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Just passing through: the effect of the Master Settlement Agreement on estimated cigarette tax price pass-through

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Abstract

In 1998, cigarette manufacturers and state attorneys general in the United States settled a group of lawsuits in an agreement known as the Master Settlement Agreement (MSA). Among the provisions of this agreement were a set of mandated escrow payments to the states that would be based on cigarette sales. The result of these provisions is that the apparent relationship between taxes and prices changed substantially following implementation of the MSA. This article estimates whether the MSA escrow amounts are reflected in prices and compares the pass-through rate of state and federal cigarette taxes only and the rate when one adds escrow payments. We find much different pass-through rates for the two measures. State and federal taxes are not fully passed to smokers. In years that escrow payments were made, cigarette prices increased by more than the sum of the state and federal taxes and the escrow payments.

Keywords

Master Settlement Agreement; cigarette tax; pass-through; tax elasticity

I. Introduction

In 1998, cigarette manufacturers and state attorneys general settled a group of lawsuits in an agreement known as the Master Settlement Agreement (MSA). Among other provisions, the MSA required that participating manufacturers (the four largest cigarette manufacturers) pay states about \$250 billion, including payments to the four states that settled separately (Viscusi and Hersch, 2009). Importantly for our analysis, some of these payments depended on the number of cigarettes each company sold in each state.

For tobacco researchers, the MSA has several implications. Viscusi and Hersch (2009) note that the associated per-pack payments (hereafter, the ‘escrow tax’) essentially function the

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same as a tax increase because they are a market-specific increase in the marginal cost of a pack of cigarettes. Studies that use cigarette taxes as an explanatory variable will estimate misspecified models if they exclude the federal tax or the MSA escrow payments from the tax measure. This set includes studies of cigarette demand and studies of cigarette tax pass-through.

The omission of the escrow tax is of growing importance because recent and current research increasingly uses data from periods that span the implementation of the MSA. For example, several studies use data that span the MSA period to examine how state obesity rates vary with cigarette taxes or cigarette prices. Gruber and Frakes (2006) used the 1984–2002 waves of the Behavioral Risk Factor Surveillance System (BRFSS); Nonnemaker *et al.* (2009) used the 1984–2004 BRFSS; and Baum (2009) used the 1981–2002 waves of the National Longitudinal Study of Youth 1979.

A large literature examines how cigarette consumption varies with cigarette taxes and increasingly uses data from the pre-/post-MSA period. For example, Farrelly *et al.* (2003) used aggregate sales data from 1981–2000 to examine whether cigarette consumption varies with state tobacco control expenditures and cigarette taxes. A large literature examines (across all types of markets) the rate at which retailers pass through taxes to consumers because the pass-through rate is often used to measure a market's competitiveness. Cigarette markets have attracted particular attention, in part because states levy separate taxes and, as a result, also restrict attempts to avoid taxes by shopping across borders. These characteristics focus attention on the pass-through rate because the state regulations may give firms some market power within state borders. An early study, Sumner (1981), used state-level price and tax data from 1954 to 1978 to estimate a pass-through rate that ranges from about 1.03 to about 1.07. Using data from 1960 to 1990, Keeler *et al.* (1996) estimated a pass-through rate of 1.11. Barnett *et al.* (1995) used data from the Department of Agriculture (1955–1990) to examine both the supply and demand sides of the market. They found evidence that competition among manufacturers has decreased since 1980.

The effect of omitting the MSA escrow tax varies with the way models are specified and the object of interest. For example, the coefficient on tax will be unaffected in models estimated on data from the period spanning the implementation of the MSA and that include year fixed effects because the escrow tax was imposed uniformly across states. (Although the wording of the MSA allows state legislatures to impose different settlement payments, all states adopted the same model legislation. Consequently, escrow amounts are uniform nationwide.) The above studies on obesity and cigarette taxes include year fixed effects. However, even with year effects, the tax elasticities will change when the escrow tax is included because adding the escrow tax changes the base from which the elasticity is calculated. When a model does not include year fixed effects, as in Farrelly *et al.* (2003), the coefficient on the tax itself will be biased.

To demonstrate our point, we estimate the tax pass-through rate when one includes or excludes the MSA escrow payments. When the escrow tax is included, the estimated tax pass-through rate increases.

The remainder of this article is organized as follows. In Section II, we discuss our data and methods. In Section III, we present the results. In Section IV, we interpret the results.

II. Data and Methods

Our data come from several sources. We obtained state tax and price data for the years 1995–2007 from the Tax Burden on Tobacco (TBOT), a publication of the consulting firm

Orzechowski and Walker (Orzechowski and Walker, 2008). The TBOT is the most common source for price data in the cigarette demand literature and is used by all of the articles cited above that used price in their models. Price data from the Tax Burden reflect prices on 1 November of each year. Our second data source is the MSA, a legal settlement between the 4 largest cigarette manufacturers and 44 US states. Among several other provisions limiting cigarette marketing, the MSA required cigarette manufacturers to make payments into state escrow accounts according to the number of cigarettes they sell. The agreement came into effect on November 1998, so we add this part of the tax to our data in that month. The escrow payments phased in between 1999 and 2007. Because the payments are per cigarette, they function in the same way as an excise tax. Finally, we control for several other factors that may affect pass-through rates. We control for local business cycles using state unemployment rates from the Bureau of Labor Statistics. Since the Tax Burden lists prices as of 1 November, we use tax and unemployment data averaged over October and November in each year. We also control for state per capita income (from the Bureau of Economic Analysis), percent white race, percent black race and the percentages of people in the following age groups: 0–9, 10–19, 20–29, 30–49, 50–64 and over 65 (from the US Census Bureau).

Table 1 shows the average state + federal tax, state + federal + escrow tax and price by year from 1995 to 2007. The escrow tax came into effect on November 1998, and the MSA and non-MSA values diverge at that point. Most of the change shows up starting in 1999.

To demonstrate how this divergence matters empirically, we estimate how much of a tax increase is passed through to consumers in the price. Using OLS, we regress the cigarette price on the tax rate, the state unemployment rate, a vector of state demographic variables (including income, race and age percentages), a time trend equal to 1 in 1995 and a vector of state fixed effects. The time trends will capture many of the supply-side factors, such as wholesale tobacco prices and retail outlet density, which generally change slowly over time. To demonstrate the effect of the MSA, and the empirical issues that result, we first estimate the model using only state and federal taxes. We then estimate the same models but include the escrow tax.

In a different specification, we control for variation across time using year fixed effects. This specification will net out all differences across years that do not vary across states, including the effects of changes in the federal and escrow taxes. Although this specification may control more effectively for national changes in determinants of price (e.g. national advertising or information about health risks of smoking), the specification may underestimate the true pass-through rate because it nets out the contribution of the federal and escrow taxes to cigarette prices.

III. Results

This section presents results from the pass-through models. Table 2 presents results of pass-through models that use several different methods to control for time. We estimate all models with the state and federal taxes only and the combined state, federal and escrow taxes. We include state fixed effects and state demographics in all models.

Table 2 presents the results of the tax pass-through estimates using the TBOT price series. We include elasticities for all tax rates. Columns (1) and (2) contain results from the model with a quadratic time trend. Columns (3) and (4) contain results from the model with state-specific time trends. The last column presents the model with year fixed effects. Not surprisingly, the results of the model with year fixed effects are the same regardless of whether the escrow tax is included or excluded (the increase is uniform across all markets

and is therefore taken care of by the fixed effects). We therefore do not include separate columns with year effects for the two different measures of taxes. We do include elasticities calculated both with and without the escrow tax.

The results reveal several interesting patterns. First, if one fails to include the escrow tax, one would conclude that pass-through rates are significantly less than full. In all cases except the year fixed effects models, the models including the escrow tax indicate a higher tax pass-through rate than the models without. The difference is particularly large in the model with state-specific quadratic time trends, in which the coefficient is significantly less than 1 without the escrow tax, but becomes significantly greater than 1 when the escrow tax is included. Note again that in the year fixed effects model, some of the tax pass-through is absorbed in the year fixed effect coefficients.

Second, pass-through is close to 1 in most specifications, but significantly less than 1 in the specification that excludes the escrow tax but includes state-specific time trends. Several previous studies, including Sumner (1981) and Keeler *et al.* (1996), find pass-through rates that are significantly greater than 1 using price and tax data from earlier time periods. The estimates that include the escrow tax do not provide conclusive evidence that pass-through was greater than 1, which suggests that cigarette markets may be competitive. The estimates that do not include the escrow tax, by contrast, suggest that pass-through rates were less than 1 (significantly less than 1 in the case of model (4)).

Third, the estimated pass-through rates in models (2), (4) and (5) are very similar. As we mentioned previously, estimates that include year fixed effects may somewhat underestimate pass-through, because the year effects will absorb some of the tax variations. The models that do not include the escrow tax yield estimates that are actually less than this lower bound, particularly in the model with state-specific quadratic time trends.

Fourth, while the coefficients in the model with year fixed effects are the same regardless of whether we include the escrow tax, the elasticities are not. When we exclude the escrow tax, the tax elasticity is about 0.3. When we include it, the tax elasticity rises to 0.4. Thus, the escrow tax matters even if we control for year effects.

In summary, the results suggest that retailers adjust prices to reflect both state and federally levied taxes, including the effective tax that the MSA introduced in late 1998. Omitting these taxes from models of cigarette consumption and sales can lead to bias.

IV. Conclusion

In this study, we conduct several simple analyses of tax pass-through rates in the period surrounding the MSA. Our results provide support for several conclusions. First, pass-through rates are greater than 1 when we account for the escrow tax (significantly larger when we include state-specific time trends) and less than 1 (although not significantly) when we do not account for the escrow tax. This finding shows that failing to include the escrow tax might lead one to conclude that cigarette manufacturers no longer have market power.

Second, researchers should account for the escrow tax when estimating models that use cigarette tax as a predictor. In addition to pass-through models, the escrow tax will be relevant in models of cigarette demand that use taxes directly or that use them as an instrument for price. It will also be relevant in studies of obesity that use cigarette taxes as a predictor. Adding year effects to the model will correct the point estimates of the tax coefficient in demand models, but both the federal tax and the MSA escrow tax will still be relevant if the researcher calculates tax elasticities.

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Table 1

Price and tax by year

Year	State + federal	State + federal + escrow	Price
1995	0.62	0.62	1.97
1996	0.61	0.61	2.01
1997	0.62	0.62	2.06
1998	0.65	0.65	2.26
1999	0.65	0.85	2.92
2000	0.74	0.95	3.01
2001	0.73	0.99	3.18
2002	0.86	1.11	3.46
2003	0.99	1.29	3.5
2004	1.02	1.33	3.42
2005	1.08	1.37	3.44
2006	1.07	1.35	3.44
2007	1.12	1.43	3.52

Note: All values are in real 2000 dollars.

Table 2

Tax pass-through results

	Quadratic time			State quadratic time			Year fixed effects		
	Mean	(1)	(2)	(3)	(4)	(5)			
Real state + federal tax	0.840 (SD = 0.427)	0.942** (0.045)		0.763** (0.079)		1.030** (0.028)			
Real state + federal + escrow tax	1.022 (SD = 0.491)		1.087** (0.031)		1.090** (0.046)				
Implied tax elasticity		[0.275]	[0.427]	[0.222]	[0.428]	[0.300]/[0.405]			
Unemployment rate	0.044 (SD = 0.012)	-0.022 (0.014)	0.009 (0.010)	-0.030 (0.022)	0.038* (0.017)	-0.006 (0.010)			
Percent white	0.822 (SD = 0.138)	-3.187 (2.814)	0.203 (2.145)	-6.677 (6.720)	-4.031 (4.989)	1.226 (1.715)			
Percent black	0.113 (SD = 0.117)	-0.501 (3.358)	0.586 (2.552)	5.290 (14.331)	-0.670 (10.673)	0.729 (2.079)			
Percent female	0.508 (SD = 0.008)	-22.250 (14.861)	-3.247 (11.327)	-124.680** (33.430)	-41.471 (25.182)	-3.137 (9.075)			
Percentage of people aged 0-9	0.090 (SD = 0.031)	-8.393* (3.897)	-3.410 (2.959)	-7.769 (11.312)	8.142 (8.471)	-3.396 (3.435)			
Percentage of people aged 10-19	0.101 (SD = 0.037)	4.255* (2.137)	2.116 (1.622)	17.973* (8.475)	4.266 (6.345)	4.830** (1.843)			
Percentage of people aged 20-29	0.095 (SD = 0.035)	-3.274 (2.717)	-1.119 (2.060)	-24.141** (6.224)	-14.090** (4.627)	2.961 (2.019)			
Percentage of people aged 30-49	0.146 (SD = 0.008)	5.096 (5.961)	-0.155 (4.527)	58.934** (13.140)	17.685 (9.798)	-0.807 (4.180)			
Percentage of people aged 50-64	0.088 (SD = 0.009)	13.185* (6.619)	1.555 (5.061)	85.902** (14.749)	31.364** (11.086)	-1.262 (4.627)			
Percentage of people aged 65+	0.087 (SD = 0.033)	-2.567 (1.970)	-1.147 (1.496)	-17.591** (4.115)	-8.584** (3.086)	0.570 (1.839)			
Per capita income/1000	29.3 (SD = 6.56)	0.002 (0.009)	0.003 (0.007)	0.009 (0.023)	0.034* (0.017)	-0.001 (0.009)			
Constant		14.593 (9.168)	2.941 (6.989)	57.212** (18.354)	21.127 (13.780)	1.298 (5.796)			
Observations		663	663	663	663	663			
R ²		0.94	0.97	0.95	0.97	0.98			

Notes: SEs are given in parentheses. Elasticities are given in square brackets.

* and **Denote significance at the 5% and 1% levels, respectively.