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First-Year Impact of the 1989 California Cigarette Tax Increase on Cigarette Consumption

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Introduction

With the passage of the voter-initiated California Proposition 99, the state excise tax on cigarettes was increased by 25 cents per package, effective January 1, 1989.¹ Although the initiative earmarked a percentage of the new revenues for tobacco use control, medical care, and tobacco-related research,² excise taxes have also been recognized as having potential public health benefits by reducing cigarette consumption.³⁻⁷ The purpose of this study was to estimate the impact of the 1989 tax increase on cigarette consumption in California.

Methods

Cigarette consumption data were derived from state government records of cigarette excise tax revenues.⁸ Quarterly adult per capita consumption was computed by dividing the total number of packs of cigarettes taxed by the estimated population over age 17. Quarterly estimates of the adult population were interpolated from yearly estimates published by the US Census Bureau.^{9,10} Quarterly prices for cigarettes were interpolated from annual (November) estimates¹¹ and adjusted for inflation.

A quasi-experimental multiple time series design was used to analyze consumption data from 1980 through the end of 1990. This period offers a relatively stable baseline against which extraneous effects can be quantified. Consumption data from California and the United States were first plotted to visually assess any change in the consumption trends. Time-series regression analyses were conducted to assess the size and significance of the impact of the tax increase. The regression

models controlled for the influence of changes in the real price of cigarettes, and for other factors known to influence cigarette distribution and sales. Because of multicollinearity among the predictor variables, three alternative regression models were used: (1) an ordinary least squares (OLS) model with all relevant variables included; (2) an OLS model with an extraneous, prespecified coefficient for the real price of cigarettes; and (3) a ridge regression model with all relevant variables included. The extraneous price coefficient in the second model was based on a -0.4 price elasticity of demand for cigarettes and for consumption and price levels just prior to the tax increase.

Results

Quarterly per capita consumption trends from 1980 to 1990 for California and for all other states combined are plotted in Figure 1. Immediately apparent are the overall lower consumption rate in Califor-

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Editor's Note. See related editorial on p 785 of this issue.

ABSTRACT

We employed a time series design to evaluate the impact of the 1989 California cigarette tax increase on cigarette consumption in California. Adult per capita consumption data from 1980 to 1990 were analyzed for California and the United States. Trend data indicated a sharp drop in California cigarette consumption coincident with the tax increase. Time-series regression analyses support this observation, and suggest that a 5% to 7% decline in consumption is attributable to the tax increase. (*Am J Public Health.* 1992;82:867-869)

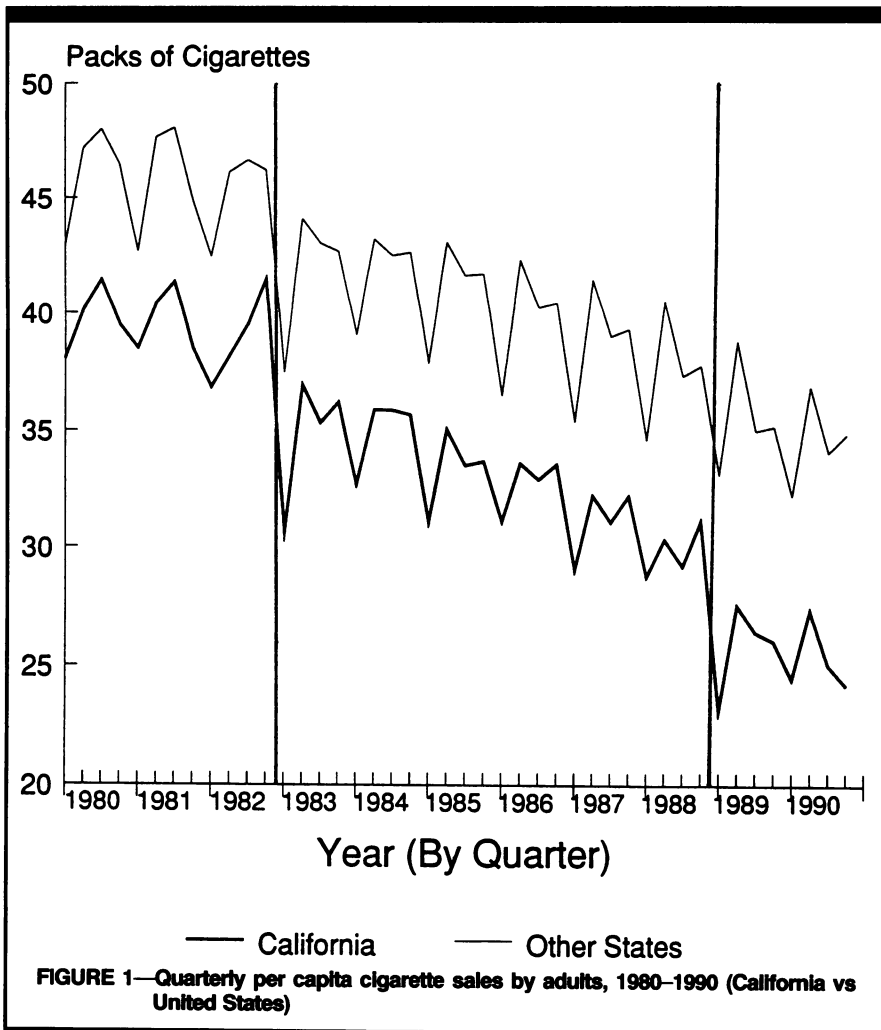


TABLE 1—Annual Percentage Decline in Adult per Capita Cigarette Consumption for California and Other States, 1983–1990

	California	Other States
Years before 1989		
1983 to 1984	0.93	1.11
1984 to 1985	4.99	1.86
1985 to 1986	1.56	2.91
1986 to 1987	5.10	2.77
1987 to 1988	4.27	3.16
Mean	3.40	2.44
Year of tax increase		
1988 to 1989	9.30	5.38
Years after 1989		
1989 to 1990	4.30	2.88

Note. Annual percentage declines were computed by averaging the declines for each quarter over the entire year. Quarters immediately before or after the 1983 federal tax increase and (for California) the 1989 tax increase were excluded from calculations.

nia than in all other states, the seasonal patterns by quarter, and a general downward trend in consumption. The 1983 federal tax increase and the 1989 California tax increase are indicated by vertical reference lines. There was a noticeable decline in consumption, which appears to be perma-

nent, at the time of the federal tax increase. As expected, the California tax increase apparently affected consumption at a time exactly coincident with the implementation of the increased tax. Positive pretax and negative posttax consumption spikes, presumably due to stockpiling, are appar-

ent for California and the United States in 1983, and for California in 1989.

The average decline in consumption from 1988 to 1989 was 9.3%, whereas the average yearly decline in the 5 years prior to the tax increase was 3.4% (Table 1). Assuming that the pretax rate of decline would have continued in the absence of the tax increase, the excess drop in consumption following the tax increase may be estimated as the difference between the two rates, or 5.9%. The decline in other states was also somewhat larger than observed in previous years and may be due to sizable tax increases in several other large states.

Table 2 presents the results of the three regression models for predicting quarterly adult per capita consumption in California. The main variable of interest is CALTAX, the dummy variable representing all quarters subsequent to the California tax increase. The coefficients for this variable estimate the overall drop in quarterly per capita consumption coincident with the 1989 California tax increase, when other known effects on cigarette consumption are controlled. The first two models produce very consistent parameter estimates; the third model produces a somewhat larger estimate. Taken together, the results suggest that a drop in per capita consumption of between about 1.5 and 2.0 packs per capita (quarterly) may be attributed to, or is at least coincident with, the 1989 tax increase. This translates to a 5% to 7% drop in per capita consumption from the 1988 level. When similar models were run for all other states combined, no statistically significant effect for CALTAX was found.

Discussion

The present analysis supports the conclusion that the implementation of the 1989 cigarette excise tax increase in California did have a significant impact on adult per capita cigarette consumption as approximated by tax-paid sales. The 5% to 7% decline in consumption derived from the regression models was consistent with the unadjusted trend data. Because the regression models control for the influence of the real price of cigarettes and base the estimated effect on all quarters subsequent to the tax increase, they appear to provide a more valid method for estimating the impact of the tax increase.

An issue that cannot be entirely resolved with the available data concerns the long-term effects of the tax increase. Although the regression models assume a one-step, permanent drop in consump-

tion, the long-term impact of the tax increase is uncertain. Even with additional data, estimating long-term effects is tenuous because of potential confounding forces, such as price, public education, and societal trends, that also influence changes in smoking behavior.

It is possible that the true impact of the California tax increase is slightly lower than the rate of 5% to 7% suggested by this study. Consumption trends in neighboring states indicate that a small percentage of the decline in California may be due to increased interstate bootlegging. Also, although not statistically significant, the unusually large decline in consumption between 1988 and 1989 in other states suggests that other influences besides the tax increase may also have been operative in California.

The estimated impact of the 1989 tax increase represents a price elasticity of between -0.25 and -0.35 and is somewhat less than previous studies on the price elasticity for cigarettes would have predicted. As the social acceptability of smoking continues to wane, smokers may be increasingly resistant to efforts that encourage cessation, including price increases. Thus, a broad array of educational strategies and policy mechanisms will be required to ensure that progress toward a smoke-free society is maintained. (The full report, containing a detailed description of the analytic method and results, is available from the authors upon request.) □

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TABLE 2—Regression Coefficients for Predicting Quarterly Adult per Capita Cigarette Consumption in California and Other States, 1980–1990

Variable ^a	Model		
	Full	Extraneous REALPC ^b	Ridge ^c
CALTAX ^d	-1.46**	-1.50**	2.08
REALPC	-0.11*	(-0.10)	-0.15
UAR	-0.24***	-0.25***	-0.15
Q2DUM	2.86***	2.86***	2.21
Q3DUM	2.62***	2.62***	1.53
Q4DUM	2.53***	2.53***	1.27
PREFED	3.86***	3.85***	3.64
POSTFED	-3.28**	-3.36***	-2.70
PRETAX	1.40	1.39	0.49
POSTTAX	-2.22*	-2.18*	-2.86
F ²	.98	.97	...
Durbin-Watson	2.53	2.52	...

^aCALTAX is the dummy variable indicator for all quarters since January 1, 1988; REALPC is the estimated real price of cigarettes (excluding the 25-cent increase due to the 1989 tax increase); QUARTER is the quarter number (starting with the first quarter of 1980), used to capture the overall downward linear trend in consumption; Q2DUM, Q3DUM, and Q4DUM are dummy indicators for second, third, and fourth quarter of each year to control for seasonal variation in wholesale distributions; and PREFED, POSTFED, PRETAX, and POSTTAX are dummy variables to capture the pre- and posttax increase sales spikes associated with the 1983 federal and 1989 state excise tax increases.

^bExtraneous REALPC model is an OLS model with an extraneous, prespecified coefficient for the real price of cigarettes (based on -0.4 price elasticity and for consumption and price levels just prior to the tax increase).

^cParameter estimates for $k = .30$.

^dFor each model, the coefficient for the variable CALTAX reflects the average sustained change in quarterly adult per capita consumption associated with the 1989 tax increase.

* $P < .05$; ** $P < .01$; *** $P < .001$. (Significance levels not available for ridge regression models.)