
Maine	-119.1*** (14.33)	-122.6*** (15.12)	-117.7*** (15.76)	-121.1*** (16.46)
Maryland	-170.6*** (13.02)	-175.5*** (14.16)	-165.6*** (13.77)	-171.6*** (14.81)
Massachusetts	-362.8***	-368.7***	-364.8***	-371.9***

	(10.50)	(11.62)	(11.42)	(12.39)
Michigan	-252.5*** (12.70)	-255.7*** (12.52)	-256.7*** (13.64)	-260.4*** (13.15)
Minnesota	-307.6*** (13.02)	-309.8*** (13.50)	-311.6*** (13.91)	-314.2*** (14.37)
Mississippi	-284.6*** (10.39)	-288.3*** (10.93)	-285.5*** (11.18)	-289.6*** (11.53)
Missouri	11.80 (16.19)	9.138 (16.66)	12.72 (17.86)	9.764 (18.35)
Montana	-183.2*** (12.14)	-187.4*** (12.99)	-186.3*** (13.44)	-190.9*** (14.28)
Nebraska	-152.6*** (18.62)	-156.6*** (19.21)	-141.8*** (19.37)	-146.7*** (19.92)
Nevada	-146.2*** (12.30)	-149.5*** (12.82)	-145.2*** (13.15)	-148.8*** (13.61)
New Hampshire	-437.5*** (14.21)	-438.3*** (13.74)	-437.3*** (15.24)	-438.0*** (14.64)
New Jersey	-238.1*** (10.78)	-240.8*** (11.07)	-237.7*** (11.61)	-241.0*** (11.84)
New Mexico	-325.2*** (11.54)	-326.4*** (11.25)	-333.4*** (12.62)	-334.1*** (12.21)
New York	-245.4*** (14.34)	-248.5*** (15.02)	-241.7*** (15.56)	-245.1*** (16.14)
North Carolina	-422.4*** (10.71)	-426.8*** (11.27)	-425.3*** (11.58)	-430.6*** (11.91)
North Dakota	-160.6*** (12.31)	-160.2*** (12.22)	-161.4*** (13.25)	-160.8*** (13.15)
Ohio	-101.7*** (13.13)	-106.0*** (14.00)	-97.78*** (14.35)	-102.9*** (15.18)
Oklahoma	-305.0*** (13.04)	-308.6*** (13.71)	-305.7*** (13.91)	-309.6*** (14.48)
Oregon	-83.73*** (15.85)	-85.80*** (16.21)	-83.74*** (17.55)	-85.70*** (17.92)
Pennsylvania	-339.2*** (11.99)	-341.5*** (12.39)	-334.4*** (13.02)	-337.7*** (13.33)
Rhode Island	-320.4*** (11.07)	-320.1*** (10.99)	-321.3*** (11.90)	-320.6*** (11.80)
South Carolina	-256.3*** (15.63)	-260.2*** (16.10)	-254.5*** (16.61)	-259.2*** (16.91)
South Dakota	-96.85*** (14.48)	-98.09*** (14.64)	-99.14*** (16.01)	-99.98*** (16.12)
Tennessee	8.177 (12.18)	6.542 (12.40)	9.290 (13.12)	7.353 (13.29)
Texas	-172.3*** (12.99)	-172.2*** (12.93)	-173.7*** (14.20)	-173.2*** (14.11)
Utah	-230.1*** (12.24)	-231.6*** (12.37)	-231.8*** (13.44)	-233.4*** (13.55)
Vermont	-337.5*** (14.11)	-342.6*** (15.30)	-333.9*** (15.15)	-340.1*** (16.33)
Virginia	-97.32*** (12.18)	-103.5*** (13.58)	-93.28*** (12.96)	-100.9*** (14.28)
Washington	-262.7*** (12.94)	-261.6*** (13.00)	-268.7*** (13.75)	-267.2*** (13.77)
West Virginia	-387.0*** (11.77)	-390.2*** (12.13)	-385.5*** (13.20)	-389.5*** (13.29)

Wisconsin	-145.8*** (16.21)	-148.3*** (16.78)	-142.9*** (17.60)	-146.3*** (18.20)
Wyoming	-265.4*** (11.58)	-268.2*** (12.12)	-263.6*** (12.42)	-267.2*** (12.92)
year_1998	-0.271 (5.113)	-0.0686 (5.105)	-9.123 (6.789)	-8.035 (6.669)
year_1999	-16.85*** (4.899)	-16.63*** (4.895)	-22.86*** (5.473)	-22.06*** (5.410)
year_2000	-39.93*** (5.376)	-39.56*** (5.354)	-34.53*** (6.627)	-34.73*** (6.529)
year_2001	-19.72*** (5.658)	-19.33*** (5.640)	-18.68** (5.826)	-18.43** (5.782)
year_2002	-4.180 (5.712)	-3.837 (5.691)	-7.431 (5.708)	-6.812 (5.677)
year_2003	-29.95*** (5.130)	-29.80*** (5.098)	-27.05*** (6.047)	-27.33*** (5.936)
year_2004	-30.26*** (5.633)	-30.38*** (5.593)	-18.72 (10.46)	-20.21* (10.15)
year_2005	-52.00*** (6.001)	-52.26*** (5.948)	-28.40 (17.28)	-31.30 (16.69)
year_2006	-64.80*** (6.798)	-65.54*** (6.720)	-33.68 (22.32)	-37.94 (21.56)
year_2007	-78.52*** (7.502)	-80.13*** (7.413)	-42.78 (25.10)	-48.56* (24.12)
year_2008	-62.53*** (7.322)	-64.68*** (7.267)	-15.75 (31.89)	-23.29 (30.65)
year_2009	-56.14*** (7.316)	-58.62*** (7.214)		
Constant	711.0*** (21.87)	715.4*** (22.58)	749.6*** (41.60)	749.7*** (41.14)

Robust standard errors in parentheses; *** p<0.001, ** p<0.01, * p<0.05; Real values adjusted to 2009 dollars. The reference state for the state fixed effect is Alabama. The reference year for year fixed effects is 1997.

**Figure 1. Average Number of Convenience Stores in A State
1997 - 2009**

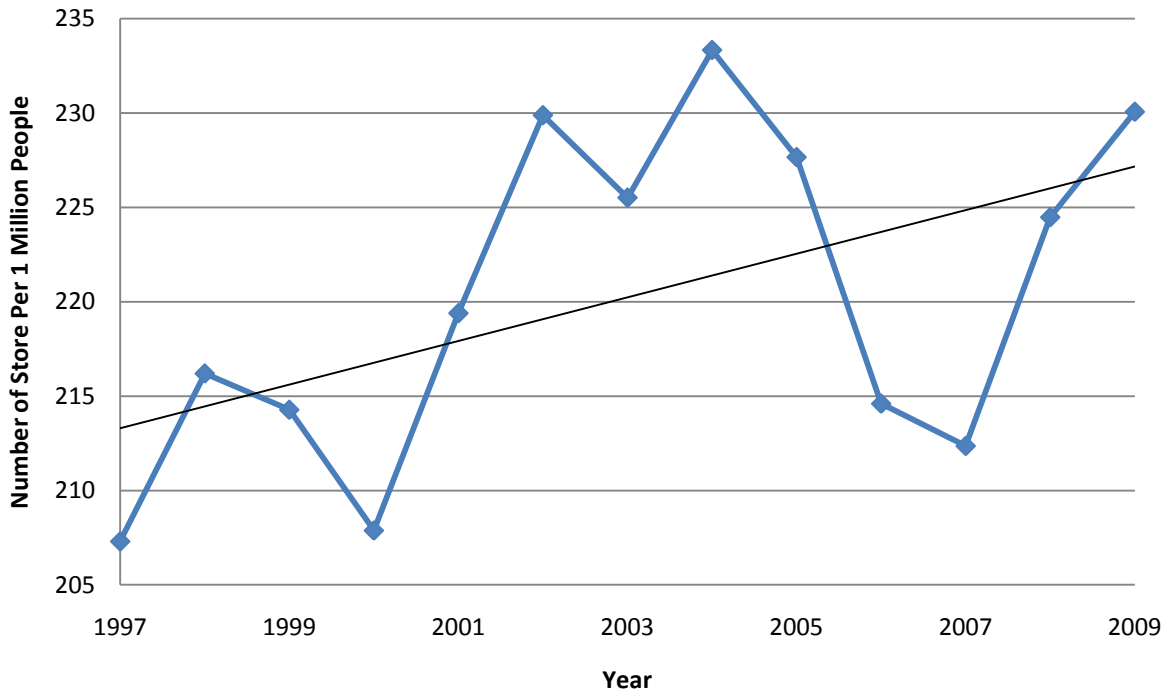


Figure 2. Average State Real Cigarette Tax Rate 1997 - 2009

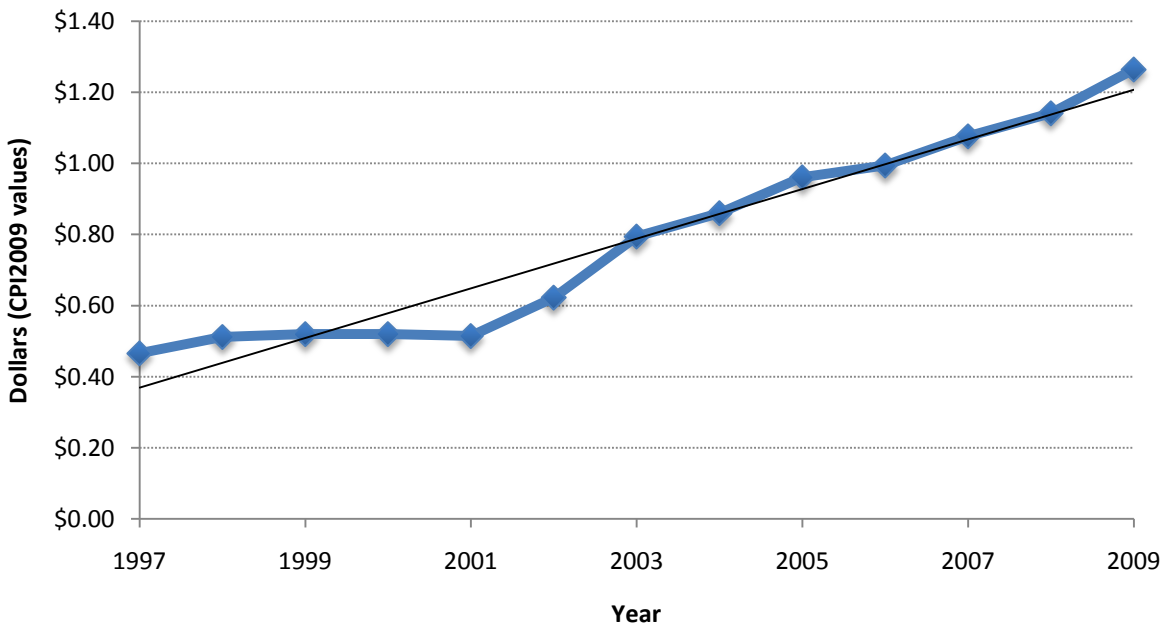


Figure 3. Average Smoke-Free Air Policy Index 1997 - 2009

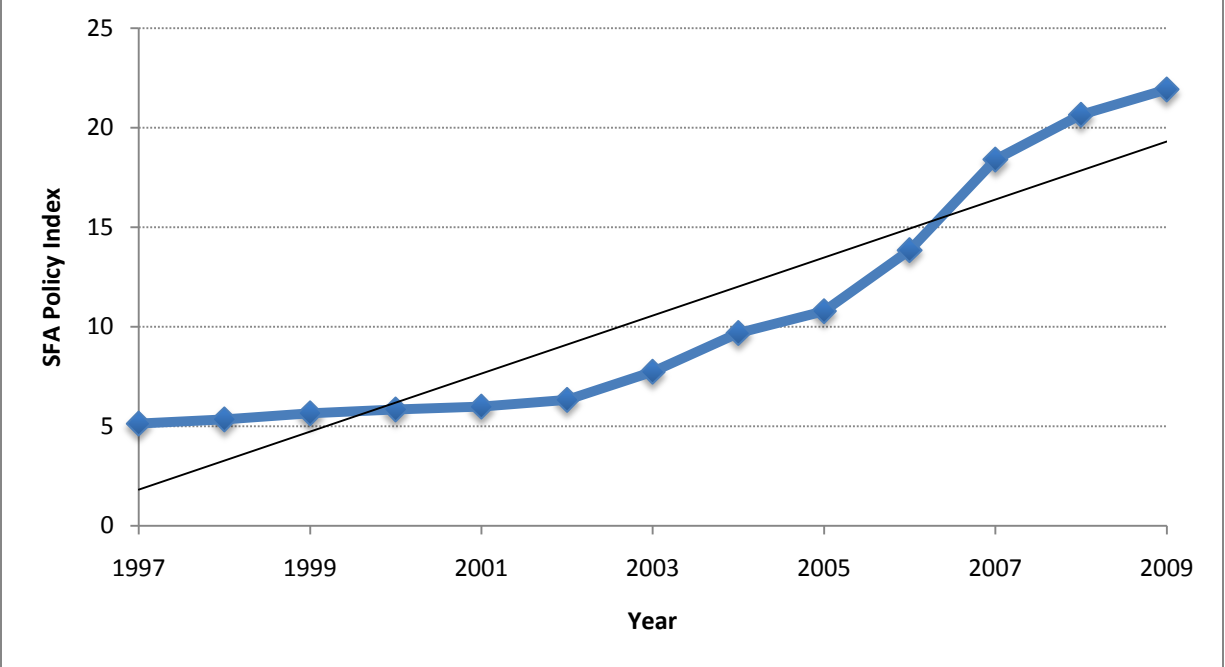
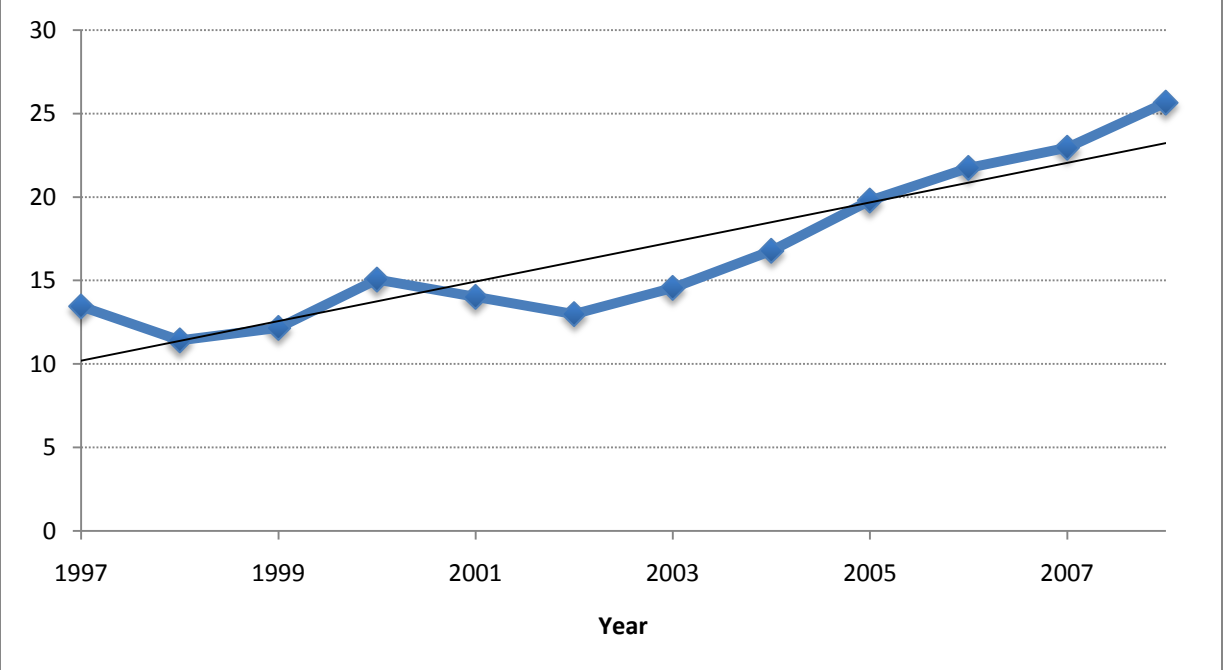


Figure 4. Average Gas Price 1997 - 2008, Dollars Per Million Btu



Appendix: Summary Statistics

Variable Name	Number of Observation	Mean	Std. Dev.	Min	Max
Convenience Stores Per Capita	663	220	81	84	441
Gas Stations Per Capita	663	259	69	102	515
Combined Gas and Convenience Stores Per Capita	663	480	124	241	801
Real Income Per Capita	663	37070	6245	25234	66268
State Unemployment	663	5	2	2	14
Real Gas Price	612	17	5	9	29
Real State Cigarette Excise Tax	663	79	59	3	318
Smoke-Free Air Policy Index	663	11	12	-9	39

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