The Effect of Cigarette Taxation on Prices: An Empirical Analysis using City-Level Data

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Abstract:

This paper uses new data collected by the author on cigarette taxation in 443 municipalities from 1990 to 2009. These data are combined with state-level price and tax information to measure the relative effects of state and local taxes on cigarette prices. The results suggest that a $1 increase in the state excise cigarette tax increases cigarette prices by $1.10 to $1.13, but that a $1 increase in city or county-level excise taxes has a significantly smaller positive effect on prices of $1.06. These findings are similar between premium and generic cigarette brands.

I. Introduction

There are currently around 500 municipalities that have cigarette excise taxes at the local level.[1] These taxes are levied on top of state and federal taxes which average $2.28 per pack. Some of the local ordinances can raise the overall tax to as much as $5.26 per pack as is the case in New York City.[2] Consumers have seen a steady increase over the past decade in these as well as state and federal cigarette excise taxes.[3] In fact, the combined tax on cigarettes has risen over 300% over this time period. Officials have cited a number of justifications for the increase in cigarette taxes such as the need to raise tax revenue (over $23 billion annually) and the deterrence of smoking.[4] Ultimately how much consumption is deterred is determined by how much price increases in the market place due to the tax. This is more commonly known in the public finance literature as the economic incidence of the tax which is the primary focus of this study.

Previous literature measuring the incidence of tobacco taxation (e.g. Hanson and Sullivan (2009), Keeler et. al. (1996), Harris (1987), Sumner (1985), Ashenfelter and Sullivan (1985)) has found a wide range of results with some studies showing taxation having no effect on prices to others going so far as to say that the price in the market place increases by roughly

[1] Tax Burden on Tobacco (2008) puts this figure at 520 while Campaign for Tobacco-Free Kids (2009) says there are over 460 local jurisdictions that have local cigarette taxes. Local level is defined as a city, town, or county excise cigarette tax.

[2] Other notables include Chicago, IL ($4.67), Evanston, IL ($4.49) and Anchorage, AK ($4.41). A list of the highest taxed cities for cigarettes in the U.S. can be viewed in Table 1.

[3] Figure 1 charts increases in average state and federal cigarette taxes from 1950 to 2009.

[4] Figure 2 displays cigarette tax revenue received by state and federal authorities from 1950 to 2009. There is a large literature on the relationship between cigarette prices and consumption. Becker et al. (1994), Evans et al. (1999), and Gruber and Koszegi (2001) are a few notables in this line of research. In addition, Chaloupka and Warner (2000) give a comprehensive review of this literature.

double the amount of the tax.[5] This study improves upon previous research in a number of ways. First and foremost, I have collected cigarette tax and price data at the city, county and state level for 443 municipalities. Therefore, this is the first study of its kind to be able to analyze how tax changes affect prices at different levels of government. The local level data also allow me to analyze border city effects resulting from the tax changes over time. In addition to the local level data, I utilize two previously unused datasets to examine state tax changes affect on prices from 1990 to 2009. This is the first study to use state variation across years as a means of identification for any dataset after 1990. One of the datasets I exploit has price information on generic as well as premium brands of cigarettes which allows me to compare the level of tax incidence between the two of them.

My results suggest that cigarette excise taxes are over-shifted to consumers in the form of higher prices at both the state and local levels of government. My estimates suggests a $1 increase in the state cigarette tax leads to anywhere from a $1.10 to $1.13 increase in the price of cigarettes. These estimates are in line with previous work done by Sullivan and Hanson (2009) and Keeler et. al. (1996). The local level results suggest that a local tax increase of $1 at

[5] Earlier studies in the 1980's report the widest range of results. Ashenfelter and Sullivan (1987) find some evidence that excise tax increases do not consistently act to increase prices. Sumner and Wohlgenant (1985) find the effect of a tax increase will result in a small increase in the price of tobacco. Probably the most widely known tax incidence study from this era is a study by Harris (1987) which analyzes the 1983 increase in the federal cigarette excise tax. Harris argues that the oligopoly response to the federal excise tax increase of $0.08 per pack is to increase prices by $0.016. He matches cost data with the actual price increase at the wholesale as well as retail level and concludes that input costs and the federal tax increase cannot explain the large increase in prices. There have only been two studies after 1990 which have analyzed the incidence of tobacco taxation. The first is by Keeler et. al. (1996). Keeler et. al. use state tax variation for the years 1960 to 1990 as a means of identification utilizing price data from the Tobacco Institute. Keeler et. al. find that a 1 cent increase in the state cigarette tax increases prices by 1.11. The second study is by Hanson and Sullivan (2009). Hanson and Sullivan use a 2008 increase in the state of Wisconsin's tobacco tax as a natural experiment to measure the economic incidence of tobacco taxation. They use a difference-in-differences identification strategy with Wisconsin retail stores as the treatment group and stores from the surrounding states as a control group. Hanson and Sullivan find that the $1 increase in the state of Wisconsin's cigarette tax increases cigarette prices by between $1.08 and $1.17.

the city or county level increases prices by $1.06. An F-test indicates that the level of local cigarette tax incidence is significantly smaller than the tax incidence results found at the state level. I find no difference in the level of tax incidence when comparing generic and premium brand cigarettes. My results suggest that state taxes instead of local taxes are a better tool to discourage consumption for policy makers if their goal is to reduce consumption through higher prices.

The remainder of the paper proceeds as follows. Section II outlines my identification strategy. Section III describes the various datasets used in my estimation strategy. Section IV presents my results. Section VI is a discussion segment. The first part of Section VI explains why the incidence of cigarette taxation is different at the local and state levels of government and the second part discusses why both local and state cigarette excise taxes are found to be over-shifted to consumers. Section VI concludes.

II. Identification Strategy

As a first means to identify the incidence of tobacco taxation I use state variation in taxes and cigarette prices in similar fashion to Keeler's (1996) study. This is the most basic of my econometric specifications as I am able to use both datasets in this estimation strategy. Both datasets have price information dating back to 1990 and I use the 157 cigarette (state level) tax changes since then to estimate the incidence of cigarette taxation. This basic model is outlined below:

(1) $P_{it} = \beta\tau_{it} + State_i + Time_t + \varepsilon_{it}$

Where, P_{it} is the price in dollars of a pack of cigarettes in year i in time period t. τ_{it} signifies the tax rate in dollars, $State_i$ is the individual state effects, $Time_t$ is the time effects from yearly dummy variables, and ε_{it} is the error term. β is the coefficient of interest in this equation. If β is equal to one, then this implies that taxes are fully shifted onto consumers in the form of higher prices by the exact amount of the tax. If β is less than one, then producers take on part of the burden of the tax and prices that consumers pay in the market place increases by less than the amount of the tax. Finally, if β is greater than one, then the price consumers pay increases by more than the amount of the tax. This is defined as over-shifting of the tax onto consumers.

The fixed effects described previously control for any unchanging characteristics of the observations over time. Also, they control for any common shocks (i.e. federal tax increase) for all of the observations. However, they do not control for any time variant factors not included in my model. For instance, if business costs (i.e. wage, energy, rental costs) increase at differential rates across areas and time and these are correlated with tax rates, then this will be picked up in the error term and bias the results in Equation 1. To account for this, I re-estimate Equation 1 with the inclusion of cost parameters.[6] In addition, I have collected tax data at the local level and combined this with price data at the local level in the ACCRA dataset. Using this combined dataset I am able to estimate the expanded model below:

[6] I use the ACCRA cost parameters in similar fashion to Besley and Rosen (1999) in their study on the incidence of sales taxes.

(2) $P_{it} = \beta_1 S\tau_{it} + \beta_2 L\tau_{it} + Costs_{it} + City_i + Time_t + \varepsilon_{it}$

Where, once again P_{it} is the price in dollars of a pack of cigarettes in year i in time period t. $S\tau_{it}$ is the state tax, $L\tau_{it}$ is the combined city and county local tax, $City_i$ is the individual city effects, $Time_t$ is the time effects from quarterly dummy variables, and ε_{it} is the error term. β_1 and β_2 are the coefficients of interest from Equation (2). The coefficient β_1 represents the effect that a one dollar increase in the state cigarette tax rate has on price. Similarly, the coefficient β_2 represents the effect that a one dollar increase in the local cigarette tax has on price. A standard F-test can be used to determine if β_1 and β_2 are statistically different from one another.

III. Data

The first dataset used in this study consists of cigarette prices taken from the American Chamber of Commerce Researchers Association (ACCRA) cost of living index. ACCRA collects quarterly price data on a number of products in various urban areas across the U.S. The prices are collected by local chambers of commerce or similar organizations that have volunteered to participate in their survey. ACCRA has price data on consumer products dating back to 1980. However, cigarette prices in excel format were only available from 1990 to 2004. Therefore, my main results are estimated using quarterly data for this time period.

My model calls for the need to control business input costs across urban areas over time. One positive aspect of the ACCRA dataset is that it allows for me to include input costs (or more accurately -- proxies of input costs) in my regressions. I include several variables from the ACCRA dataset which proxy for wage, energy, and rental costs. For wage costs, I use the average price of a home service call to fix a clothes washing machine. While not ideal, this value should be strongly correlated with wages at gas stations, grocery stores, tobacco store cashiers, etc. Other options available in the ACCRA dataset which could be used as proxies for wages include average auto maintenance repair costs and various medical costs such as optometrist, general practitioner, or average dental cleaning costs. I include the average mortgage payment for a 4 bedroom, 2 bath, 2400 square foot house as a proxy for rental costs. The only other viable option for rental costs was the total purchase price for the same type of house. Lastly, as a proxy for energy costs I include the average price for one gallon of regular unleaded gasoline. Other available variables include total home energy costs, average electrical costs for an all-electric home, and average home energy costs at current rates for natural gas, fuel oil, coal, and wood. I ultimately chose to use gasoline given its strong correlation to shipping costs by businesses.

There are a few drawbacks to this dataset. One is that some of the urban areas such as St. Louis and Kansas City cross state lines. I restrict the dataset to only include urban areas that do not cross state lines because of differing tax rates. This was also done for urban areas which crossed county lines that had varying tax rates. After these restrictions, the dataset consisted of 577 urban areas which had quarterly cigarette price data at some point over the years 1990 to 2004. Another drawback is that the survey is implemented on a volunteer basis. Thus, there

are some areas in which their chamber of commerce failed to respond resulting in gaps in prices and quarters for some of these areas. Lastly, the survey only collected price data on one type of major cigarette brand. This restricts the interpretation of the results to apply only to one brand of cigarette.

The ACCRA dataset does not include tax rates at the local level. I am unaware of any dataset that has this information. Therefore all of the local tax data had to be collected by phone conversations with city, county and state officials. I was able to collect city, county and state tax information on 443 of the 577 urban areas included in the ACCRA dataset. There were a total of 17445 observations resulting from these 443 urban areas. My dataset includes the specific amounts and dates of any tax changes for the 443 urban areas dating from January 1st, 1990 to January 1st, 2009.[7] I had to convert these rates into quarterly tax rates since all of the price information in the ACCRA dataset is at the quarterly time level. The final tax rates used in the regressions are the quarterly weighted average tax rates.

The second dataset used in this study comes from the Tax Burden on Tobacco (TBT) report produced annually by Orzechowski and Walker (2008). TBT collects cigarette price data through the use of an annual survey to retailers across the U.S. The prices are aggregated at the state level and are listed as a weighted average price per pack as of November 1st each year from 1990 to 2009.[8] The inclusion of the District of Columbia and the fifty states give the dataset a total of 969 observations over this time period. One unique aspect to the TBT dataset

[7] I should note that some of the urban areas did not keep tax records as far back as 1990. Thus, the observations in the earlier years for these areas were not able to be used in my final regressions.
[8] TBT has cigarette prices dating back to 1954, but the prices prior to 1990 do not differentiate between generic and premium cigarettes.

is that it lists two different prices – one with only premium brand prices and one dataset which include generic brand prices in its calculations. The tax rates used in conjunction with the TBT dataset were the same as those used with ACCRA except that I did not have to use a weighted average tax rate. I simply used the exact state tax rate as of November 1st of the respective year.

Summary statistics for the ACCRA, TBT, and tax data can be viewed in Tables 2 and 3. The price and tax data shown in Tables 2 and 3 are all in nominal values.[9] Probably the most striking feature between the ACCRA and TBT datasets is the difference in means for cigarette prices. The average price per pack for cigarettes in the ACCRA dataset is $2.20 while in the TBT dataset it is $3.06 for premium brands and $2.87 for generic brands. This means that the average price for cigarettes in the ACCRA dataset is a full 23% less than the lowest average price in the TBT dataset.[10]

Another interesting contrast is the difference in the average state tax rate for the observations in both datasets. The average state cigarette tax in TBT ($0.84) is almost two times the average state tax in the ACCRA dataset ($0.45). The local cigarette tax on average is only $0.01. This is most likely due to the small number of observations in the ACCRA dataset having local cigarette taxes. There were 417 (roughly 2%) out of the 17445 observations which had a tax implemented at the local level. The average local cigarette tax for these observations was $0.32 with a standard deviation of 0.51.

[9] In addition, all of the regressions in this paper were run by using nominal values for cigarette taxes and prices.
[10] A large measure of this difference disappears when I restrict the averages to only include prices from 1990 to 2004 in both datasets. This restriction gives an average price of $2.20 for ACCRA prices and $2.39 for TBT (generic) prices. This results from excluding the higher priced observations from the later years in the TBT dataset.

The differences in average cigarette prices across samples are troubling and call for some type of quality check when analyzing ACCRA and TBT data. For this I turn to paper by Young and Bieliska-Kwapisz (2002) that used ACCRA data to estimate the incidence of alcohol taxation. They assessed the quality of the ACCRA dataset by comparing alcohol prices in the Consumer Price Index (CPI) to those in ACCRA. I use a similar approach and compare the cigarette prices from the ACCRA and TBT datasets with those found in the CPI.

Cigarette prices from CPI are only available at the national level from 1998 to 2009. The ACCRA dataset I use has prices from 1990 to 2004 and the TBT dataset has prices from 1990 to 2009. I am therefore able to compare CPI data with the ACCRA and TBT datasets for the years 1998 to 2004. Over this time period CPI cigarette prices increased by 73%, TBT by 71%, and ACCRA by 96%. Figure 3 shows the changes in prices across CPI, TBT, and ACCRA from 1998 to 2004. The trend lines are very similar for all three datasets except for the slightly larger increase in the ACCRA dataset in prices from 2001 to 2002. Other than this blip, the datasets appear to be a good measure of the trends in cigarette prices over this period of time.

IV. Results

The results from Equation (1) using the TBT dataset can be viewed in Table 4. The main fixed effects results can be viewed in Columns 2 and 4. These indicate that a $1 increase in the state cigarette excise tax yields a $1.10 increase in cigarette prices. This is true for both the

generic and premium brand results, although the generic prices give a slightly higher estimate than the premium prices (1.099 compared to 1.095). The standard error of 0.037 for each of the state cigarette tax coefficients in Columns 2 and 4 indicates the $1.10 increase in price is significant at the one percent level. The nearly identical tax incidence estimates for generic and premium brands suggests that increases in taxes at the state level has similar effects on prices to both types of brands.

The addition of fixed effects causes a large change in the state cigarette tax coefficients. For instance, the coefficient increases to 2.021 from 1.095 when fixed effects are not included when analyzing premium prices. A similar increase is found (1.099 to 1.905) when generic prices are being analyzed. The R^2 is roughly 0.77 for premium prices and 0.78 for generic prices when fixed effects are not included. The R^2 increases to 0.98 when fixed effects are included for both the premium and generic results. Thus, a great deal of the variation in cigarette prices can be explained solely by looking at fixed effects and state cigarette excise taxation. The two most important results that can be taken from Table 4 is that state cigarette excise taxes are over-shifted to consumers (the price goes up by more than the tax) and the effect on prices is roughly equal to both premium and generic brands.

Table 5 presents results from Equation (2) using the ACCRA dataset. Columns 1 through 4 show the coefficient for local taxation ranging between 0.241 and 1.196 and those for state taxation between the values of 1.130 and 2.085. This can be interpreted as saying that a $1 increase in the county or city cigarette tax will increase prices anywhere between $0.24 and $1.20 and a $1 increase in state taxes will increase prices between $1.13 and $2.09. The range of results is quite broad, because of the different specifications controlling for fixed effects as well as cost controls. The most precise estimates which

include both cost controls and fixed effects indicate that a $1 increase at the local level will increase prices by $1.06 and a $1 increase at the state level will increase prices by $1.13.

Column 1 uses the most basic regression without the inclusion of cost controls or fixed effects. The coefficients for both the local as well as state tax are the largest among any of the four specifications. These coefficients are significant at the 1% level. The coefficient for local taxation is at least 11% higher than any of the other estimates in columns 2 through 4. The most prominent result from Column 1 is the large estimate from the state tax coefficient of 2.085. A strict interpretation of this coefficient means that an increase of $1 in the state tax results in more than a $2 increase in cigarette prices. The results from Column 1 should be viewed with caution given that cost controls and fixed effects are not included in this econometric specification.

Column 2 adds in cost controls, but still leaves out fixed effects for its specification. The values for the cost control parameters are not shown in Table 2. The coefficients for the cost control parameters were all positive and significant at the 5% level.[11] This is encouraging since theory would suggest that as business costs increase, a leftward shift in the supply curve should increase the price paid by consumers in the marketplace. The coefficient for local taxation is the lowest among any of the other specifications at 0.241. This value is not significant at the 10% level. The estimate of 1.256 for the state tax coefficient is more in line with Columns 3 and 4 than the estimate provided by Column 1. However, it is still over 10% higher than the estimates provided when fixed effects are included. The coefficient for state taxation is significant at the 1% level.

Columns 3 and 4 include fixed effects in their econometric specifications. Cost controls are left out of the specification used in column 3 and can account for the slight increase in the coefficients for the local and state tax variables. All of the coefficients for the local and state tax variables are significant

[11] This is true for Columns (2) and (4) in Table 5.

at the 1% level for each of the specifications that use fixed effects. The coefficients for the cost control parameters are positive and significant at the 5% level just as the other econometric specifications that used cost controls. The main results from Column 4 which include cost controls and fixed effects suggest that a local cigarette tax increase of $1 will increase cigarette prices by $1.06 and an increase in the state tax of $1 will increase prices by $1.13.

An F-test is used to examine whether the coefficients for the local and state tax variables statistically differ from each other. My results indicate that the difference in local and state tax incidence is statistically significant at the 10% level across all four specifications in Table 2. This suggests that excise taxes implemented at the local level do not have as large an effect on prices as similar taxes implemented at the state level. Therefore, state taxes instead of local taxes are a better tool to discourage consumption for policy makers if their goal is to reduce consumption through higher prices.

V. Discussion

Why does the level of tax incidence vary between state and local governments?

A likely reason for the difference in the level of tax incidence between local and state excise taxes is differential transportation costs and the issue of cross border smuggling of cigarettes.[12] The transportation costs to find a cheap substitute are quite low when a local

[12] See Baltagi and Levin (1986), Gruber, et. al. (2003), Stehr (2005), and Lovenheim (2008) for studies on cross border cigarette smuggling.

ordinance increases cigarette excise taxes. A consumer can simply drive a couple of miles outside the city limits to buy the same carton of cigarettes at a cheaper rate. However, if the state implements the tax, the consumer's transportation costs drastically increase since they now might have to drive several hours to find a cheap substitute.[13]

The relative cost of the substitute good is therefore larger when states increase cigarette excise taxes instead of cities because of these transportation costs. This causes a smaller leftward shift in the demand curve due to the substitution effect when states implement taxes in comparison to city taxes. Therefore, prices increase by a smaller amount when local level taxes are levied in comparison to states. The empirical results in this paper strongly support this theory.

Why does over-shifting occur?

In the simple case of a perfectly competitive market with constant marginal costs, a $1 tax increase will lead to full-shifting of the tax onto consumers. Thus, prices in the market place paid by consumers will go up by $1 (the exact amount as the tax). However, the cigarette industry is far from a perfectly competitive industry. There have been numerous studies detailing imperfect competition in the tobacco industry (e.g. XXXXX). It could be described as an oligopoly considering only four companies (Philip Morris, R.J. Reynolds, Loews, and British

[13] Other options for the consumer to evade high cigarette taxation include buying cigarettes over the internet, in the local black market, or through a local Indian smoke shop.

American Tobacco) control over ninety percent of the market.[14] Therefore, the possibility exists that taxes can be over-shifted since prices adjust in an imperfect market.

To model this I consider a simple version of the conjectural variations model outlined in Delipalla and Keen (1992) and Delipalla and O'Donnell (2001).[15] They state that in an industry with *n* firms, the after-tax profit earned by firm *i* is

(3) $\pi^i = [P(X) - t]x^j - c(x^j)$,

where *P* is the consumer price, *X* is the industry output, x^j is the firm's output, $c(x^j)$ is the firm's total cost of producing the given level and *t* is the excise tax per unit. The strategic interaction between firms is captured by $\frac{dX}{dx^i} = \delta^i \in [0, n]$. With δ^i = 0, conjectures are "competitive"; δ^i = 1 corresponds to Cournot conjectures and $\delta^i = n$ to tacit collusion. The first-order condition for profit maximization is given by

(4) $[P(X) + \delta^i P_x x^j] - c(x^j) - t = 0$,

with subscripts indicating derivatives. Dividing (3) by δ^i and summing over *i* yields

[14] Another interesting fact is that industry data shows that only four companies (Philip Morris, R.J. Reynolds, Loews, and British American Tobacco) control over ninety percent of the market.
Source: http://www.oligopolywatch.com/2003/08/28.html

[15] Their model includes an ad valorem tax as well. This model only considers a per unit tax on the good.

(5) $$P\left[\sum\frac{1}{\delta^i}+\frac{P_X}{P}X\right]-\sum\frac{1}{\delta^i}\,c_{x^i}-\,t\sum\frac{1}{\delta^i}=0$$

After applying the implicit function theorem to (5), the following derivative is derived

(6) $$\frac{dP}{dt}=\frac{\sum\frac{1}{\delta^i}}{[\sum\frac{1}{\delta^i}+1+A+E]}$$

Where $A=\frac{\sum\frac{1}{\delta^i}c_{x^i x^i}}{nP_X}$ and $E=-\frac{P_{XX}\,X}{P_X}$ denotes the elasticity of the slope of the inverse demand function. Under perfect competition with constant marginal costs $\frac{dP}{dt}$ = 1. Meaning that price increases by the exact amount of the tax. However, imperfect competition can cause $\frac{dP}{dt}$ to deviate from equaling one depending on the market structure and the elasticity of the slope of the inverse demand function. Therefore, in non-competitive markets such as the tobacco industry it is possible to have prices increase by more than the unit tax being implemented.

This model provides a theoretical framework predicting that excise taxes can be under or over-shifted to consumers. Empirical research has shown this to be true for a number of goods, most notably alcohol and cigarettes as shown in this paper.[16] There are several

[16] Young and Bielinska-Kwapisz (2002) and Kenkel (2005) both find excise taxes on alcohol to be over-shifted to consumers. Also, sales taxes have found to be over-shifted to consumers on some goods as shown by Poterba (1996) and Besley and Rosen (1999).

explanations as to why this occurs in the tobacco industry. One such explanation is detailed by Becker et. al. (1994). They claim that cigarette companies know in the long-run (due to higher taxes) casual or new consumers will quit or simply not start up smoking, because of the high costs. Thus, in the long-run profits will be much lower due to the loss of these consumers. To compensate for this, companies increase price by more than the tax to increase profits in the short-run on long-term smokers who are not likely to stop smoking due to the addicted nature of the product.

Another theory involves the matter of sticky prices and the use of tax changes as a coordination mechanism for retailers.[17] It is costly for retailers to routinely change prices in terms of both time and money. If costs are increasing over time (due to inflation) and retailers do not change their prices on cigarettes, the profit level made per pack will gradually decrease over time. When retailers make a price change they know it will likely stay that same price until another tax change or until they change prices on a number of goods throughout the store. Therefore, they increase the price on cigarettes by more than the amount of the tax to obtain maximum profit over this time period before the next price adjustment.

In addition, a tax increase motivates all retailers to adjust their prices at the same time since there is a universal cost increase for everyone. Prior to the change in cigarette taxation retailers were reluctant to increase prices out of fear of losing market share. The price adjustment by everyone allows retailers to not worry as much about losing market power.

[17] I thank TJ Brooks and Derek Laing for pointing this out.

Therefore, the tax increase acts a coordination mechanism for retailers to increase prices to a more profitable level (which is higher than the amount of the tax).

Finally, a simple mark-up story can possibly explain the mechanical aspects of over-shifting in the marketplace. As previously discussed cigarette taxation takes place at different levels of government. The federal tax of $1.01 is levied upon the manufacturer of cigarettes. After this tax is paid, the product is shipped to the distributers. The distributers are the ones who pay the state and local taxes. Thus, retailers do not pay any of the per unit excise tax associated with cigarettes. They are only required to submit tax payments as the result of sales taxes on the good. It is possible that distributors raise the price on cigarettes by the exact amount of the tax before they sell the product to the retailers. After the retailers receive the product, they increase their price to the consumers by marking up the price by a certain percentage (from the already adjusted cost they are paying the distributors).[18] Mechanically, this could possibly explain what is going on in the market.[19]

VI. Conclusion

[18] For example, let's say there is a state level excise tax of $1 per pack levied upon distributers and that retailers buy their cigarettes from distributors for $4 per pack. In addition, the retailers have a mark-up of 20%, so they sell their cigarettes at a price of $4.80. Now let's say the state increases their excise tax on cigarettes from $1 to $2 and now distributors sell their cigarettes to retailers for $5 per pack (notice they increase their prices by the exact amount of the tax). However since retailers mark their prices up by 20%, they now sell their cigarettes to consumers at $6 per pack. Therefore, the cigarette excise tax went up by $1, but the actual cigarette prices paid by consumers went up by $1.20.

[19] I currently have no data at the manufacturer or distributor level to test this theory. However, personal correspondence with store owners does imply that this is how many retail outlets mark up their products and in fact describe price changes seen with respect to recent cigarette tax changes.

Theoretical models predict that over-shifting of taxation can take place in the presence of imperfect markets. However, there has been very little empirical evidence to support this theory (especially in the tobacco literature). The few empirical studies analyzing the incidence of cigarette taxation have found a wide range of results with some studies showing taxation having no effect on prices to others going so far as to say that the price in the market place increases by roughly double the amount of the tax.

I add to this literature by collecting new data on cigarette taxation in 443 municipalities from 1990 to 2009. These data are combined with state-level price and tax information to measure the relative effects of state and local taxes on cigarette prices. Therefore, given this unique dataset, this is the first study of its kind to be able to analyze how tax changes affect prices at different levels of government. In addition, this is also the first study to use state variation in prices and taxes across years as a means of identification for any dataset after 1990.

My results suggest that a $1 increase in the state excise cigarette tax increases cigarette prices by $1.10 to $1.13, but that a $1 increase in city or county-level excise taxes has a significantly smaller positive effect on prices of $1.06. The state level results are in similar magnitude to those found in Keeler et. al. (1996) and Hanson and Sullivan (2009). I find no difference in the level of tax incidence between premium and generic cigarette brands. My main results suggest that state taxes instead of local taxes are a better tool to discourage consumption for policy makers if their goal is to reduce consumption through higher prices.

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Table 1: Highest Taxed Cities for Cigarettes

	Local Rate	State Rate	Combined Tax Rate
1. New York City, NY	$1.50	$2.75	$4.25
2. Chicago, IL	$2.68	$0.98	$3.66
3. Evanston, IL	$2.50	$0.98	$3.48
4. Cities in the State of Rhode Island	$0.00	$3.46	$3.46
5. Anchorage, AK	$1.40	$2.00	$3.40
6. Cicero, IL	$2.16	$0.98	$3.14
7. Rosemont, IL	$2.05	$0.98	$3.03
8. Barrow, AK	$1.00	$2.00	$3.00
9. Matanuska-Susitna, AK	$1.00	$2.00	$3.00
10. Sitka, AK	$1.00	$2.00	$3.00
11. Cities in Cook County, IL	$2.00	$0.98	$2.98
12. Cities in the State of New York	$0.00	$2.75	$2.75
13. Cities in the State of New Jersey	$0.00	$2.70	$2.70
14. Cities in the State of Hawaii	$0.00	$2.60	$2.60
15. Cities in the State of Wisconsin	$0.00	$2.52	$2.52
16. Cities in the State of Massachusetts	$0.00	$2.51	$2.51
17. Washington D.C.	$2.50	$0.00	$2.50
18. Juneau, AK	$0.30	$2.00	$2.30
19. Cities in the State of Vermont	$0.00	$2.24	$2.24
20. Fairbanks, AK	$0.20	$2.00	$2.00

Source: Campaign for Tobacco-Free Kids

Table 2: Summary Statistics for TBT (1990 to 2009)

	Premium Brands		Generic Brands	
	State Cigarette Tax	Cigarette Price	State Cigarette Tax	Cigarette Price
Observations	969	969	969	969
Mean	$0.84	$3.06	$0.84	$2.87
Standard Deviation	0.54	1.24	0.54	1.16
Minimum	$0.18	$1.28	$0.18	$1.21
Maximum	$3.14	$7.11	$3.14	$6.73

Table 3: Summary Statistics for ACCRA (1990 to 2009)

	State Cigarette Tax	Local Cigarette Tax	Cigarette Price
Observations	22597	17445	16694
Mean	$0.45	$0.01	$2.20
Standard Deviation	0.42	0.09	0.86
Minimum	$0.02	$0.00	$0.22
Maximum	$2.75	$1.50	$7.02

Summary Statistics for Cigarette Price is from 1990 to 2004 since the ACCRA dataset did not have price data after the 4th quarter of 2003.

Table 4: Effects of Cigarette Taxes on Price using TBT Data

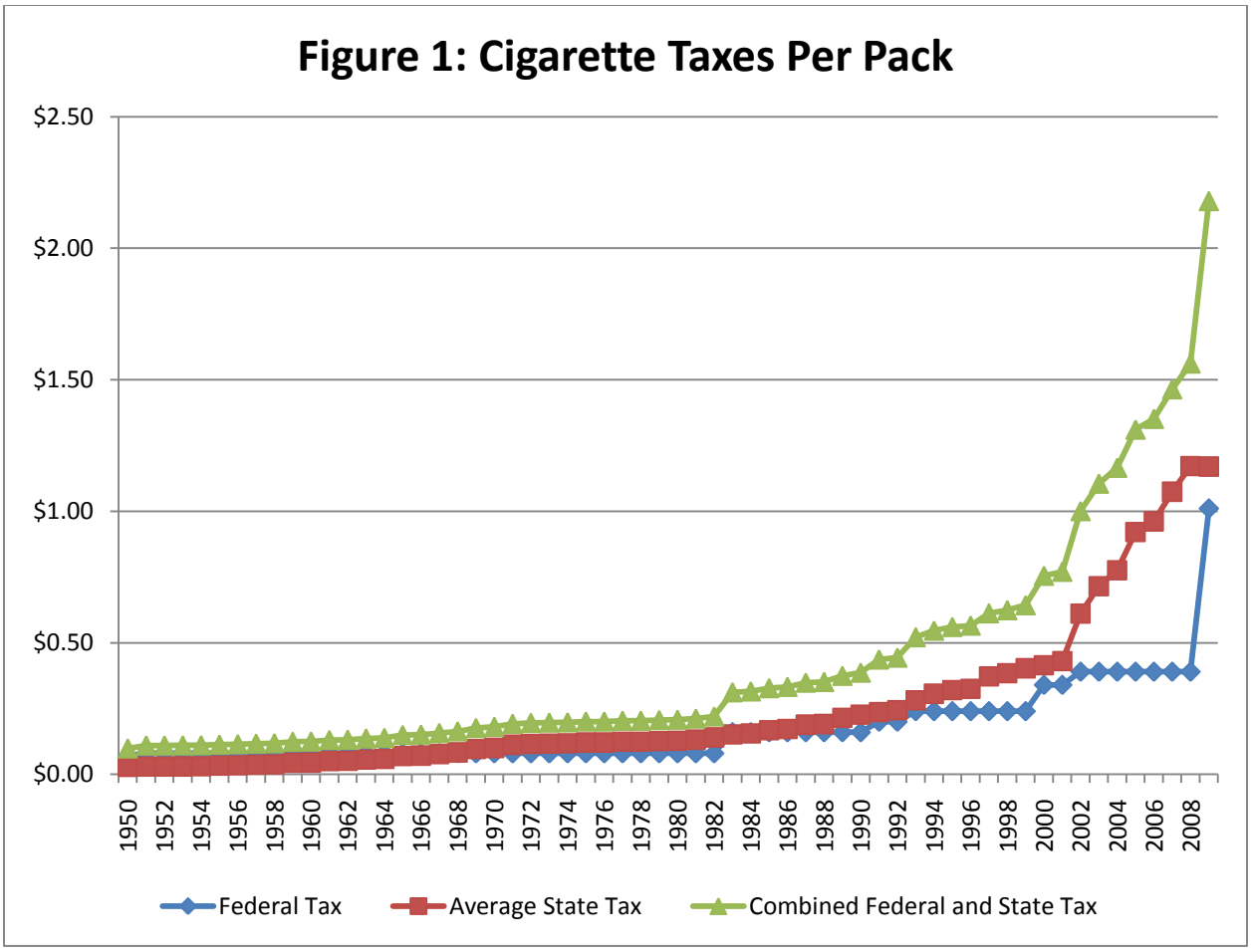
	Premium		Generic	
	(1)	(2)	(3)	(4)
State Cigarette Tax	2.021	1.095	1.905	1.099
	(0.036)***	(0.037)***	(0.031)***	(0.037)***
State and Time Fixed Effects?	no	yes	no	yes
Number of Observations	969	969	969	969
R^2	0.7685	0.9836	0.7843	0.9820

*** Indicates statistically significant at 1% level, ** at 5% level, * at 10% level. All equations include a constant term, but its coefficient is not reported. All 50 states as well as Washington D.C. included in regressions. Standard errors using robust standard errors with clustering at the state level are reported in parentheses.

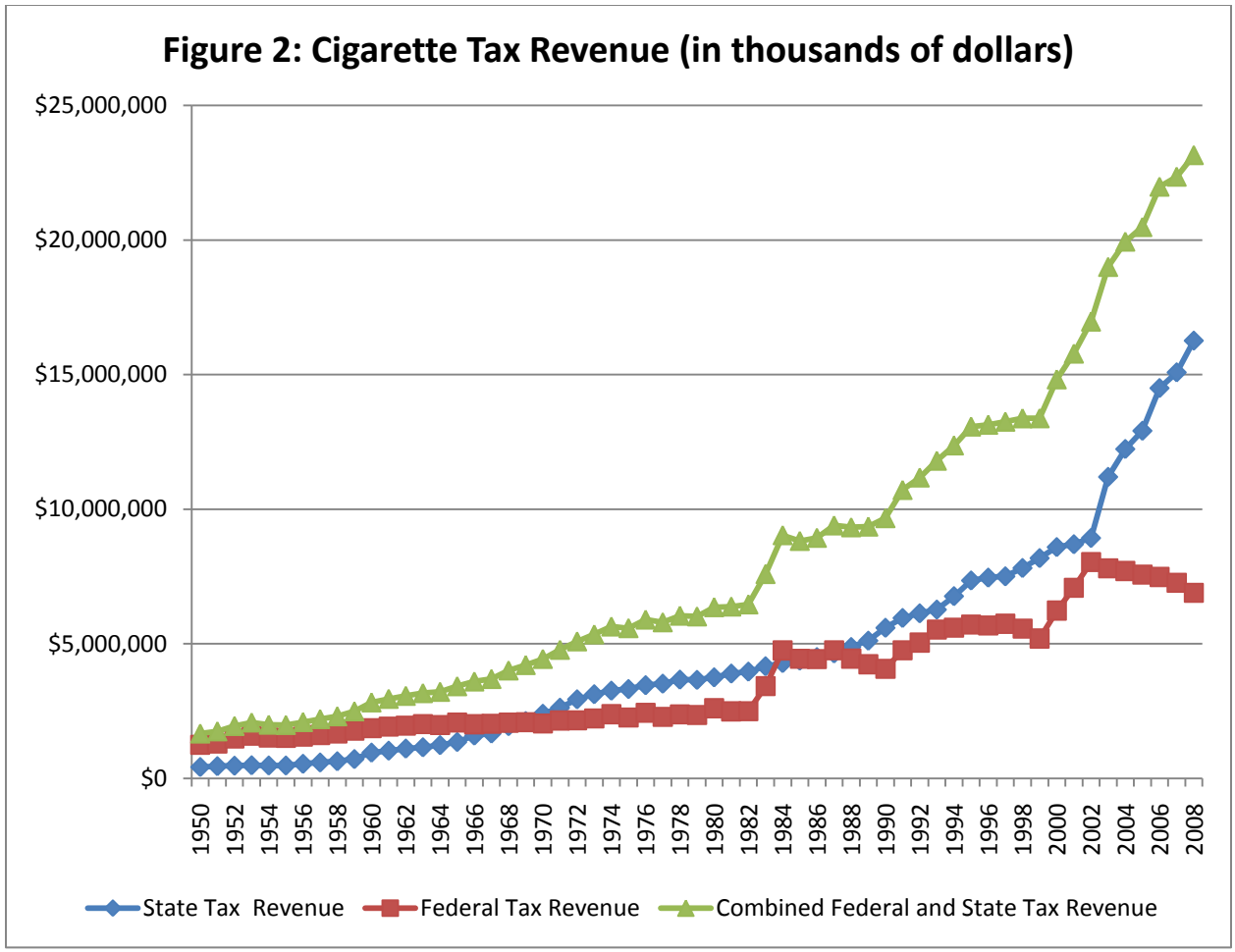
Table 5: Effects of Cigarette Taxes on Price using ACCRA Data

	(1)	(2)	(3)	(4)
Local Cigarette Tax	1.196	0.241	1.077	1.058
	(0.095)***	(0.245)	(0.017)***	(0.016)***
State Cigarette Tax	2.085	1.256	1.137	1.130
	(0.052)***	(0.051)***	(0.028)***	(0.028)***
Cost Controls?	no	yes	no	yes
Area and Time Fixed Effects?	no	no	yes	yes
Number of Areas	443	443	443	443
Number of Observations	12860	12860	12860	12860
R^2	0.3744	0.6685	0.9749	0.9763

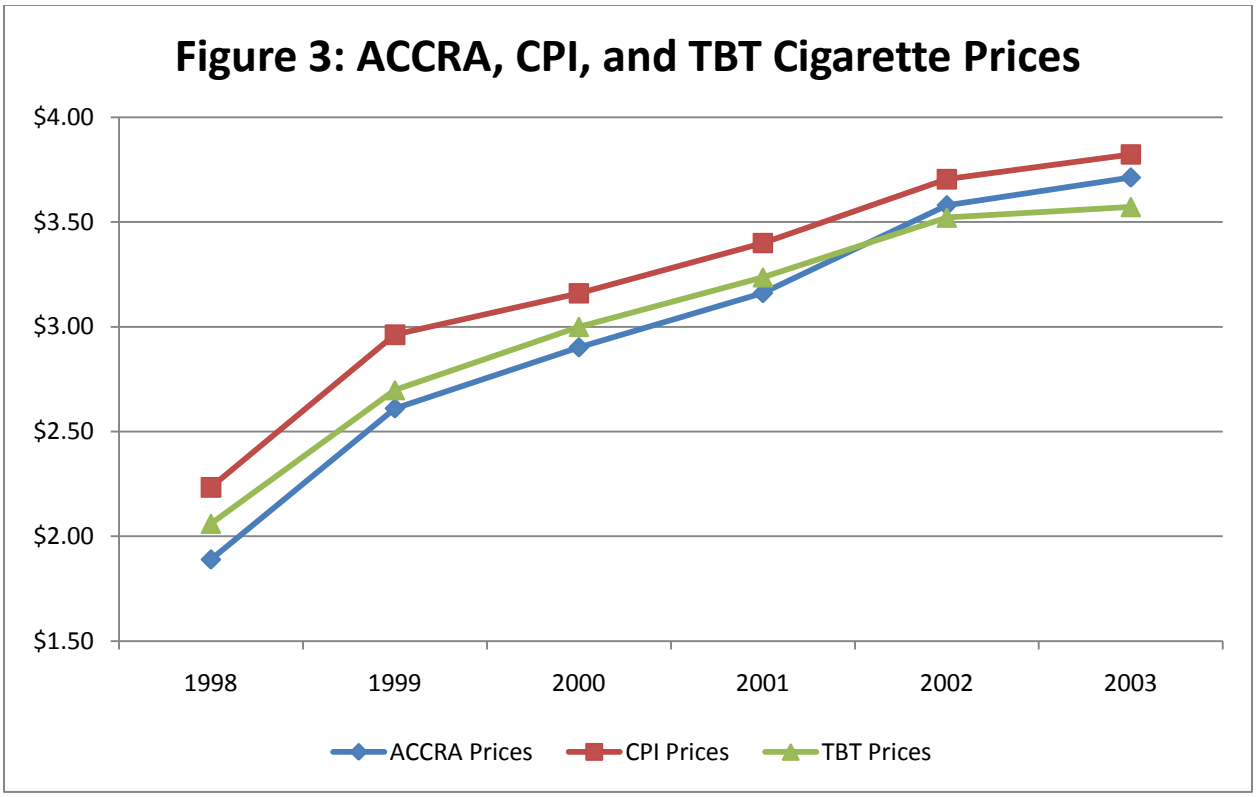
*** Indicates statistically significant at 1% level, ** at 5% level, * at 10% level.
All equations include a constant term, but its coefficient is not reported. Standard errors using robust standard errors with clustering on urban areas are reported in parentheses.



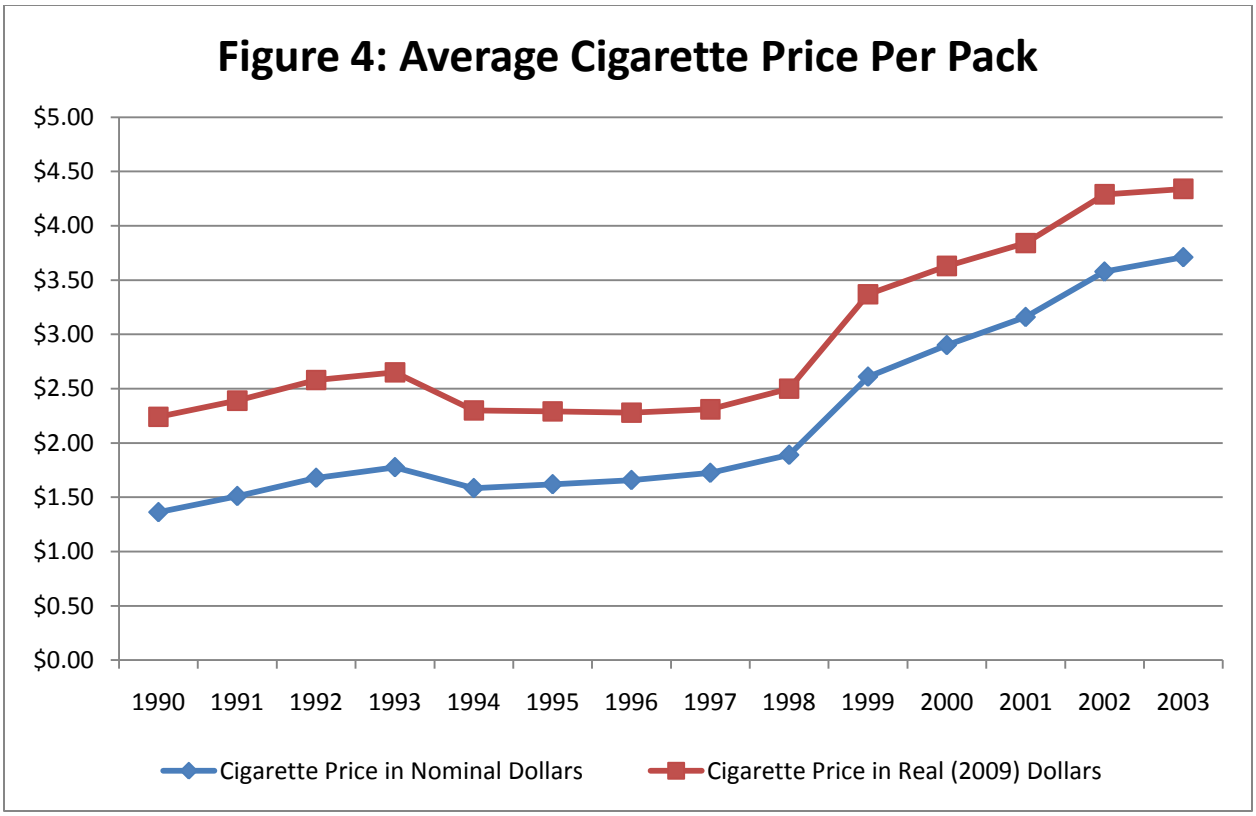
Source: Tax Burden on Tobacco 2008



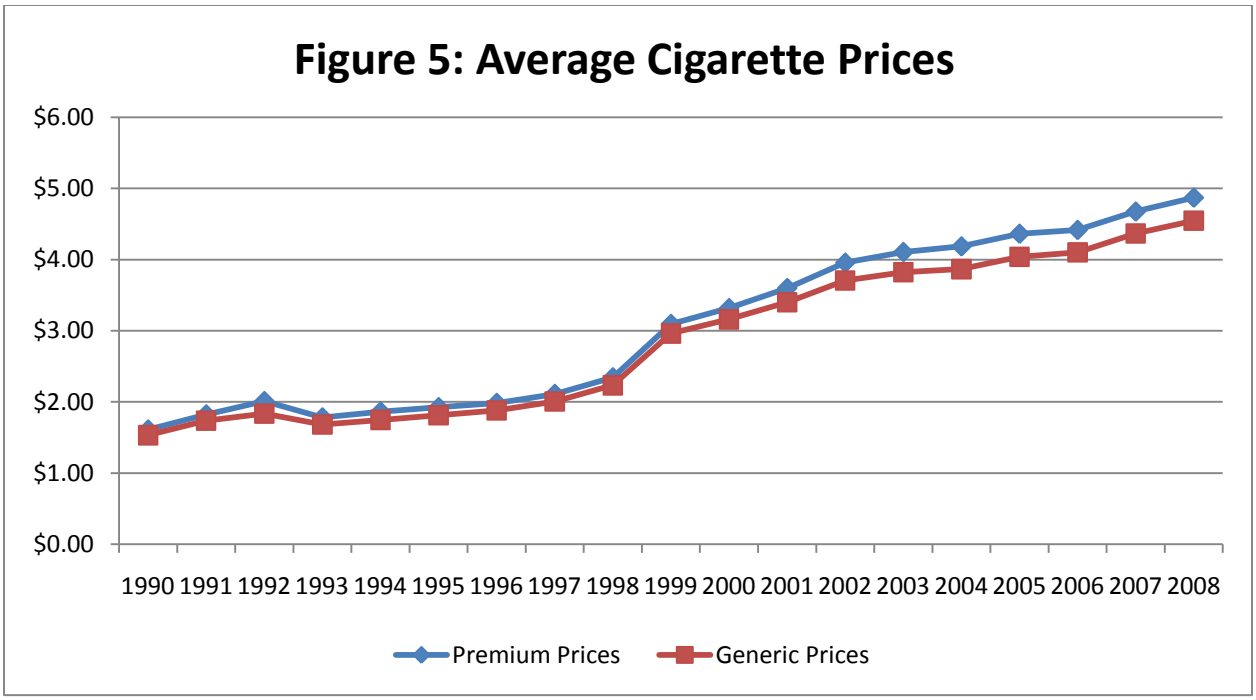
Source: Tax Burden on Tobacco 2008



CPI starting price is the average of TBT and ACCRA prices. TBT includes both generic and premium brand prices.



Note: This is average prices for cigarettes in the ACCRA dataset from January 1st, 1990 to December 31st, 2003. Consumer Price Index was used to calculate cigarette prices in 2009 dollars.



Note: These are average cigarette prices in the Tax Burden on Tobacco dataset.