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

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Abstract

This paper combines new, author-collected tax data with data both from the American Chamber of Commerce Researchers Association (ACCRA) cost of living index (COLI) and from the Tax Burden on Tobacco (TBT) to measure the relative effects of city, county and state excise cigarette taxation on cigarette prices. The results indicate that a $1 increase in the state excise cigarette tax increases cigarette prices between $1.10 and $1.14, but that a $1 increase in a city or county-level excise tax increases prices by $1.07. These findings are similar between premium and generic cigarette brands. Additionally, urban areas located near states with lower cigarette taxes tend to have lower cigarette prices relative to urban areas located near states with the same or higher tax rates.

Keywords: Tax Incidence, Cigarettes, Excise Taxes, Taxation, Over-shifting

JEL Classification Numbers: H22, H32, H71

1. Introduction

Approximately 500 municipalities currently have cigarette excise taxes at the local level.[1] Municipalities levy these taxes in addition to state and federal taxes, which combine to average \$2.46 per pack.[2] As described in Table 1, the degree of taxation for cigarettes can be substantial. Some local ordinances put forth overall excise taxes of over \$4.00 per pack, with New York City the highest at \$6.86. Figure 1 reveals that consumers have witnessed a steady increase over the past decade in cigarette excise taxes. Between 2000 and 2010, the combined excise tax rate on cigarettes has risen over 150% in real dollars. Officials cite a number of justifications for the increase in cigarette excise taxes, such as the need to raise tax revenue (over \$32 billion annually) and the deterrence of smoking.[3] Ultimately, the economic burden of these taxes must fall on consumers, producers, or some combination of the two.

Previous literature analyzing the incidence of cigarette taxation has generated a wide range of results. Ashenfelter and Sullivan (1987) find that excise tax increases do not consistently lead to increased cigarette prices. The results of Sumner and Ward (1981), Harding, Leibtag, and Lovenheim (2010) and Chiou and Muehlegger (2010) indicate that prices are under-shifted to consumers, i.e. prices do not go up by the full amount of the cigarette tax. DeCicca, Kenkel, and Liu (2010) generally find that taxes are fully shifted to consumers, i.e. prices go up by the exact amount of the tax, although some of their estimates point to under-shifting. Sumner and Wolgenant (1985) also find that taxes are fully shifted to consumers. On the other hand, Barzel (1976), Johnson (1978), Coats (1995), Keeler et al. (1996), and Hanson and Sullivan (2009) find evidence of over-shifting, i.e. prices to consumers go up by more than the amount of the cigarette tax. Harris (1987) has the highest estimates, his results showing price increases of roughly double the amount of the tax. Delipalla and O'Donnell's (2001) study with crosscountry data finds mixed results, with some countries showing evidence of over-shifting and others indicating that cigarette taxes are under-shifted.[4]

This study combines new, author-collected tax data from 443 municipalities and local-level cigarette price data from the American Chamber of Commerce Researchers Association (ACCRA) cost of living index (COLI) to examine the effects of city, county and state excise cigarette taxation on cigarette prices. Given the unique aspects of this data, it may be the first study capable of measuring these effects across all three levels of government. The local-level data also allow for an analysis of border area effects using Geographic Information Systems (GIS) software. In addition to the local-level data, we utilize the Tax Burden on Tobacco (TBT) dataset to analyze state tax changes and their effect on cigarette prices from 1990 to 2010. This dataset has price information on generic as well as on premium brands of cigarettes, which allows for a comparison of tax incidence estimates between brands.

Our empirical results indicate that cigarette excise taxes are over-shifted (the price of cigarettes increases by more than the tax) to consumers at both the state and the local levels of government. The estimates demonstrate that a $1 rise in the state cigarette tax increases the price of cigarettes between $1.10 and $1.14 per pack. The local-level results suggest that a local tax increase of $1 at the city or county level increases prices by $1.07. We find no significant difference in the level of tax incidence when comparing generic and premium brand cigarettes. In terms of variation in prices across geography, our results indicate that cigarette prices significantly decrease for localities within the proximity of lower-taxed jurisdictions.

The paper proceeds as follows. Section 2 presents a theoretical framework of tax incidence that permits over-shifting. Section 3 outlines the identification strategy for estimation. Section 4 describes the datasets. Section 5 presents the results. Section 6 concludes the study.

2. A Theoretical Framework for Over-shifting

A standard result in tax incidence is that in the usual static model under perfect competition, over-shifting cannot occur. However, studies have provided theoretical models that allow for over-shifting under imperfect competition. The framework we present revisits Musgrave (1959) and Bishop (1968). It works within a conventional static model of firm behavior under monopolistic competition. Other theoretical frameworks that permit over-shifting include Harberger (1962), Taubman (1965), Barzel (1976), Delipalla and Keen (1992), Becker, Grossman, and Murphy (1994), Delipalla and O'Donnell (2001), and Anderson, de Palma, and Kreider (2001).

Consider the representative firm. It faces a market demand function for the good that it produces and sells, given by:

$$Q = D(P, X_D), \quad D_P < 0, \tag{1}$$

where Q is output, P is the price of the good including all taxes, and X_D is a vector of exogenous demand variables. Theory typically does not place a restriction on the sign of $D_{PP} = \partial D_P/\partial P$, the concavity of the demand equation. It becomes clear, though, that the possibility of over-shifting centers on this term.

The firm has a cost function given by $C(Q, X_C)$, with C_Q, $C_{QQ} > 0$, and X_C denoting a vector of exogenous cost variables. It also has to pay the tax τ for each unit of output sold. The firm maximizes profits, π, given by

$$\pi = PQ - C(Q, X_C) - \tau Q, \tag{2}$$

subject to the demand function (1). With λ denoting the Lagrange multiplier for the constraint and $\lambda > 0$, the firm chooses P, Q, and λ. Performing the optimization and assuming interior solutions results in the following first order conditions:

$$Q + \lambda D_P = 0, \tag{3}$$

$$P - C_Q - \tau - \lambda = 0, \tag{4}$$

and the constraint (1).

To examine tax incidence, we focus on the term $\partial P/\partial\tau$. Taking the total differential of the system (1), (3), and (4), applying comparative static analysis, and substituting for λ in the answer using (3) yields:

$$\frac{\partial P}{\partial \tau} = \frac{D_P^2}{-QD_{PP} + D_P^2(2 - D_P C_{QQ})}. \tag{5}$$

A priori, we expect that $\partial P/\partial\tau > 0$, i.e. the firm passes on at least some of the tax to the final price of the good. A review of (5), though, reveals that the condition does not hold unambiguously. Rather the denominator must have positive sign, as expressed by

$$(D_P^2 / Q)(2 - D_P C_{QQ}) > D_{PP}. \tag{6}$$

The above condition holds without ambiguity under demand functions that are either linear ($D_{PP} = 0$) or concave ($D_{PP} < 0$) in the price level. However, given a convex demand function ($D_{PP} > 0$) a restriction needs to be placed on the magnitude of D_{PP} for (6) to hold. We assume that this restriction applies.

The next step is to investigate over-shifting, or when $\partial P/\partial \tau > 1$. Substituting for $\partial P/\partial \tau$ from (5) into this inequality and performing some algebraic rearrangement gives us:

$$D_{PP} > (D_P^2 / Q)(1 - D_P C_{QQ}). \tag{7}$$

Based upon (7), over-shifting cannot occur if the demand function is either linear or concave in the price level. But with a convex demand equation, over-shifting may take place. Moreover, given restrictions on the magnitude of D_{PP} that do not appear to be implausible, the conditions (6) and (7) can be satisfied simultaneously.

To further examine when over-shifting may occur, we express the over-shifting condition in a slightly different way. Let $e = -(P/Q)D_P$ denote the price elasticity of demand for the firm's good. Using this equation to substitute for D_P in (7) yields

$$D_{PP} > (e^2 Q / P^2)[1 + (eQ / P)C_{QQ}]. \tag{8}$$

Given a convex demand function, over-shifting would be more likely to occur for price inelastic goods. And from a graphical perspective, over-shifting lends itself to profit maximizing choices with a flat marginal cost curve, a small level of output, and a correspondingly high price.

Two additional points bear mentioning. First, the convex demand function associated with over-shifting arguably has empirical relevance. For example, consider the constant price elasticity specification given by $D(P, X_D) = f(X_D)P^{-\beta}$, with β a parameter having positive sign and $f(.)$ a positive-valued function. In this case, $D_{PP} = \beta\,(\beta + 1)\, f(X_D)P^{-(\beta + 2)}$, which unambiguously has positive sign.

Second, imperfect competition appears to play a critical role in establishing a theoretical basis for over-shifting. To illustrate this point within our example, we can easily adapt the above model to examine tax incidence under perfect competition. Then the relevant system consists of the demand function (1) and the first order condition for output choice under unconstrained profit maximization of (2). Comparative static analysis results in $\partial P/\partial\tau = 1/(1 - D_P C_{QQ})$, implying that $0 < \partial P/\partial\tau < 1$. This finding gives the familiar result that over-shifting cannot take place under perfect competition.

3. Identification Strategy

To examine the incidence of cigarette taxation we first use state variation in taxes and cigarette prices across time, which is analogous to previous studies in the tax incidence literature (Coats 1995, Keeler et al. 1996, Poterba 1996, Besley and Rosen 1999, Young and Bielinska-Kwapisz 2002, Alm, Sennoga, and Skidmore 2009, and DeCicca, Kenkel, and Liu 2010). This econometric specification uses yearly cigarette tax and price information from the TBT as its main data source. The TBT has state-level tax and price information dating from November 1, 1990 to November 1, 2010. Our study uses the 175 cigarette state-level cigarette excise tax changes during that time period to estimate the incidence of cigarette taxation. The model appears below:

$$P_{it} = \beta S\tau_{it} + State_i + Time_t + \varepsilon_{it}\ , \tag{9}$$

where P_{it} is the price in real dollars of a pack of cigarettes in state i in year t (including all taxes), $S\tau_{it}$ signifies the state cigarette tax rate in real dollars, $State_i$ is the individual state effects, $Time_t$ is the time effects from yearly dummy variables and ε_{it} is a white noise error term. The parameter β is the coefficient of interest in this equation. If β equals one, then the tax burden fully shifts 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 tax burden and the prices that consumers pay in the marketplace increase 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; the tax incidence literature defines this behavior as over-shifting.

The fixed effects in (9) control for both unchanging characteristics in the observations over time and for common shocks (e.g. a federal tax increase). Fixed effects, however, do not control for any time variant factors, such as business costs (i.e. wage, energy, rental costs). If business costs are in fact correlated with tax rates and cigarette prices, then excluding these variables may bias the results from (9). To account for this behavior, equation (10) adjusts (9) to include cost variables.[5]

Equation (10) focuses on the effects of both state and local taxes on cigarette prices. It also includes cost variables. As described in the next section, data to estimate this equation come from the ACCRA dataset along with city and county level tax data collected by the authors.

The equation appears below:

$$P_{it} = \beta_1 S\tau_{it} + \beta_2 L\tau_{it} + Costs_{it} + UrbanArea_i + Time_t + \varepsilon_{it}, \qquad (10)$$

where P_{it} is the price of a pack of cigarettes in urban area i in time period t (including all taxes), $S\tau_{it}$ is the state cigarette tax, and $L\tau_{it}$ is the combined city and county local cigarette tax, all in real dollars. The quarterly dummy variables $UrbanArea_i$ and $Time_t$ measure the individual urban area effects and time effects; $Costs_{it}$ includes wage, energy, and rental cost variables in real dollars; and ε_{it} is a white noise error term. The coefficients β_1 and β_2 are the parameters of interest from (10). The coefficient β_1 represents the effect of a one-dollar increase in the state cigarette tax rate on price, while β_2 represents the effect of a one-dollar increase in the local cigarette tax on price.

The inclusion of local level data arguably represents an important extension of previous research on tax incidence, which has used only state level data. For instance, many tax increases at the local and state level take place during similar time periods. If New York City and New York State simultaneously increase their tax rates, for example, then failure to include local tax rates might bias upwards any estimate of the state tax rate's effect on cigarette prices.[6]

4. Data

We use two datasets to analyze the incidence of cigarette taxation. The first comes from Orzechowski and Walker (2010), which annually produce the TBT report. TBT collects cigarette price data through the use of an annual survey to retailers across the United States. The TBT, which includes information on both generic and premium brands, aggregates prices at the state level and lists them as a weighted average of the price per pack on November 1 of each year from 1990 to 2010. The TBT lists the state tax rates for the same time period. The dataset includes information on the District of Columbia and all fifty states, a total of 1,071 observations. We convert all prices and tax rates from the TBT into November 2010 dollars.[7]

The bottom of Table 2 shows summary statistics for the TBT dataset from 1990 to 2010. The average price for a pack of premium brand cigarettes is $4.01 with a standard deviation of 1.29. The maximum price for a pack of premium brand cigarettes is $10.06 and the minimum is $2.09. The average state cigarette excise tax from 1990 to 2010 is $0.73 per pack, with a standard deviation of 0.61. Generic brands of cigarettes sell for slightly less than premium brands, at an average of $3.76 per pack with a standard deviation of 1.22. Generic brand packs of cigarettes have a maximum price of $9.65 with a minimum price of $1.97.

The degree of cigarette price variation across geography, as shown in Figure 2, is substantial. The majority of states with the highest prices are located in the Northeastern part of the United States. The five states with the highest prices are New York ($10.06), Hawaii ($8.92), Rhode Island ($8.18), Washington ($7.99), and Connecticut ($7.94). The state with the lowest prices is Missouri, with packs of cigarettes selling for only $4.51 on average. Likewise, the five states with the highest state taxes on cigarettes are New York ($4.35), Rhode Island ($3.46), Washington ($3.03), Hawaii ($3.00), and Connecticut ($3.00). Missouri has the lowest state cigarette tax in the United States at $0.17 per pack.[8]

The second dataset consists of cigarette prices taken from ACCRA. ACCRA reports quarterly price data on a number of consumer products in various urban areas across the United States. Local chambers of commerce or similar organizations collect price data on a volunteer basis. ACCRA has price data dating back to 1980. However, since quarterly data on cigarette prices in Excel format are only available from 1990 to 2004, this serves as the sample period for the estimated models with ACCRA data. AACRA lists all of the cigarette prices by carton. As there are generally ten packs of cigarettes in a typical carton, we divide all the ACCRA prices by ten to reflect the price of a single pack of cigarettes. All cigarette prices are converted into November 2010 dollars.

The ACCRA dataset has a few drawbacks. One downside is that some of the urban areas, such as St. Louis and Kansas City, cross state lines. Given the complexity in assigning tax rates, we restrict the dataset to include only urban areas within one state.[9] The dataset consists of 608 urban areas, which have quarterly cigarette price data at some point between 1990 and 2004. The ACCRA dataset contains two types of urban areas – city urban areas such as St. Louis and Kansas City and county urban areas such as Worcester County, MD and York County, PA. The vast majority of urban areas (543 or 89.3 percent) are categorized as city urban areas. The remaining (65 or 10.7 percent) urban areas are categorized as county urban areas. We include both types of urban areas in our analysis. The fact that the ACCRA dataset relies on volunteers is another issue. The chamber of commerce in some areas periodically fails to respond to the survey, which leads to gaps in quarterly prices. Lastly, the survey only collects price data on one major cigarette brand, which limits the interpretation and application of the results.

The ACCRA dataset does not include cigarette tax rates at the local level and no dataset in existence appears to include this information. Therefore, we collect all local tax data from phone and email correspondence with city, county, and state officials. City, county and state tax information is available for 443 of the 608 urban areas included in the ACCRA dataset. A total of 12,860 observations have all the cigarette price and tax information across the 443 areas. The author-collected dataset includes the specific amounts and dates of any tax changes for the 443 urban areas dating from January 1, 1990 to January 1, 2009.

Since the ACCRA dataset only has cigarette price data from January 1, 1990 to January 1, 2004, this interval serves as the sample period for estimation. We convert local-level tax rates into quarterly weighted average tax rates, to be consistent in measurement to the ACCRA dataset. All taxes and prices are in November 2010 dollars.

Table 3 lists the summary statistics for cigarette prices and taxes based on the data from the ACCRA dataset and the author-collected local level tax data. State cigarette taxes in the ACCRA dataset average $0.45 per pack, with a standard deviation of 0.30. The maximum state excise cigarette tax is $1.82 per pack and the minimum is $0.03.[10] For the entire sample, local taxes average roughly half a cent, with a standard deviation of 0.06. For those observations having a positive local tax value, the average local cigarette tax is $0.20, with a standard deviation of 0.36.[11] The maximum local cigarette excise tax is $1.81 per pack and the minimum is $0.00.[12] Prices for cigarettes average $3.00 per pack, with a standard deviation of 0.87. The maximum price per pack in the ACCRA dataset is $8.32 and the minimum is $1.52.

Probably the most striking feature between the ACCRA and TBT datasets is the difference in means for cigarette prices. The average price per pack of premium brand cigarettes in the TBT dataset is roughly one-third more ($4.01 vs. $3.00) than cigarettes in the ACCRA dataset. The variation in sample periods may partially explain the difference in average prices between the two datasets. The ACCRA dataset covers cigarette prices from 1990 to 2004 and the TBT dataset covers prices from 1990 to 2010. Restricting the TBT dataset to the 1990 to 2004 time period, as shown at the top of Table 2, decreases the average price for a pack of premium cigarettes to $3.50. The TBT dataset's higher average prices, as compared to other cigarette price data, are not surprising, as other studies (e.g. Decicca, Kenkel, and Liu 2010, 7-8) have documented the phenomenon. Possible explanations stem from the fact that the TBT does not include volume discounts for carton purchases, other price discounts, or coupons; additionally, it is possible that their sample is not representative of retailers.

The difference in average state tax rates represents another interesting contrast between the two datasets. The average state tax rate in the TBT dataset is 62 percent higher than the average state tax rate in the ACCRA dataset ($0.73 vs. $0.45). Once again, restricting the TBT dataset to the time period from 1990 to 2004 lowers the average state tax rate to $0.54.

Given the fact that the ACCRA dataset is at the local level, we can analyze how geography plays a role in determining prices. Google Earth software provides the geographic center (latitude and longitude coordinates) for every city and county observation in the ACCRA dataset. Arcmap GIS software geo-codes the coordinates to obtain precise location data for all 443 urban areas in the ACCRA dataset. Figure 3 contains the visual locations for each observation in the ACCRA dataset.

We employ Arcmap GIS software to calculate the straight-line distance in miles to the nearest state border for every observation, which means it can categorize every observation in terms of whether it is a border location.[13] The border location categories include: within one mile, five miles, ten miles, and twenty-five miles of the nearest state border. Table 4 shows the summary statistics for the distance measures. We exclude observations located in Hawaii and Alaska since they do not border any other states. This brings the total number of observations with distance measures to 12,788 in comparison to 12,860 in the original ACCRA dataset.

In the overall sample, the average distance to the nearest state border is 61.90 miles, with a standard deviation of 64.45. The furthest distance to a state border is 378.38 miles and the shortest distance is 0.11 miles. As observations get closer to their state borders, the data show a general decrease in cigarette prices. Those observations within one mile of the nearest state border have the lowest average cigarette prices at $2.86 per pack in comparison to the $2.99 average for the overall dataset. As observations get closer to their state borders, local taxes tend to increase. Observations within one mile of their state border average almost 14 times ($0.041) the amount of local cigarette taxes as in the overall dataset ($0.003).

The dataset also enables us to determine which of the observations are located next to a lower-taxed jurisdiction in comparison to their own. Here we define a lower-taxed jurisdiction as one with a lower state cigarette excise tax in comparison to the combined local and state cigarette excise tax of the adjacent urban area. The majority of the observations are not situated near lower-taxed jurisdictions. For instance, there are a total of 1,819 (or 43 percent) observations located near a lower-taxed jurisdiction within twenty-five miles of their state border. This compares to 83 (or 2 percent) observations located near a neighboring state with the same tax rate and 2,311 (or 55 percent) observations situated near a higher-taxed state in the within twenty-five mile category. Similar trends occur in the within ten miles, five miles, and one mile categories.

Equation (10) identifies the need to control for business input costs across urban areas over time. The ACCRA dataset enables us to include proxies of input costs in their estimated models. For wage costs, we use the average price of a home service call to repair a clothes washing machine. We proxy rental costs with the average mortgage payment for a four-bedroom, two-bath, 2,400-square-foot house. For energy costs, we use the average price for one gallon of regular unleaded gasoline. All business cost data are converted into November 2010 dollars. These are the same cost variables from the ACCRA dataset employed by Besley and

Rosen (1999) in their study on the incidence of sales taxes. As a robustness check, we performed estimations using a number of different combinations of alternative cost variables with little change in results.

5. Estimates of Cigarette Tax Incidence

5.1 Tax Incidence Results

Table 5 depicts the results from equation (9), which uses the TBT dataset. Columns two and four show the main results with fixed effects. These results indicate that a \$1 increase in the state cigarette excise tax yields roughly a \$1.10 increase in cigarette prices; this is true for both generic and premium brands. The t-statistics of 32.93 and 34.68, which appear in parentheses for the state cigarette tax coefficient, test the hypothesis $H_o: \beta = 0$ versus $H_1: \beta \neq 0$. Both t-statistics indicate that the coefficient is significantly different from zero at the one percent level for both types of brands. In addition, we test for over-shifting based upon the null hypothesis $H_o: \beta = 1$ versus $H_1: \beta > 1$; t-statistics for this test are reported in square brackets. The t-statistics of 2.91 and 3.10 indicate that the state tax coefficients are greater than one at the one percent level of significance. This is a strong signal that over-shifting occurs in the market for cigarettes. The nearly identical tax incidence estimates for generic and premium brands suggests that increases in cigarette excise taxes at the state level have similar effects on prices from both types of brands.

The addition of fixed effects causes a large change in the state cigarette tax coefficient. For prices of premium cigarettes the coefficient decreases from 1.776 to 1.097 when fixed effects are included. We find a similar decrease (1.701 to 1.098) when analyzing prices of generic cigarettes. The R^2 is roughly 0.69 for premium prices and 0.71 for generic prices when the study excludes fixed effects, increasing to 0.99 when the study includes fixed effects for both premium and generic brands. Thus, fixed effects and state cigarette excise taxation explain a non-trivial amount of variation in cigarette prices based upon the TBT data. The two most important results shown in Table 5 are that state cigarette excise taxation is over-shifted onto consumers and the price effect is roughly equal for both premium and generic brands.

Table 6 presents results from Equation (10) using the ACCRA dataset and the local level tax data. Columns one through three do not include local taxation as an explanatory variable. The estimates for the coefficient for state taxation range from 1.136 to 1.660, with all of the coefficients significantly greater than one at the one percent level. Inclusion of fixed effects reduces the state cigarette tax coefficient by roughly 31 percent. The most precise estimate, which includes cost controls and fixed effects in column three, indicates that a $1 increase in the state cigarette tax rate will increase prices by $1.14.

Columns four through six show the regression results when the analysis includes both state and local tax data. The coefficients for local taxation range between 1.067 and 1.369; those for state taxation range between 1.104 and 1.624. This means that a $1 increase in the county or city cigarette tax rate will increase prices between $1.07 and $1.37 and a $1 increase in state taxes will increase prices between $1.10 and $1.62. The range of results is quite broad across the different specifications. The most precise estimates, which include both cost controls and fixed effects, indicate a $1 increase at the state level will raise prices by $1.10, but that a $1 increase at the local level will only raise prices by $1.07. All the local and state tax coefficients are significantly greater than one at the one percent level.

A direct comparison of the results from the ACCRA and TBT datasets can be done by looking at column two in Tables 5 and 6. The ACCRA results here do not include the cost and local tax variables. Interestingly the results from the TBT dataset suggest a $1 increase in the state cigarette tax will raise prices by $1.10, while the same increase leads to an estimated $1.14 rise in prices as shown in the ACCRA results. It appears that the data source has more of an effect on the size of the coefficients than the level of the data, or controlling for cost factors.

The point estimates from columns four through six in Table 6 provide some evidence that local taxation has a smaller effect on prices in comparison to state-level cigarette taxes. The size of the difference between these estimates, however, is somewhat unclear; an F-test indicates no statistically meaningful difference between coefficients.

If state taxes do in fact increase cigarette prices more than local taxes, then a possible explanation is differential transportation costs and cross border smuggling of cigarettes.[14] The transportation costs to find a cheap substitute may be quite low when a local ordinance increases cigarette excise taxes. A consumer can simply drive just outside the city or county limits to buy the same pack of cigarettes at a cheaper rate. If the state implements the tax, however, the consumer's transportation costs drastically increase, since they now have to drive a greater distance to find a cheaper substitute.[15]

The relative cost of substitute goods, therefore, depends on which level of government implements the tax. Higher levels of government taxation, such as state taxes in comparison to local-level taxes, will cause smaller substitution effects. Unless consumers live near the state border, it is difficult for them to avoid state-level cigarette taxes given high transportation costs. The difference in transportation costs allows retailers to increase their prices by a higher amount if the state implements the tax, than when a city or a county implements the same tax. Our empirical results in this paper lend some support for this theory.

Notably, the inclusion of local taxes in the regressions reduces the point estimates for the state tax rate coefficients. Including local tax data reduces the coefficient for the state tax rate in every specification, except for those specifications that do not include cost controls and fixed effects. The main specifications, which include cost controls and fixed effects, show the state tax coefficient reduced from 1.136 in column three to 1.104 in column six. This result suggests the possibility that studies using only state-level data will generate biased estimates if they do not include local-level tax data as well.

5.2 Differences in Cigarette Prices across Geography

As previously stated, the level of tax incidence may depend on the level of government implementing the tax. Also of note is that geography may account for cigarette price variation. Urban areas located near lower-taxed jurisdictions might see downward pressure on their prices, since a low-priced substitute good is available to consumers just across the border. To test for the possibility of price differences across geography, the study uses the following equation:

$$P_{it} = \beta_1 S\tau_{it} + \beta_2 L\tau_{it} + \beta_3 LowerTaxBorder + Costs_{it} + UrbanArea_i + Time_t + \varepsilon_{it}, \qquad (11)$$

where, as in equation (10), P_{it} is the price in real dollars of a pack of cigarettes in urban area i in time period t; $S\tau_{it}$ is the state cigarette tax in real dollars; $L\tau_{it}$ is the combined city and county cigarette tax in real dollars; $UrbanArea_i$ is the individual urban area effects; $Time_t$ is the time effects from quarterly dummy variables; $Costs_{it}$ consist of wage, energy, and rental cost variables in real dollars; and ε_{it} is a white noise error term. The variable *LowerTaxBorder* equals one if urban area *i* is located within one mile of a lower-tax state border, zero otherwise. Correspondingly, we analyze other distance measures (five, ten and twenty-five miles) to observe if there are differences in cigarette prices across geography. Table 7 shows the results for each separate regression by distance.

The results from Table 7, with respect to cigarette tax incidence estimates, are similar in magnitude to those in Table 6. The results show a $1 increase in the local cigarette tax rate raises prices by approximately $1.07 and a $1 increase in state taxes raises prices by roughly $1.10. All the estimated models include cost controls as well as area and time fixed effects. As for the distance measures, columns one through four show a pattern of decreasing cigarette price as locations get closer to lower-taxed jurisdictions.

The findings in column four shows virtually no difference in cigarette prices for urban areas located within twenty-five miles of a lower-taxed jurisdiction, as compared to urban areas located within twenty-five miles of same or higher-taxed jurisdictions. The difference in cigarette prices across geography, however, becomes more apparent when narrowing the distance measures to within ten, five, and one mile of lower-taxed jurisdictions. The point estimates from columns two and three show urban areas located within five or ten miles of a lower-taxed jurisdiction price their packs of cigarettes lower by roughly $0.03. The estimates, however, are imprecise; none of the distance coefficients are significantly different from zero at the ten percent level in columns two and three. Urban areas within one mile of a lower-taxed jurisdiction (column one) exhibit the strongest effect on prices. Urban areas located within one mile of a lower-taxed jurisdiction price their packs of cigarettes lower by roughly $0.08.[16] This estimate is significantly different from zero at the five percent level.

The results provide evidence that downward pressure on prices occurs for those locations near lower-taxed jurisdictions. Lower prices can cause higher consumption rates and an overall lower tax burden for those individuals located near lower-taxed jurisdictions. Government officials can use various techniques, such as harsher punishment for smugglers and tax rate coordination across jurisdictions, to correct this problem in the future.

5.3 Over-shifting

The empirical findings predominantly point to over-shifting in the market of cigarettes. Beyond the theoretical models from the literature, several other explanations may account for this behavior, especially within small retail outlets that sell cigarettes.

One possibility of why over-shifting occurs involves sticky prices and the use of tax changes as a coordination mechanism.[17] Routinely changing prices is costly, in terms of both time and money, to retailers. If costs increase over time and retailers do not change their prices on cigarettes, then the profit level made per pack will gradually decrease over time. When retailers make a price change, they know it will likely remain the same price until another cigarette tax change or until they alter prices on a number of goods throughout the store. Retailers may therefore increase the price on cigarettes by more than the amount of the tax to maintain profits before the next price adjustment.

Additionally, a tax increase motivates all retailers to simultaneously adjust their prices since there is a universal cost increase for everyone. Prior to the change in cigarette taxation, retailers might be reluctant to increase prices for fear of losing market share. The universal price adjustment, however, decreases retailers' fears of losing market power. The tax increase, therefore, acts a coordination mechanism for retailers to increase cigarette prices to a more profitable level (which is higher than the amount of the tax).

Alternatively, a simple mark-up story may explain the mechanical aspects of over-shifting in the marketplace, especially as it operates within different levels of government taxation. Suppose that the Federal government levies a tax per pack on cigarette manufacturers. After manufacturers pay this tax, they ship the product to the distributers. The distributers then pay the state and local excise taxes. Thus, retailers do not pay any of the per-unit excise tax associated with cigarettes; local- or state-level governments only require retailers to submit tax payments as the result of sales taxes on the good.

If the state or local government implements a cigarette excise tax increase, then distributors may increase the price of the product they sell to retailers by the exact amount of the tax. After retailers pay the increased price of the product that they receive from the distributors, they increase the shelf price of their cigarettes by the exact amount of the excise tax. When retailers add the sales tax onto the new shelf price, however, the overall price increases by more than the excise tax.[18]

6. Conclusion

This study combines new author-collected data and data from both ACCRA and TBT to measure the relative effects of city, county and state excise taxation on cigarette prices. Our dataset also allows for an analysis of border effects using GIS software. The TBT data allows us to examine possible differences in cigarette tax incidence estimates between premium and generic brands.

The findings uniformly indicate that over-shifting occurs due to taxation at all levels of government. They indicate that a $1 increase in the state excise cigarette tax increases cigarette prices between $1.10 and $1.14, but a $1 increase in a city or county-level excise tax increases prices by $1.07. We find no significant difference in the level of tax incidence between premium and generic cigarette brands. Additionally, we provide some evidence that urban areas located near jurisdictions with lower cigarette taxes tend to have significantly lower prices in comparison to those areas near same or higher-taxed jurisdictions.

Our tax incidence estimates compare favorably with those from a number of previous studies (e.g. Barzel 1976, Johnson 1978, Coats 1995, Keeler et al. 1996) that have used variation in taxation and prices across states and time as a means to identify the incidence of cigarette taxation. The point estimates from Barzel (1976), Johnson (1978), Coats (1995), and Keeler et al. (1996) indicate that a $1 state tax increase results in a price increase of $1.07, $1.10, $1.02, and $1.11 for each of the respective studies – all consistent with our results. Hanson and Sullivan (2009), using a difference-in-differences identification strategy, finds that a $1 state tax increases cigarette prices between $1.08 and $1.17 – once again, in line with our estimates.

On the other hand, our results differ the most from Sumner and Ward (1981), Ashenfelter and Sullivan (1987), Harding, Leibtag, and Lovenheim (2010), and Chiou and Muehlegger (2010), as their findings indicate that under-shifting takes place in the market for cigarettes. Differences may stem from control variables, data sources, sample periods, estimation strategies, or other factors. Sumner and Ward (1981) use a first-differencing identification strategy with state level price and tax data from 1954 to 1976 from the Tobacco Tax Council. Ashenfelter and Sullivan (1987) use TBT data from 1955 to 1982 and their identification strategy includes the use of nonparametric tests. Harding, Leibtag, and Lovenheim (2010) use Nielsen Homescan data from 2006 to 2007, along with state level cigarette tax variation across time. They include household demographic characteristics in their model as well as a variable accounting for the difference between a home state tax and the closest lower-tax state's tax. Chiou and Muehlegger (2010) use data from a local supermarket chain in the Chicago metropolitan area between 1989 and 1996. They implement a first-differencing approach as their identification strategy.

Our results strongly indicate that cigarette taxes at both the local and state level are over-shifted onto consumers with some evidence that state-level excise taxes increase cigarette prices more than local taxes. Additionally, findings from the geo-coded data indicate that cigarette prices vary by geography, particularly in those areas located near states with a lower cigarette excise tax. Thus, differences in geographic location and the level of government that implements cigarette taxes can lead to variations in prices for consumers. These variations, along with the findings taken as a whole, carry important implications regarding consumption levels, the overall level of tax burden between consumers and business, and the ability of government at different levels to collect revenue from the taxation of cigarettes.

Endnotes

*We thank without implication two anonymous referees and the editor, James Alm, for a number of beneficial comments on a previous draft. We also thank TJ Brooks, Morris Coats, Andrew Hanson, William Horrace, Jeffrey Kubik, Derek Laing, Fritz Laux, Bob McNab, Christopher Rohlfs, and seminar participants at Syracuse University and the National Tax Association's Annual Conference for helpful comments as well as Kathleen Bradley for editing assistance.

[1]Orzechowski and Walker (2010) estimate this figure at 520, while Campaign for Tobacco-Free Kids (2011) indicates that over 460 local jurisdictions have local cigarette taxes. In this study, we define local level as a city, town, or county excise cigarette tax.

[2] The average state excise cigarette tax rate is $1.45 and the federal excise tax on cigarettes is $1.01 per pack as of November 1, 2010 (Orzechowski and Walker 2010).

[3]The revenue estimate comes from Orzechowski and Walker (2010). There is a large literature on the relationship between cigarette prices and consumption, with a comprehensive review found in Chaloupka and Warner (2000).

[4]Evidence of over-shifting has been found with other goods as well. Young and Bielinska-Kwapisz (2002) and Kenkel (2005) find excise taxes on alcohol to be over-shifted to consumers. The results of Poterba (1996) and Besley and Rosen (1999) also point to over-shifting in sales taxes on some goods.

[5]Demand variables may be important as well (e.g. income, education, unemployment, population, etc.), but local level data for these variables are at best highly difficult to obtain.

[6]On the other hand, our estimated models may not have accounted for all the time-varying factors at the state or local level that are correlated with cigarette tax changes and prices. For example, public willingness to accept a cigarette tax change may be a function of changing attitudes toward smoking.

[7]All real prices in this study are converted by using the Consumer Price Index – All Urban Consumers (CPI-U) as measured by the U.S. Department of Labor, Bureau of Labor Statistics.

[8]The appendix contains more detailed information on combined state and local tax rates as well as average cigarette prices by state.

[9]We exclude nine urban areas from the analysis due to complications in assigning tax rates across state lines. They were Allentown-Bethlehem-Easton PA-NJ Metro, Augusta-Richmond-County GA-SC Metro, Davenport-Moline-Rock Island IA-IL Metro, Fargo-ND-MN Metro, Kansas City MO-KS Metro, Kingsport-Bristol TN-VA Metro, St. Louis MO-IL Metro, Texarkana TX-AR Metro, and Winchester VA-WV Metro. Similarly, we exclude urban areas that cross county lines where the counties have varying tax rates and those counties with different tax rates between cities inside their borders.

[10]During the fourth quarter of 2002, the cities of Fitchburg and Boston in Massachusetts had the highest state cigarette excise tax rate of $1.824 in the ACCRA dataset. During the second quarter of 1991, twelve urban areas in the state of North Carolina had the lowest state cigarette excise tax rate of $0.032. They are Eden, Gastonia, Charlotte, Marion, Winston-Salem, Burlington, Greensboro, Hickory, Rocky Mount, Chapel Hill, Fayetteville, and Greenville.

[11]In the sample, 270 out of the 12860 observations have positive local level tax. Because of the small percentage of observations with this property, the estimates of local level tax incidence may be less than completely reliable. Despite this limitation, our empirical results in the next

section appear to produce at least reasonably precise estimates of the effect of local cigarette taxes on cigarette prices. In this way, it can provide useful information to local governments that may be considering the implementation of an excise tax on cigarettes.

[12]Manhattan and Queens, NY have the highest local cigarette tax rate in the ACCRA dataset.

[13]We tried to calculate road distance instead of straight-line distance, but ran into several issues when using MapQuest and Arcmap GIS. MapQuest will only calculate the road distance to a specific address or urban area and we are trying to find the distance to the border. We are also unaware about how to calculate road distance by using Arcmap GIS. We believe that straight-line distance serves as a reasonable proxy for road distance. Similar issues arose when trying to use the population center of urban areas instead of their geographic center.

[14]See Baltagi and Levin (1986), Gruber, Sen, and Stabile (2003), Stehr (2005), Chiou and Muehlegger (2008), Lovenheim (2008), Goolesbee, Lovenheim, and Slemrod (2010), and Merriman (2010) for studies on cross border cigarette smuggling.

[15]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 Native American smoke shop.

[16]There are a total of 12 urban areas located inside one mile of their state's border. They are Ashland, KY, Covington, KY, Cumberland, MD, Dubuque, IA, Grand Forks, ND, Huntington, WV, La Crosse, WI, Moorhead, MN, Manhattan, NY, Owensboro, KY, Paducah, KY, and Vicksburg, MS. We obtain similar results from estimations that exclude these observations.

[17]We thank TJ Brooks and Derek Laing for providing these insights.

[18]Personal correspondence with storeowners, however, suggests that many retail outlets mark up their products and describe price changes seen with respect to recent cigarette tax changes.

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Table 1: Highest Taxed Cities for Cigarettes[a]

	Local Tax	State Tax	Federal Tax	Combined Tax Rate
1. New York City, NY	$1.50	$4.35	$1.01	$6.86
2. Cities in the State of New York	$0.00	$4.35	$1.01	$5.36
3. Chicago, IL	$2.68	$0.98	$1.01	$4.67
4. Evanston, IL	$2.50	$0.98	$1.01	$4.49
5. Cities in the State of Rhode Island	$0.00	$3.46	$1.01	$4.47
6. Anchorage, AK	$1.45	$2.00	$1.01	$4.46
7. Cicero, IL	$2.16	$0.98	$1.01	$4.15
8. Rosemont, IL	$2.05	$0.98	$1.01	$4.04
9. Cities in the State of Washington	$0.00	$3.03	$1.01	$4.04
10. Barrow, AK	$1.00	$2.00	$1.01	$4.01
11. Matanuska-Susitna Borough, AK	$1.00	$2.00	$1.01	$4.01
12. Sitka, AK	$1.00	$2.00	$1.01	$4.01
13. Juneau, AK	$1.00	$2.00	$1.01	$4.01
14. Cities in the State of Connecticut	$0.00	$3.00	$1.01	$4.01
15. Cities in the State of Hawaii	$0.00	$3.00	$1.01	$4.01
16. Cities in Cook County, IL	$2.00	$0.98	$1.01	$3.99
17. Cities in the State of New Jersey	$0.00	$2.70	$1.01	$3.71
18. Cities in the State of Wisconsin	$0.00	$2.52	$1.01	$3.53
19. Cities in the State of Massachusetts	$0.00	$2.51	$1.01	$3.52
20. Washington D.C.	$2.50	$0.00	$1.01	$3.51

[a]Source: Campaign for Tobacco-Free Kids (2011). Taxes are as of July 1, 2010.

Table 2: Summary Statistics for TBT Data[a]

	Observations	Mean	Standard Deviation	Minimum	Maximum
1990 to 2004:					
Premium Brands					
State Cigarette Tax	765	\$0.54	0.39	\$0.03	\$2.82
Cigarette Price	765	\$3.50	0.98	\$2.09	\$7.15
Generic Brands					
State Cigarette Tax	765	\$0.54	0.39	\$0.03	\$2.82
Cigarette Price	765	\$3.30	0.92	\$1.97	\$6.86
1990 to 2010:					
Premium Brands					
State Cigarette Tax	1071	\$0.73	0.61	\$0.03	\$4.35
Cigarette Price	1071	\$4.01	1.29	\$2.09	\$10.06
Generic Brands					
State Cigarette Tax	1071	\$0.73	0.61	\$0.03	\$4.35
Cigarette Price	1071	\$3.76	1.22	\$1.97	\$9.65

[a]All prices are in November 2010 dollars.

Table 3: Summary Statistics for ACCRA and Local Level Tax Data (1990 to 2004)[a]

	Observations	Mean	Standard Deviation	Minimum	Maximum
State Cigarette Tax	12860	$0.45	0.30	$0.03	$1.82
Local Cigarette Tax	12860	$0.004	0.06	$0.00	$1.81
Cigarette Price	12860	$3.00	0.87	$1.52	$8.32

[a]All taxes and prices are in November 2010 dollars. Summary statistics include urban areas in all 50 states.

Table 4: Summary Statistics for ACCRA and Local Level Tax Data Including Distance Measures (1990 to 2004)[a]

	Within 1 Mile of the State Border	Within 5 Miles of the State Border	Within 10 Miles Of the State Border	Within 25 Miles of the State Border	More than 25 Miles from the State Border	Overall
Average Price	$2.86	$2.91	$2.91	$2.92	$3.03	$2.99
Standard Deviation for Price	1.036	0.911	0.937	0.872	0.862	0.867
Average State Cigarette Tax	$0.404	$0.424	$0.422	$0.417	$0.465	$0.449
Standard Deviation for State Cigarette Tax	0.382	0.332	0.350	0.319	0.291	0.301
Average Local Cigarette Tax	$0.041	$0.011	$0.012	$0.007	$0.001	$0.003
Standard Deviation for Local Cigarette Tax	0.245	0.129	0.139	0.096	0.012	0.056
Average Distance in Miles	0.73	2.24	4.31	11.46	86.68	61.90
Standard Deviation for Distance	0.18	1.37	2.90	7.59	65.60	64.45
Maximum Distance	0.89	4.57	9.95	24.11	378.38	378.38
Minimum Distance	0.11	0.11	0.11	0.11	25.19	0.11
Number of observations located near another state with a lower tax rate	89	458	715	1819	NA	NA
Number of observations located near another state with the same tax rate	2	2	19	83	NA	NA
Number of observations located near another state with a higher tax rate	223	703	1235	2311	NA	NA
Total Number of Observations	314	1163	1969	4213	8575	12788

[a]Distance is measured as the straight line distance in miles to the nearest state border according to ArcMap GIS software. Cities in Alaska and Hawaii are excluded. All taxes and prices are in November 2010 dollars.

Table 5: Effect of Cigarette Taxes on Price Using TBT Data[a]

	Premium		Generic	
	(1)	(2)	(3)	(4)
State Cigarette Tax	1.776	1.097	1.701	1.098
	(29.02)***	(32.93)***	(29.48)***	(34.68)***
	[12.68]***	[2.91]***	[12.15]***	[3.10]***
State and Time Fixed Effects?	no	yes	no	yes
Number of Observations	1071	1071	1071	1071
R^2	0.6931	0.9886	0.7139	0.9881

[a]All estimated equations include a constant term. Estimations use data from all 50 states as well as Washington D.C., with all taxes and prices in November 2010 dollars. Robust standard errors are computed with clustering at the state level. Numbers in parentheses are t-statistics testing the null hypothesis that the coefficient equals zero. Numbers in square brackets are t-statistics testing the null hypothesis that the coefficient equals one. The symbols *** indicate statistically significant at the one percent level, ** at the five percent level, and * at the ten percent level.

Table 6: Effect of Cigarette Taxes on Price Using ACCRA and Local Level Tax Data[a]

	(1)	(2)	(3)	(4)	(5)	(6)
Local Cigarette Tax				1.369	1.072	1.067
				(16.31)***	(62.84)***	(69.18)***
				[4.40]***	[4.23]***	[4.34]***
State Cigarette Tax	1.660	1.138	1.136	1.624	1.106	1.104
	(29.31)***	(34.30)***	(35.37)***	(31.47)***	(42.21)***	(41.72)***
	[11.66]***	[4.17]***	[4.23]***	[12.09]***	[4.04]***	[3.92]***
Cost Controls?	no	no	yes	no	no	yes
Fixed Effects?	no	yes	yes	no	yes	yes
Number of Areas	443	443	443	443	443	443
Number of Observations	12860	12860	12860	12860	12860	12860
R^2	0.3343	0.9740	0.9742	0.3427	0.9767	0.9768

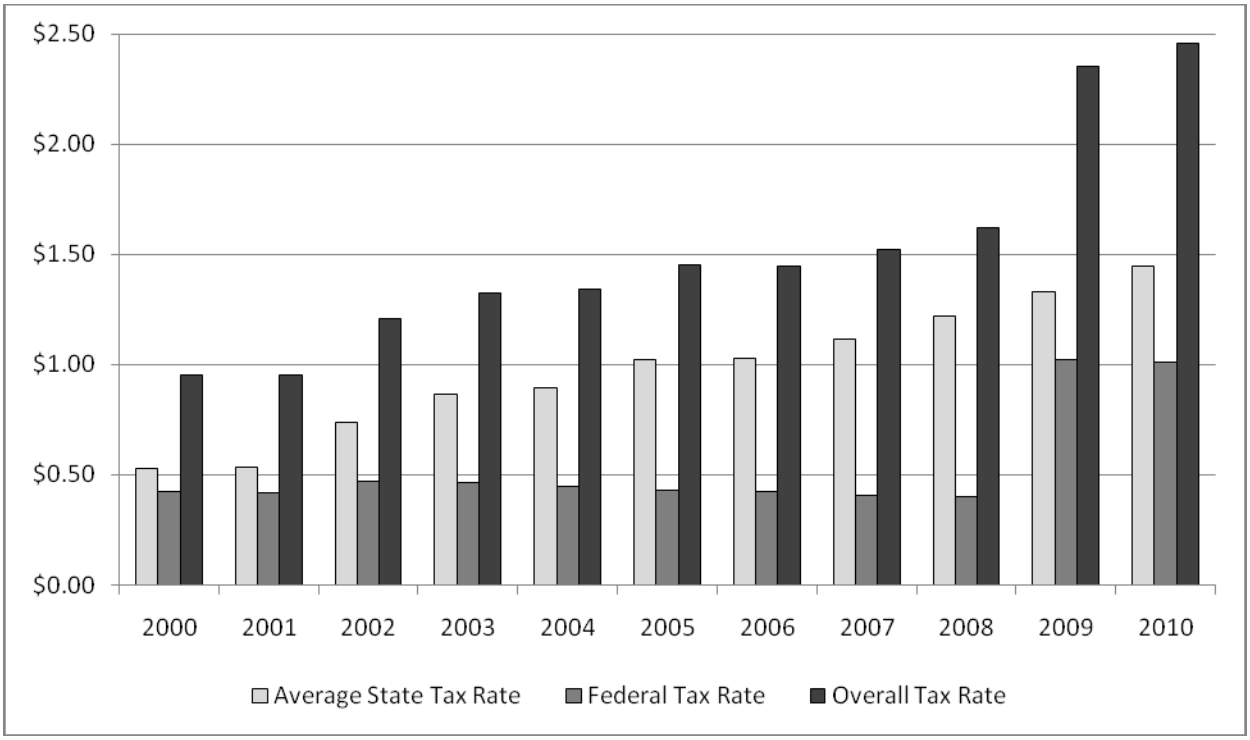
[a]All estimated equations include a constant term. Estimations use data from all 50 states as well as Washington D.C., with all taxes and prices in November 2010 dollars. Robust standard errors are computed with clustering at the state level. Numbers in parentheses are t-statistics testing the null hypothesis that the coefficient equals zero. Numbers in square brackets are t-statistics testing the null hypothesis that the coefficient equals one. The symbols *** indicate statistically significant at the one percent level, ** at the five percent level, and * at the ten percent level.

Table 7: Effect of Cigarette Taxes on Price by Distance to the Border Using ACCRA Data[a]

	(1)	(2)	(3)	(4)
Local Cigarette Tax	1.076	1.073	1.072	1.070
	(62.28)***	(68.68)***	(70.45)***	(74.33)***
	[4.42]***	[4.64]***	[4.71]***	[4.85]***
State Cigarette Tax	1.101	1.101	1.101	1.099
	(40.66)***	(40.47)***	(40.30)***	(39.78)***
	[3.73]***	[3.72]***	[3.70]***	[3.57]***
Lower Tax Border Inside 1 Mile	-0.0795			
	(-2.18)**			
Lower Tax Border Inside 5 Miles		-0.0349		
		(-1.12)		
Lower Tax Border Inside 10 Miles			-0.026	
			(-1.00)	
Lower Tax Border Inside 25 Miles				0.0067
				(0.37)
Cost Controls?	yes	yes	yes	yes
Area and Time Fixed Effects?	yes	yes	yes	yes
Number of Areas	440	440	440	440
Number of Observations	12788	12788	12788	12788
R^2	0.9767	0.9766	0.9766	0.9766

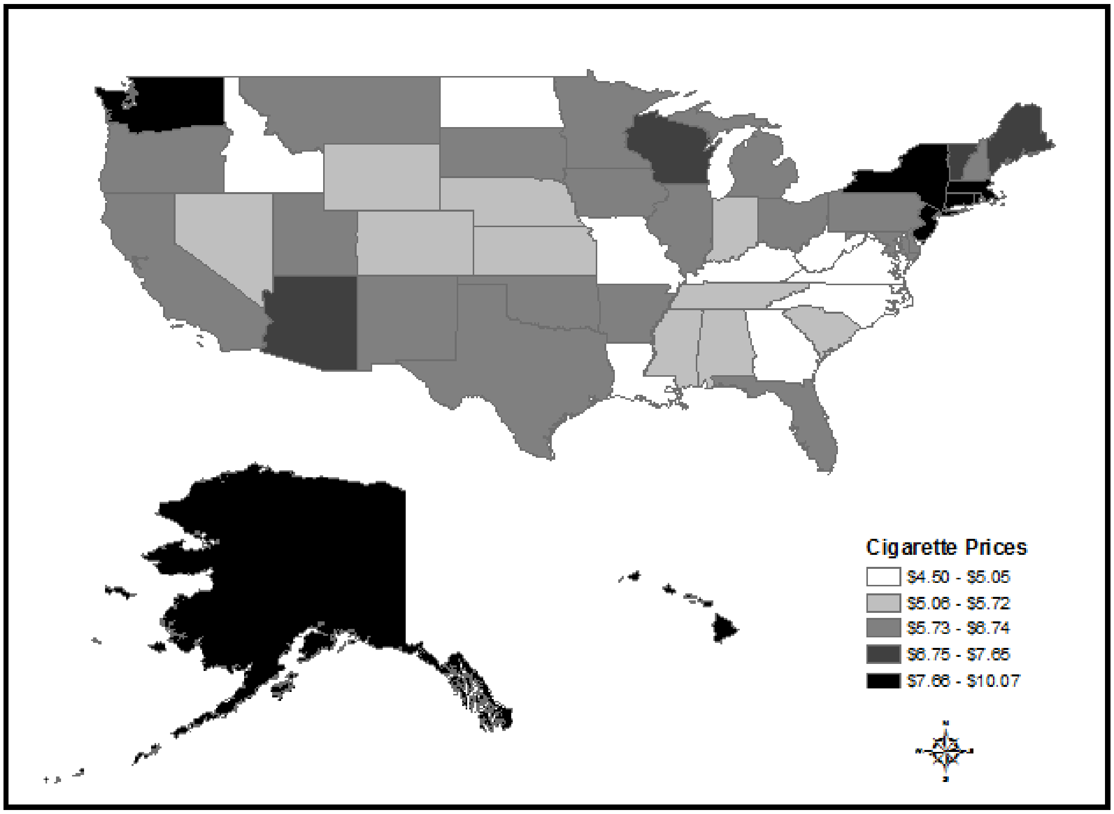
[a]All estimated equations include a constant term. Estimations use data from all 50 states as well as Washington D.C., with all taxes and prices in November 2010 dollars. Robust standard errors are computed with clustering at the state level. Numbers in parentheses are t-statistics testing the null hypothesis that the coefficient equals zero. Numbers in square brackets are t-statistics testing the null hypothesis that the coefficient equals one. The symbols *** indicate statistically significant at the one percent level, ** at the five percent level, and * at the ten percent level.

Figure 1: Cigarette Tax Rates from November 2000 to November 2010



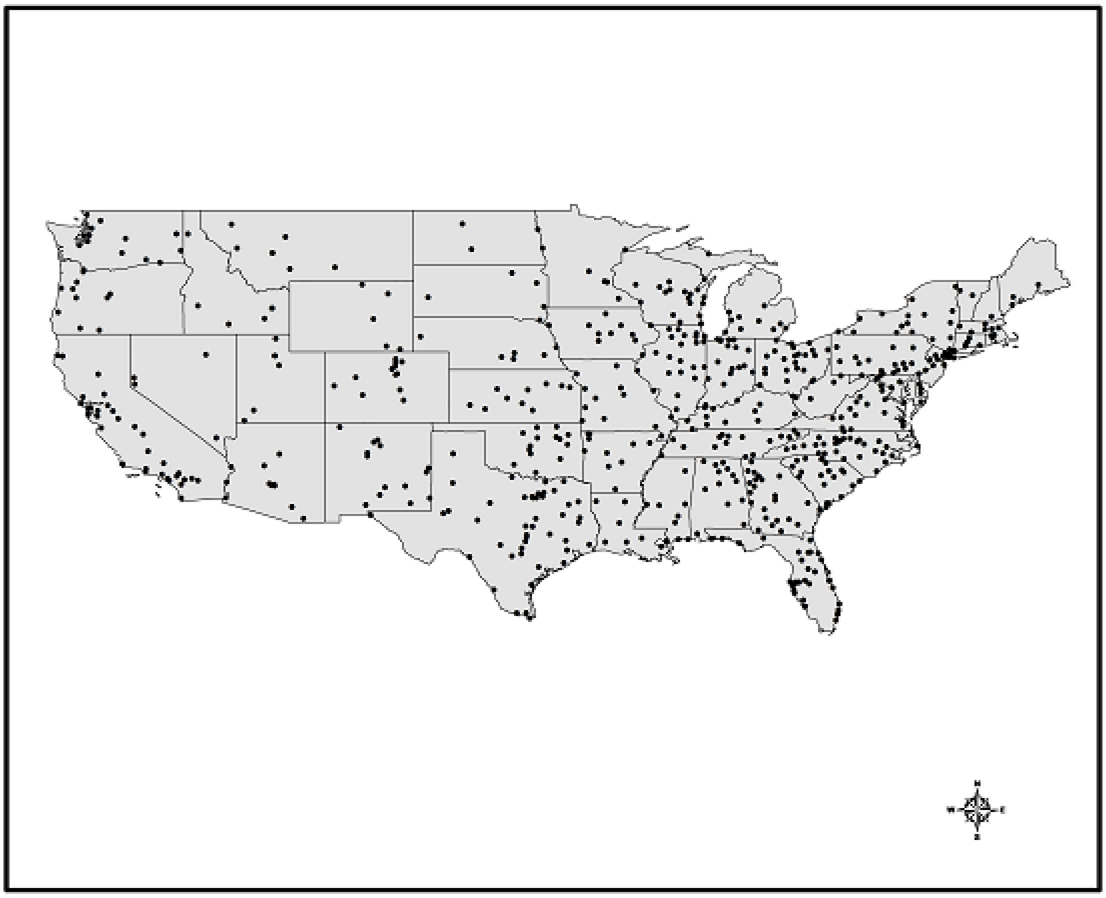
Source: Orzechowski and Walker (2010). Tax rates listed are in November 2010 dollars. All 50 states as well as Washington D.C. are included in the average state tax rate calculations.

Figure 2: Average Price for a Pack of Cigarettes by State



Source: Maps created using Arcmap GIS software. Price data come from Orzechowski and Walker (2010). Prices listed are the average price for a pack of premium brand cigarettes in November 2010 dollars.

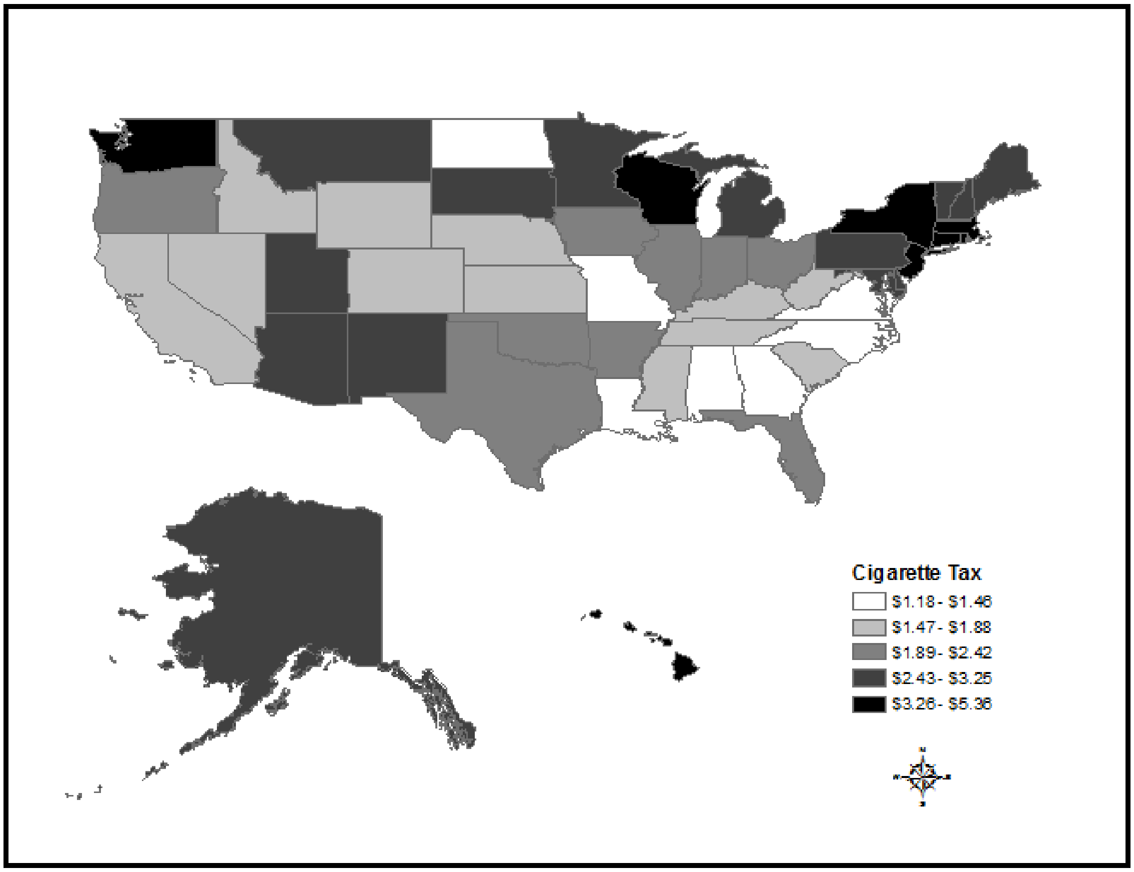
Figure 3: Urban Areas by Location in the ACCRA Dataset



Source: Map created using Arcmap GIS software. Latitude and longitude coordinates come from Google Earth. Urban areas in Alaska and Hawaii are excluded.

Appendix:

Figure A1: Combined State and Federal Cigarette Excise Tax



Source: Maps created using Arcmap GIS software. Tax data is from Tax Burden on Tobacco (2010). Taxes listed are in November 2010 dollars. The per pack tax rates shown do not include local taxes.

Table A1: Cigarette Prices and Tax Rates by State

State	Price	State Tax	Federal Tax	State and Federal Tax
AL	$5.08	$0.43	$1.01	$1.44
AK	$7.91	$2.00	$1.01	$3.01
AZ	$6.81	$2.00	$1.01	$3.01
AR	$5.83	$1.15	$1.01	$2.16
CA	$5.80	$0.87	$1.01	$1.88
CO	$5.58	$0.84	$1.01	$1.85
CT	$7.94	$3.00	$1.01	$4.01
DE	$5.89	$1.60	$1.01	$2.61
DC	$7.48	$2.50	$1.01	$3.51
FL	$6.11	$1.34	$1.01	$2.35
GA	$5.01	$0.37	$1.01	$1.38
HI	$8.92	$3.00	$1.01	$4.01
ID	$5.04	$0.57	$1.01	$1.58
IL	$6.20	$0.98	$1.01	$1.99
IN	$5.56	$1.00	$1.01	$2.01
IA	$6.09	$1.36	$1.01	$2.37
KS	$5.48	$0.79	$1.01	$1.80
KY	$4.98	$0.60	$1.01	$1.61
LA	$4.91	$0.36	$1.01	$1.37
ME	$6.86	$2.00	$1.01	$3.01
MD	$6.67	$2.00	$1.01	$3.01
MA	$7.84	$2.51	$1.01	$3.52
MI	$6.47	$2.00	$1.01	$3.01
MN	$6.09	$1.58	$1.01	$2.59
MS	$5.33	$0.68	$1.01	$1.69
MO	$4.51	$0.17	$1.01	$1.18
MT	$6.39	$1.70	$1.01	$2.71
NE	$5.31	$0.64	$1.01	$1.65
NV	$5.34	$0.80	$1.01	$1.81
NH	$6.36	$1.78	$1.01	$2.79
NJ	$7.72	$2.70	$1.01	$3.71
NM	$6.20	$1.66	$1.01	$2.67
NY	$10.06	$4.35	$1.01	$5.36
NC	$4.97	$0.45	$1.01	$1.46
ND	$4.64	$0.44	$1.01	$1.45
OH	$5.84	$1.25	$1.01	$2.26
OK	$5.82	$1.03	$1.01	$2.04

Table A1 (Continued): Cigarette Prices and Tax Rates by State

State	Price	State Tax	Federal Tax	State and Federal Tax
OR	$5.87	$1.18	$1.01	$2.19
PA	$6.04	$1.60	$1.01	$2.61
RI	$8.18	$3.46	$1.01	$4.47
SC	$5.12	$0.57	$1.01	$1.58
SD	$6.12	$1.53	$1.01	$2.54
TN	$5.17	$0.62	$1.01	$1.63
TX	$6.13	$1.41	$1.01	$2.42
UT	$6.28	$1.70	$1.01	$2.71
VT	$7.18	$2.24	$1.01	$3.25
VA	$4.93	$0.30	$1.01	$1.31
WA	$7.99	$3.03	$1.01	$4.04
WV	$5.00	$0.55	$1.01	$1.56
WI	$7.34	$2.52	$1.01	$3.53
WY	$5.19	$0.60	$1.01	$1.61

Source: Tax Burden on Tobacco (2010). Prices listed are the average price for a pack of premium brand cigarettes on 1 November 2010. Tax Rates are current as of 1 November 2010.