

Homework 3

Research in Health Economics, Spring 2025

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My answers in the following file. Check out my repository [here](#).

Summarize the Data

Question 1

Present a bar graph showing the proportion of states with a change in their cigarette tax in each year from 1970 to 1985.

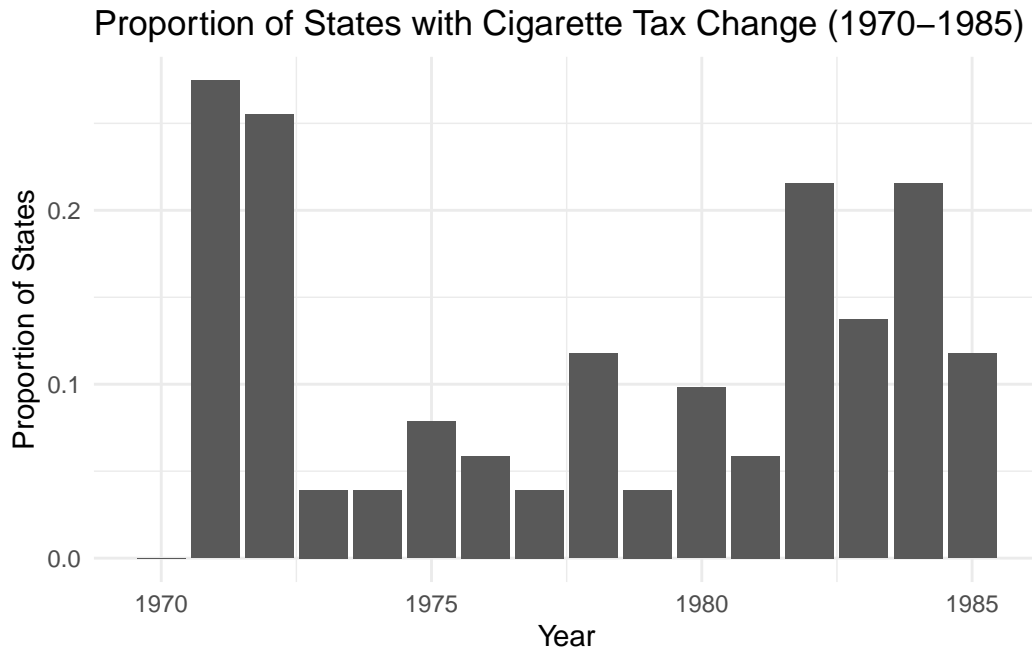


Figure 1

Question 2

Plot on a single graph the average tax (in 2012 dollars) on cigarettes and the average price of a pack of cigarettes from 1970 to 2018.

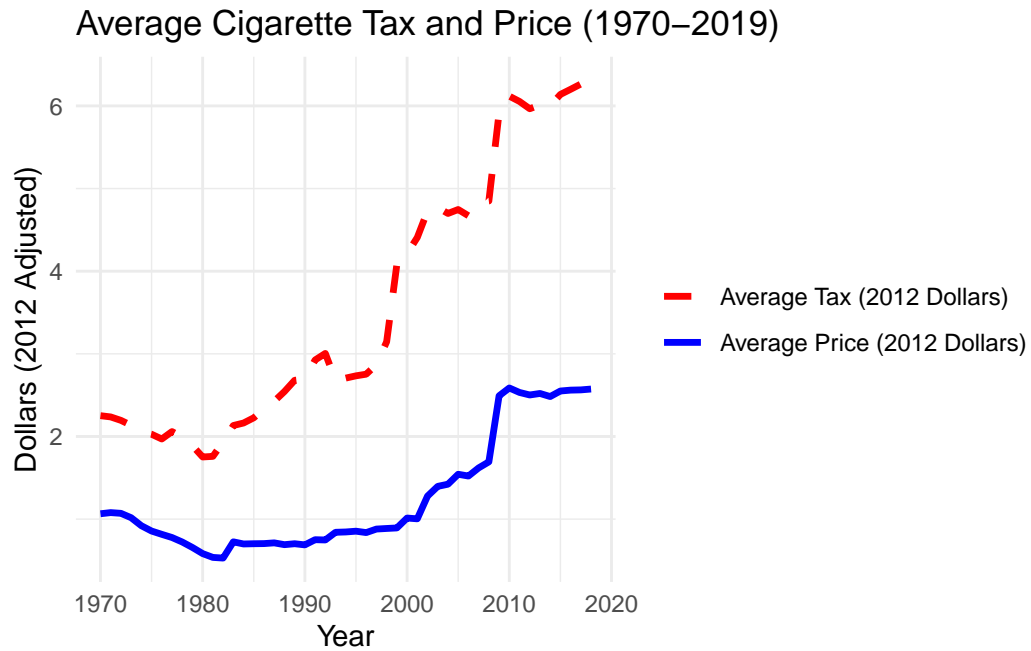


Figure 2: Average Tax and Price on Cigarettes (in 2012 dollars)

Question 3

Identify the 5 states with the highest increases in cigarette prices (in dollars) over the time period. Plot the average number of packs sold per capita for those states from 1970 to 2018.

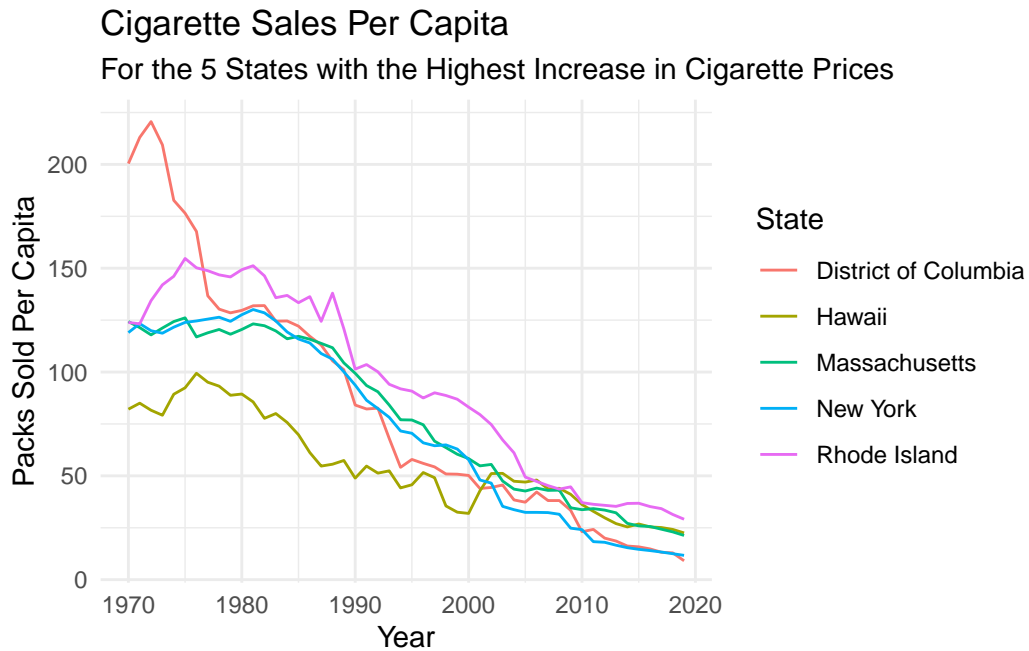


Figure 3: Average Cigarette Sales per Capita for the 5 States with Highest Price Increases

Question 4

Identify the 5 states with the lowest increases in cigarette prices over the time period.
Plot the average number of packs sold per capita for those states from 1970 to 2018.

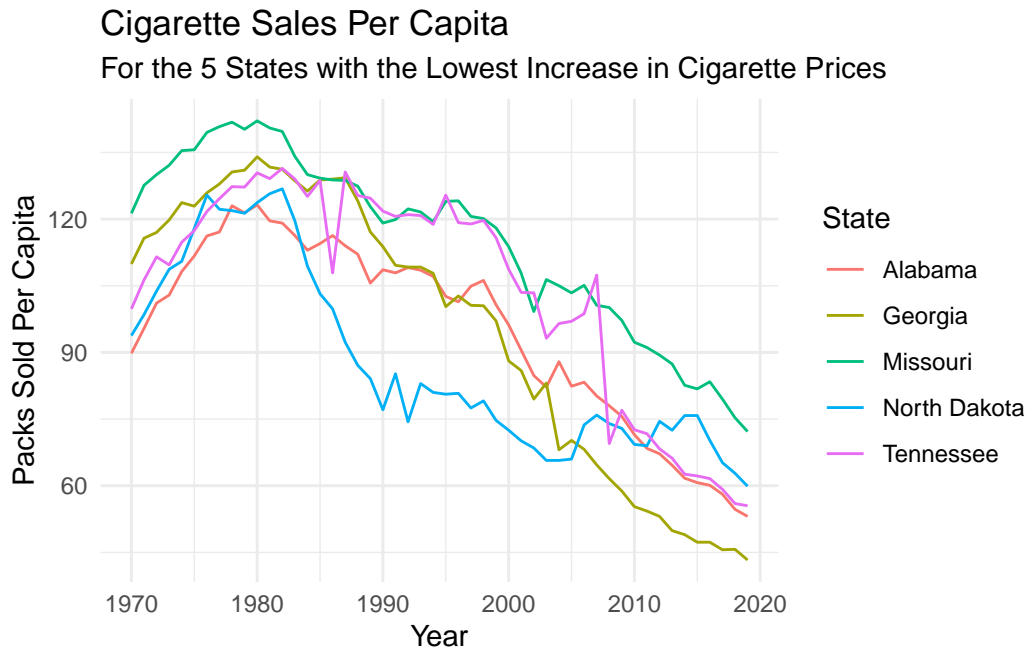


Figure 4: Average Cigarette Sales per Capita for the 5 States with Lowest Price Increases

Question 5

Compare the trends in sales from the 5 states with the highest price increases to those with the lowest price increases.

Here, the biggest trend we see is that the average packs per capita for all states has been generally decreasing over time. For the states with the highest price increases, seen in question 3, the number of packs sold has decreased more significantly than those in the states with the lowest increases in cigarette prices.

Estimate ATEs

Table 1: Elasticity Estimates from OLS and IV

	1970-1990		1991-2015	
	OLS	IV	OLS	IV
<i>Estimates</i>				
Log Price	-0.809 (0.038)	-0.796 (0.071)	-0.997 (0.025)	-1.150 (0.028)
N	1,071	1,071	1,275	1,275
R2	0.294	0.294	0.561	0.548
<i>Reduced Form</i>				
Log Tax		-0.207 (0.021)		-0.591 (0.013)
N		1,071		1,275
R2		0.082		0.607
<i>First Stage</i>				
Log Tax		0.260 (0.012)		0.514 (0.007)
N		1,071		1,275
R2		0.290		0.812

Question 6: Focusing only on the time period from 1970 to 1990, regress log sales on log prices to estimate the price elasticity of demand over that period. Interpret your results.

Looking at the results shown in the figure above, a -0.809 OLS estimate is noted for the log price in the 1970-1990 time period. The estimated coefficient on log price represents the price elasticity of demand. Thus, a coefficient of -0.809 (OLS) means that a 1% increase in price is associated with a 0.809% decrease in sales.

Question 7: Again limiting to 1970 to 1990, regress log sales on log prices using the total (federal and state) cigarette tax (in dollars) as an instrument for log prices. Interpret your results and compare your estimates to those without an instrument. Are they different? If so, why?

The instrumental variable (IV) estimate for the time period of 1970-1990 is -0.796. The IV estimate of -0.796 suggests a similar elasticity when accounting for potential endogeneity in price setting. The slightly smaller magnitude of the IV coefficient (-0.796 vs -0.809) suggests that OLS may slightly overestimate the price elasticity, though the difference is minor. However, overall, using cigarette tax as an instrument for price does not substantially change the estimated price elasticity of demand for cigarettes in 1970-1990.

Question 8:

Show the first stage and reduced-form results from the instrument.

See table above

Question 9

Repeat questions 1-3 focusing on the period from 1991 to 2015.

The OLS estimate for log price is -0.997 and the IV estimate for log price is -1.150. The OLS estimate (-0.997) suggests that a 1% increase in price is associated with a 0.997% decrease in cigarette sales, indicating unit elasticity (which means an elasticity of around 1). The IV estimate (-1.150) is more elastic, suggesting that when using cigarette tax as an instrument, a 1% price increase leads to a 1.15% decrease in sales, making demand slightly elastic. Both estimates are highly statistically significant, as indicated by small standard errors.

Question 10

Compare your elasticity estimates from 1970-1990 versus those from 1991-2015. Are they different? If so, why?

The demand for cigarettes became more sensitive to price changes from 1970-1990 to 1991-2015. In the earlier period, the estimates (-0.809 and -0.796) show that a 1% price increase led to about a 0.8% drop in sales, with little difference between methods. In the later period, the IV estimate (-1.150) was larger than the OLS estimate (-0.997), meaning smokers reacted more strongly to price increases. This change is likely due to more awareness of smoking's health risks, stricter laws, and more alternatives like e-cigarettes, making price a bigger factor in people's decisions to smoke.