Recommended levels of anti-tobacco spending have little effect on cigarette use.

Is the CDC Blowing Smoke?

By Michael L. Marlow
California Polytechnic State University

In 2007, the Centers for Disease Control and Prevention (CDC) released a report detailing "best practice" spending recommendations for state tobacco control programs. According to the report, "Research shows that the more states spend on comprehensive tobacco control programs, the greater the reductions in smoking — and the longer states invest in such programs, the greater and faster the impact."

The CDC spending guidelines use research to form "best practice" spending recommendations for each state. The report claims:

> Implementing a comprehensive tobacco control program structure at the CDC-recommended levels of investment would have a substantial impact. For example, if each state sustained its recommended level of funding for 5 years, an estimated 5 million fewer people in this country would smoke. As a result, hundreds of thousands of premature tobacco-related deaths would be prevented. Longer-term investments would have even greater effects.

This claim should be met with skepticism. At least four reasons suggest that benefits from meeting spending targets are not as large as the CDC argues:

- The CDC recommendations draw heavily on research from just two states: California and Massachusetts. Those two states are considered models of effective programs, in part, because they have the longest funding histories. Even if highly effective, their success may not be easily exported to other states.
- The CDC ignores studies that show little to no impact from tobacco control programs.
- There is evidence, again ignored by the CDC, that little to no connection exists between state spending on tobacco control and the degree to which residents smoke.
- The CDC offers no empirical verification that implementing recommended spending targets causes significant reductions in tobacco use.

This article focuses on the last point above. Empirical investigation of the connection between spending guidelines and tobacco use is conducted to directly assess whether states that are closer to CDC guidelines actually exhibit lower tobacco sales than states that do not. Analysis focuses on two related issues. One is the fundamental question of whether tobacco sales over 2000–2007 were influenced by spending on tobacco control. The other is the policy question of whether meeting CDC spending targets matters in efforts to reduce tobacco sales.

TOBACCO CONTROL LITERATURE

Studies of tobacco control programs often focus on California and Massachusetts because of their long funding histories. Tobacco control in California began in 1988 when voters approved the California Tobacco Tax and Health Promotion Act of 1988 (Proposition 99), which increased the state surtax on cigarettes by 25 cents per pack and earmarked revenues for tobacco control programs. In 1992, a Massachusetts ballot initiative raised taxes 25 cents per pack, with the resulting revenue to be used for creation of the Massachusetts Tobacco Control Program.

Some empirical studies have indicated that the programs do indeed reduce smoking. However, the studies' reliability is unclear. A 2003 *Journal of Health Economics* paper by Matthew Farrelly et al. points out that most studies simply perform trend analysis on the introduction of new tobacco control programs and ignore other factors that might influ-

Michael L. Marlow is professor of economics in the Orfalea College of Business at California Polytechnic State University.

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ence tobacco consumption. Those studies also focus heavily on California or Massachusetts. Even if their conclusions are valid — that tobacco control programs cause less smoking — it remains unclear whether extrapolation to other states is appropriate.

Early studies that control for one or more factors outside of tobacco control programs uniformly show that the programs are highly effective in lowering tobacco use. A 1995 *American Economic Review* paper by T.-W. Hu et al. controlled for state excise taxes and tobacco firm media expenditures and found that state spending lowered consumption in California. A 1995 *Journal of Public Health* paper also by Hu et al. estimated that a 25 cent state tax hike reduced taxed sales in California when measured over about two years. Those two studies controlled for effects of time on cigarette consumption, which may control for various other factors — such as greater health concerns — that affect smoking over time. However, the Hu team's studies focus on California, the longest-lived state program, and examine effects on taxed sales over very few and very early years of a program that began in 1988.

The Farrelly paper examined tobacco control activities of all 50 states and concluded that state tobacco control expenditures lowered taxed cigarette sales over 1981–2000, after controlling for excise taxes, smuggling, time, and other state-specific factors. They also estimated that aggregate cigarette sales would have fallen by an additional 9 percent by 2000 if states had spent at minimum funding levels advocated by the CDC. A 2005 *American Journal of Public Health* paper by John Tauras et al. concluded that spending in the 50 states lowered youth smoking prevalence and the number of cigarettes smoked over 1991–2000, after controlling for other factors that might also influence sales.

The studies discussed so far examined years in which many states did not actively fund programs. The CDC only began publishing funding data in 2000 because many states did not actively fund programs until after the Master Settlement Agreement in 1998. It remains unclear whether the experience of tobacco control programs prior to when most states actively began funding the programs easily translates into recommendations for many states that only began funding around 2000. It is also unclear if experiences in the few states with relatively long funding histories easily convey to the many states without such histories.

BEST PRACTICES SPENDING TARGETS

The CDC's 2007 "best practices" report claims that a range of $15 to $20 per capita is a reasonable annual target for each state to fund tobacco control activities. Appropriate activities include anti-smoking ads, cessation interventions (intensive counseling services and cessation medications), and enforcement of age restrictions on the purchase of tobacco.

Table 1

Keeping Up With the CDC?

Annual state spending on tobacco control for 2000–2007 as percentages of CDC minimums

	Average (percent)	Minimum (percent)	Maximum (percent)
Alabama	7	1	22
Alaska	48	17	77
Arizona	96	66	132
Arkansas	82	0	103
California	57	45	82
Colorado	54	16	110
Connecticut	5	0	19
Delaware	56	0	119
Florida	26	1	56
Georgia	30	5	49
Hawaii	77	39	95
Idaho	11	5	17
Illinois	30	13	71
Indiana	64	31	101
Iowa	36	26	49
Kansas	4	3	6
Kentucky	15	9	23
Louisiana	25	2	42
Maine	139	123	168
Maryland	67	30	99
Massachusetts	56	7	136
Michigan	0	0	0
Minnesota	94	65	122
Mississippi	108	0	165
Missouri	0	0	0
Montana	35	4	74
Nebraska	35	3	53
Nevada	30	22	33
New Hampshire	14	0	28
New Jersey	42	23	67
New Mexico	35	16	56
New York	45	31	89
North Carolina	19	0	40
North Dakota	27	0	38
Ohio	73	35	97
Oklahoma	25	8	46
Oregon	31	14	53
Pennsylvania	49	0	80
Rhode Island	25	10	33
South Carolina	5	0	8
South Dakota	15	8	31
Tennessee	0	0	0
Texas	9	5	12
Utah	44	39	47
Vermont	68	57	82
Virginia	40	32	57
Washington	68	45	82
West Virginia	41	38	42
Wisconsin	45	32	68
Wyoming	41	12	80

SOURCE: *Campaign for Tobacco-Free Kids, "History of State Spending for Tobacco Prevention," 2008.*

Table 1 displays how state spending on tobacco control over 2000–2007 compared to CDC-recommended minimum levels. Percentages of CDC-minimum levels are shown. Two states — Maine and Mississippi — averaged over 100 percent over this period, and three states — Michigan, Missouri, and Tennessee — spent nothing. Table 2 displays total spending in years 2000–2007 as well as average percentages of CDC minimums in each of those years. Total spending (in 2005 dollars) has been declining since 2003, and percent of CDC minimums has ranged between 33.6 percent and 46.9 percent. Aggregate spending is $5.3 billion, which is roughly $18 per capita. The CDC is thus arguing that states should have spent at least $8 billion more during those years, for a total of $13.3 billion, to meet minimum recommended levels of funding. That works out to roughly $44.30 per capita over those years. The summary measures appear to indicate ample variation with which to assess CDC claims that consistent meeting of recommended spending targets over time leads to significant reduction in tobacco use.

As mentioned previously, the CDC stresses the importance of maintaining state funding over time at levels that meet or exceed minimum targets. This suggests that it takes many years of tobacco control activity before full effects of programs can be detected. Spending is hypothesized to act as advertising: successful campaigns (in this case) reduce demand both today and tomorrow. The Hu et al. *American Economic Review* paper, the Farrelly et al. *Journal of Health Economics* paper, and my 2006 *Cato Journal* paper each found some evidence that cumulative measures of spending that discounted past spending on tobacco control were associated with less tobacco use.

This article employs discount rates of 5, 10, 15, and 20 percent in its analysis of the effectiveness of the CDC recommendations. This article also considers a cumulative measure of funding adequacy as defined by how closely states have met spending recommendations over time. Table 3 displays cumulative measures of tobacco control spending (in 2005 dollars) per capita. Values are shown for 2007, and so values over 2000–2006 are included at discounted rates. Average values are $19.53 and $11.68 for discount rates of 5 and 20 percent, respectively. Table 4 displays cumulative measures of funding adequacy, as defined as percentage of CDC minimum spending targets, at discount rates of 5 and 20 percent. Average values are 274 percent and 167 percent for discount rates of 5 and 20 percent, respectively. Cumulative measures of funding levels and adequacy thus range widely across states throughout the period.

Table 2

National Totals

Annual state tobacco control spending

	Total Spending ($2005)	Percent of CDC Minimum
2000	$771.3M	42.5
2001	813.1M	46.1
2002	814.0M	46.9
2003	715.9M	42.1
2004	561.3M	33.9
2005	538.2M	33.6
2006	533.9M	34.4
2007	562.6M	37.2

SOURCE: *Campaign for Tobacco-Free Kids, "History of State Spending for Tobacco Prevention," 2008.*

MODELING EFFECTS OF TOBACCO CONTROL

Taxed sales of cigarettes are estimated using a pooled and balanced regression model over 2000–2007. A fixed effects model is estimated to control for state-specific factors outside of the model. Total sample size is 400 observations and represents all states across the eight-year time period. The following relationship for taxed cigarette sales is estimated:

$$CIG_{it} = f(PRICE_{it}, PCY_{it}, UE_{it}, BAN_{it}, SMUG_{it}, CONTROL_{it})$$

The subscript i refers to the 50 states and t refers to years 2000 to 2007. The dependent variable CIG_{it} is the number of tax-paid per-capita cigarette sales (in packs) and is obtained from William Orzechowski and Robert Walker's 2008 monograph *The Tax Burden of Tobacco*. The log of CIG_{it} is examined, as is com-

monly done, and allows direct estimation of the price elasticity of demand because the log of the price variable is included on the right-hand side of the equation. $PRICE_{it}$ is the price (in 2005 dollars) of a pack of cigarettes, as reported by Orzechowski and Walker, and is hypothesized to be inversely related to cigarette consumption.

Real per-capita personal income PCY_{it} is obtained from U.S. Department of Commerce data. The sign on PCY_{it} is ambiguous because, while cigarette demand may be income-elastic and therefore exhibit a positive sign, higher income may also lower sales given common perceptions that higher-income individuals smoke less. Unemployment level UE_{it} controls for the state of the economy and its sign is ambiguous as well because it is unclear if high unemployment is associated with more smoking from greater emotional distress or less smoking from greater financial distress.

The smoking ban variable BAN_{it} controls for the effect of state-wide smoking bans in restaurants. Values of BAN_{it} are set to 0 prior to bans and 1 thereafter to capture effects on taxed sales. Data on bans are obtained from a 2008 publication by the group Americans for Nonsmokers Rights. Some researchers have found that smoking restrictions lead to less smoking, which suggests that its sign will be negative.

Tax-paid cigarette sales do not fully reflect in-state consumption when smokers purchase some portion of cigarettes across state borders. $SMUG_{it}$ is defined as the ratio of the own-state price to the average for bordering states and is hypothesized to be inversely related to taxed sales because higher values indicate higher incentives for cross-border smuggling. Values for Hawaii and Alaska are set to 1 because they do not border other states and so their smokers are assumed to not purchase from other states. Data are obtained from Orzechowski and Walker (2008).

$CONTROL_{it}$ measures tobacco control spending and is measured in two alternative ways. The first measure is spending (again, in 2005 dollars) per capita ($SPENDING_{it}$) and the second is as a percentage of CDC minimums ($ADEQUACY_{it}$). As discussed above, *SPEND-*

Table 3

Per-Capita Spending

Discounted cumulative per-capita tobacco control spending, in 2005 dollars

	Discount rates	
	5%	20%
Alabama	$ 2.69	$ 1.08
Alaska	$ 41.36	$ 28.41
Arizona	$ 32.57	$ 18.37
Arkansas	$ 37.66	$ 24.02
California	$ 18.43	$ 10.57
Colorado	$ 20.20	$ 13.58
Connecticut	$ 2.14	$ 1.13
Delaware	$ 42.04	$ 33.18
Florida	$ 8.21	$ 3.43
Georgia	$ 9.89	$ 4.85
Hawaii	$ 46.11	$ 27.41
Idaho	$ 6.12	$ 3.51
Illinois	$ 10.60	$ 5.27
Indiana	$ 24.47	$ 12.16
Iowa	$ 16.23	$ 9.13
Kansas	$ 1.70	$ 1.14
Kentucky	$ 6.27	$ 3.28
Louisiana	$ 11.00	$ 7.40
Maine	$ 82.67	$ 48.32
Maryland	$ 25.40	$ 13.58
Massachusetts	$ 20.44	$ 8.86
Michigan	$ 0	$ 0
Minnesota	$ 36.44	$ 20.29
Mississippi	$ 48.04	$ 24.66
Missouri	$ 0	$ 0
Montana	$ 25.27	$ 17.94
Nebraska	$ 18.30	$ 9.45
Nevada	$ 12.26	$ 7.27
New Hampshire	$ 7.85	$ 3.12
New Jersey	$ 15.22	$ 8.00
New Mexico	$ 17.85	$ 11.96
New York	$ 15.91	$ 10.76
North Carolina	$ 6.68	$ 5.20
North Dakota	$ 24.38	$ 17.10
Ohio	$ 27.27	$ 16.38
Oklahoma	$ 10.71	$ 7.24
Oregon	$ 12.69	$ 6.46
Pennsylvania	$ 18.37	$ 12.04
Rhode Island	$ 15.77	$ 8.80
South Carolina	$ 1.89	$ 1.01
South Dakota	$ 11.68	$ 6.15
Tennessee	$ 0	$ 0
Texas	$ 2.73	$ 1.50
Utah	$ 19.32	$ 11.74
Vermont	$ 60.19	$ 35.05
Virginia	$ 14.52	$ 8.49
Washington	$ 25.74	$ 16.51
West Virginia	$ 22.50	$ 13.49
Wisconsin	$ 17.72	$ 9.51
Wyoming	$ 42.99	$ 31.79

Table 4

CDC Recommendations and Total Spending

Discounted cumulative measures of funding adequacy as a percentage of CDC minimum targets

	Percent of CDC recommendation	
	5% discount rate	20% discount rate
Alabama	41	17
Alaska	335	236
Arizona	637	378
Arkansas	566	369
California	379	224
Colorado	376	263
Connecticut	33	18
Delaware	418	333
Florida	159	68
Georgia	190	96
Hawaii	514	315
Idaho	74	44
Illinois	193	98
Indiana	408	208
Iowa	236	137
Kansas	25	17
Kentucky	98	53
Louisiana	176	120
Maine	924	555
Maryland	435	240
Massachusetts	342	151
Michigan	0	0
Minnesota	615	353
Mississippi	694	364
Missouri	0	0
Montana	251	183
Nebraska	225	120
Nevada	202	126
New Hampshire	83	33
New Jersey	274	148
New Mexico	244	168
New York	314	217
North Carolina	139	110
North Dakota	189	134
Ohio	487	300
Oklahoma	171	119
Oregon	200	105
Pennsylvania	340	226
Rhode Island	162	92
South Carolina	31	18
South Dakota	98	53
Tennessee	0	0
Texas	56	32
Utah	300	190
Vermont	451	269
Virginia	267	160
Washington	469	310
West Virginia	276	169
Wisconsin	295	163
Wyoming	297	224

SOURCES: *Campaign for Tobacco-Free Kids, "History of State Spending for Tobacco Prevention," 2008; author's calculations*

Table 5

CDC Recommendations and Cigarette Sales

Effects of spending and funding adequacy on the log of cigarette sales, with and without instrumental variables

	(1)	(2) Instrument for Spending	(3)	(4) Instrument for Adequacy
Real price per pack (*PRICE*)	-0.8430*** (10.35)	-0.8430*** (10.35)	-0.8205*** (9.84)	-0.8205*** (9.84)
Per-capita income (*PCY*)	-3.2E-05*** (7.64)	-2.9E-05*** (6.37)	-3.22E-05*** (7.56)	-2.93E-05*** (6.37)
Unemployment (*UE*)	0.0037 (0.48)	0.0011 (0.14)	0.0029 (0.39)	-0.0011 (0.14)
State-wide smoking ban in restaurants (*BAN*)	-0.0198 (1.12)	-0.0249 (1.38)	-0.0238 (1.34)	-0.0249 (1.38)
Ratio of in-state price to border states' prices (*SMUG*)	-0.1863 (1.51)	-0.2148* (1.70)	-0.2286* (1.84)	-0.2148* (1.70)
Real per-capita spending on tobacco control (*SPENDING*)	0.011495*** (4.72)	0.02778** (2.17)		
Tobacco control spending as percentage of CDC minimums (*ADEQUACY*)			0.0008*** 3.98	0.0022** 2.17
Constant	10.39062*** (26.71)	10.14091*** (24.82)	10.3865*** (26.78)	10.1327*** (24.74)
R-squared	0.95	0.95	0.95	0.95
Mean dependent variable	4.26	4.26	4.26	4.26
S.E. of regression	0.0805	0.0825	0.0812	0.0825
F-statistic	146.07	138.75	143.40	138.75
Observations	400	400	400	400

NOTES: *** significant 1% level (two-tailed test); ** significant at 5 level; * significant as 10 percent level; t-statistics in parentheses

Table 6

Cumulative Tobacco Control Spending and Cigarette Sales

Effects of cumulative control spending on cigarette sales with instrumental variable for spending

	(1)	(2)	(3)	(4)
Real price per pack (*PRICE*)	-0.8241*** (9.76)	-0.8286*** (9.79)	-0.8347*** (9.83)	-0.8420*** (9.89)
Per-capita income (*PCY*)	-3.41E-05*** (6.45)	-3.48E-05*** (6.67)	-3.56E-05*** (6.93)	-3.62E-05*** (7.19)
Unemployment (*UE*)	-0.0017 (0.21)	-0.0024 (0.29)	-0.0032 (0.40)	-0.0040 (0.50)
State-wide smoking ban in restaurants (*BAN*)	-0.0289 (1.57)	-0.0296 (1.61)	-0.0302 (1.65)	-0.0306* (1.68)
Ratio of in-state price to border states' prices (*SMUG*)	-0.2244* (1.76)	-0.2269* (1.78)	-0.2268* (1.78)	-0.2248* (1.77)
	Discount Rate			
	5%	10%	15%	20%
Real per-capita spending on tobacco control (*SPENDING*)	0.0004 (0.50)	0.0008 (0.79)	0.0014 (1.11)	0.0022 (1.44)
Constant	10.4208*** (23.99)	10.4727*** (24.00)	10.5321*** (24.06)	10.5940*** (24.17)
R-squared	0.95	0.95	0.95	0.95
Mean dependent variable	4.26	4.26	4.26	4.26
S.E. of regression	0.0830	0.0830	0.0829	0.0815
F-statistic	136.90	137.05	137.30	137.65
Observations	400	400	400	400

NOTES: *** significant 1% level (two-tailed test); ** significant at 5 level; * significant at 10 percent level; t-statistics in parentheses

ING_{it} is commonly used in the literature and $ADEQUACY_{it}$ measures CDC-defined funding adequacy. Data are obtained from a 2008 publication by the group Campaign for Tobacco-Free Kids. Cumulative measures of these variables are also examined to test whether differences in funding levels exert lagged effects on tobacco use over time and across states.

If states with relatively few smokers display less tolerance for smoking and therefore spend more on tobacco control, my econometric estimates of the effect of tobacco control spending will be inaccurate. Instrumental variable estimation is one method of dealing with this endogeneity problem and involves selection of a new variable that is both highly correlated with the independent variable in question (tobacco control spending) and also uncorrelated with all the other causes of smoking. Real state per-capita tobacco settlement funds MSA_{it} are used as an instrument for $SPENDING_{it}$ and $ADEQUACY_{it}$ because those funds should influence funding availability, but it is unlikely that those funds independently influence cigarette sales. (As a check for whether MSA_{it} is a weak instrument, we can determine whether the F-statistic exceeds 10 when testing the hypothesis that coefficients on all instruments are zero. In this case, the F-statistic for $SPENDING_{it}$ was 18.1, and for $ADEQUACY_{it}$ was 19.50, indicating that MSA_{it} is a good instrument.) Settlement revenues were based on a formula that included smoking-attributable state Medicaid expenses and, while the agreement did not dictate how funds were to be allocated, tobacco control advocates argued that states should use those funds to significantly expand tobacco control spending. Evidence, however, indicates that those funds often go toward closing state government deficits and costs associated with general health care programs. Tobacco settlement data are obtained from Orzechowski and Walker's book.

CONTEMPORANEOUS SPENDING AND ADEQUACY

Table 5 displays estimates of tobacco control spending on cigarette sales. Columns (1) and (2) display estimations with and without instruments for tobac-

co control spending, and columns (3) and (4) display estimations with and without instruments for adequacy. Price coefficients, which measure price elasticities, lie between -0.82 and -0.84 and are in line with the expectation that demand for cigarettes is price inelastic. Per-capita income is found to exert negative and significant influences on sales. Unemployment and smoking ban variables do not exert significant effects. Smuggling is found to exert the hypothesized negative effect on sales in all estimations except in column (1). Coefficients on both measures of tobacco control spending are all positive and significant. Positive coefficients run counter to CDC arguments that sales fall with higher spending. The implication is that higher contemporaneous spending raises cigarette sales, and this result is found for estimations with and without instrumental variables.

At least two possibilities might explain positive coefficients on spending and adequacy measures:

- A "James Dean" effect might exist whereby spending on tobacco control raises social taboos against smoking and then (perversely) causes more smoking. There is some evidence that this happens with younger smokers following the introduction of smoking bans.
- More likely, specification error may exist when effects of spending on sales are longer-lived than the contemporaneous relation in Table 5. Tables 6 and 7 show that cumulative effects of spending and adequacy on sales are estimated to be either negative or zero, and so positive coefficients in Table 5 are likely the result of specification error.

It is also apparent that t-values associated with spending and adequacy coefficients are lower in instrumental value estimations. This commonly occurs because standard errors are biased downward in ordinary least squares estimations when endogeneity is present. This suggests that endogeneity is a problem and so only instrumental variable estimation of cumulative effects from spending and adequacy are displayed in the following tables.

Table 7

Cumulative Spending, CDC Recommendations, and Cigarette Sales

Effects of cumulative adequacy on cigarette sales with instrumental variable for adequacy of spending

	(1)	(2)	(3)	(4)
Real price per pack (*PRICE*)	-0.7956*** (9.47)	-0.7939*** (9.40)	-0.7941*** (9.34)	-0.7965*** (9.31)
Per-capita income (*PCY*)	-2.61E-05*** (5.03)	-2.72E-05*** (5.28)	-2.82E-05*** (5.56)	-2.93E-05*** (5.86)
Unemployment (*UE*)	-0.0044 (0.55)	-0.0040 (0.50)	-0.0034 (0.43)	-0.0027 (0.34)
State-wide smoking ban in restaurants (*BAN*)	0.0199 (1.09)	-0.0213 (1.16)	-0.0227 (1.24)	-0.0240 (1.31)
Ratio of in-state price to border states' prices (*SMUG*)	-0.1933 (1.52)	-0.2027 (1.60)	-0.2106* (1.66)	-0.2163* (1.71)
	Discount Rate			
	5%	**10%**	**15%**	**20%**
Tobacco control spending as percentage of CDC minimums (*ADEQUACY*)	-0.0001** (2.22)	-0.0001* (1.94)	-0.0001 (1.64)	0.0001 (1.30)
Constant	9.9678*** (23.08)	9.9985*** (22.98)	10.0418*** (22.91)	10.0962*** (22.91)
R-squared	0.95	0.95	0.95	0.95
Mean dependent variable	4.26	4.26	4.26	4.26
S.E. of regression	0.0824	0.0826	0.0827	0.0829
F-statistic	138.84	138.37	137.91	137.50
Observations	400	400	400	400

NOTES: *** significant 1% level (two-tailed test); ** significant at 5 level; * significant at 10 percent level; t-statistics in parentheses

SPENDING AND ADEQUACY

Table 6 displays estimations of cumulative control spending on cigarette sales with four alternative discount rates. Prices and income exert significant and negative effects in all four estimations, and effects of unemployment and smoking bans (except in column 4 where it is weakly significant and negative) cannot be distinguished statistically from zero. Smuggling exerts weakly significant and negative effects in all estimations. Cumulative spending measures exert no significant effects on sales in all estimations. Again, evidence does not support CDC claims that states that spend more will also have less tobacco use.

Table 7 displays estimations based on measures of cumulative spending adequacy. Effects from price, income, and unemployment mirror those of the previous table. Although smoking bans exerted negative and weakly significant effects in one instance in the previous table, it never exerts a significant effect in Table 7. Smuggling exerts significant and negative effects only when adequacy measures are discounted at 15 and 20 percent; it exerted negative effects in all estimations of the previous table. Spending adequacy exerts negative and significant effects when discounted at 5 and 10 percent. No effects are found when adequacy measures are discounted at 15 and 20 percent. Therefore, there is some support for CDC claims concerning funding adequacy when this measure is discounted at rates of 5 and 10 percent, but not at rates of 15 and 20 percent.

It is also worth noting that the effects of funding adequacy discounted at a 5 percent rate are statistically significant at the 95 percent confidence level, and at the 90 percent confidence level when funding adequacy is discounted at a 10 percent rate. In this log-linear specification, estimated coefficients of -0.0001 on funding adequacy at discount rates of

5 and 10 percent can be interpreted as unit changes in the cumulative value of adequacy associated with a 100 * -0.0001 percent change in taxed cigarette sales. Taxed sales fall by 0.011 percent for each additional unit. Based on average taxed sales in 2007 of 68 packs per capita, an additional unit rise in *ADEQUACY* would lower annual sales by 0.68 packs per capita. This estimate suggests economic effects are trivial.

CONCLUSIONS

Empirical evidence does not generally support the CDC claim that states that spend more on tobacco control deter more tobacco use than states that spend less. Contemporaneous spending on tobacco control is never found to exert an inverse effect on sales, and at times is found to exert a significant and positive effect on sales, contrary to the claims of the CDC. The true effect, however, appears to be zero based on current and past spending discounted at various rates. There is limited support for CDC claims regarding its recommendations on funding adequacy when this spending measure is discounted at rates of 5 and 10 percent, but not at rates of 15 and 20 percent. When significant, however, these effects arise at fairly low levels of confidence and with trivial effects on cigarette sales, and therefore suggest very cautious support for the CDC recommendations concerning adequacy. These conclusions are based on a battery of tests that consider various measures of contemporaneous and past spending and adequacy and are conducted over an eight-year period in which over $5 billion (in 2005 dollars), or roughly $18 per capita, was spent on tobacco control.

This study raises questions about the process by which the CDC determines its spending recommendations and whether the process is designed to reach a particular conclusion about tobacco control policy rather than to uncover policies that may best allocate resources toward controlling tobacco use. There may be a similarity to what I noted in a 2008 *Econ Journal Watch* paper on why the CDC and various researchers conclude that indoor smoking bans exert either positive or no adverse economic effects on restaurants and bars when, in fact, published studies demonstrate that numbers of businesses harmed are not zero. Factors include biases by governments and researchers that favor government solutions to perceived smoking problems, ample funding for researchers that conclude that bans exert no economic harm, simply ignoring industry-funded research that indicates some degree of harm, and tacit agreement between many researchers to not openly scrutinize the quality of colleagues' published research on this topic. It would be interesting to explore whether any of those factors might be influencing the policy process whereby the CDC makes spending recommendations regarding tobacco control. Those factors might also explain why the CDC is not compelled to demonstrate the effectiveness of its recommendations. R

Readings

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