

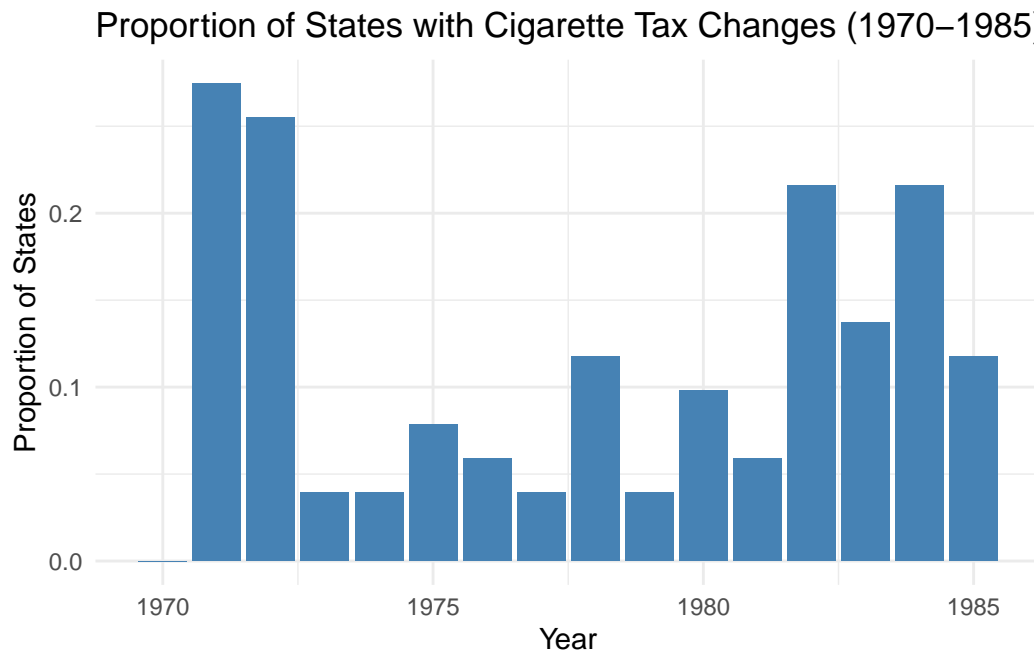
# Homework 3

Research Methods, Spring 2025

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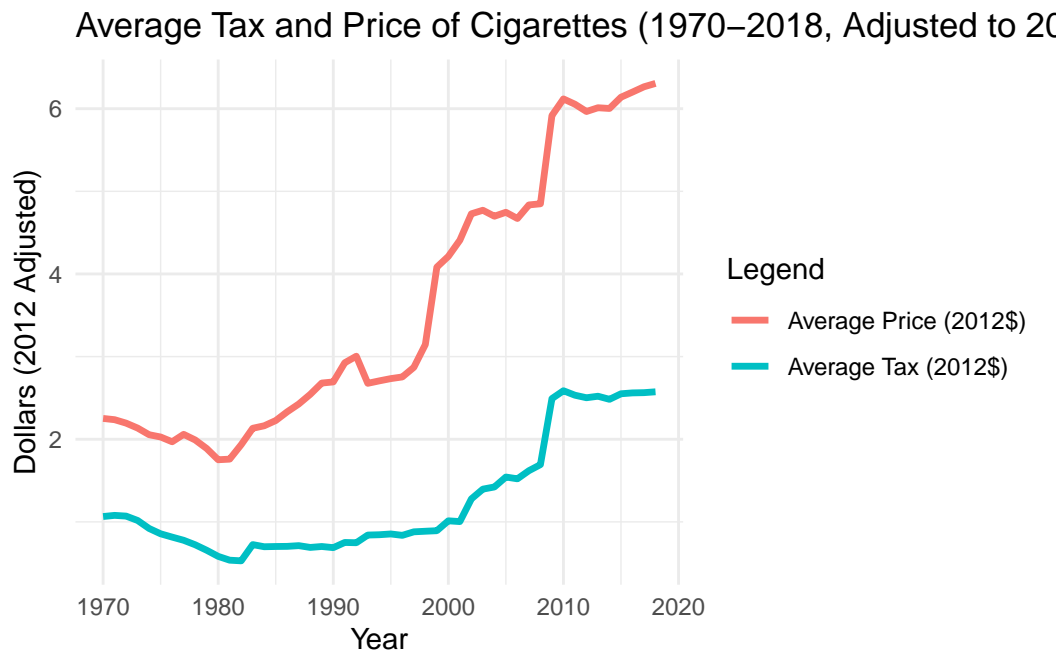
My answers to the homework questions are described below. The GitHub repository for this work is available [here](#). Enjoy!

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

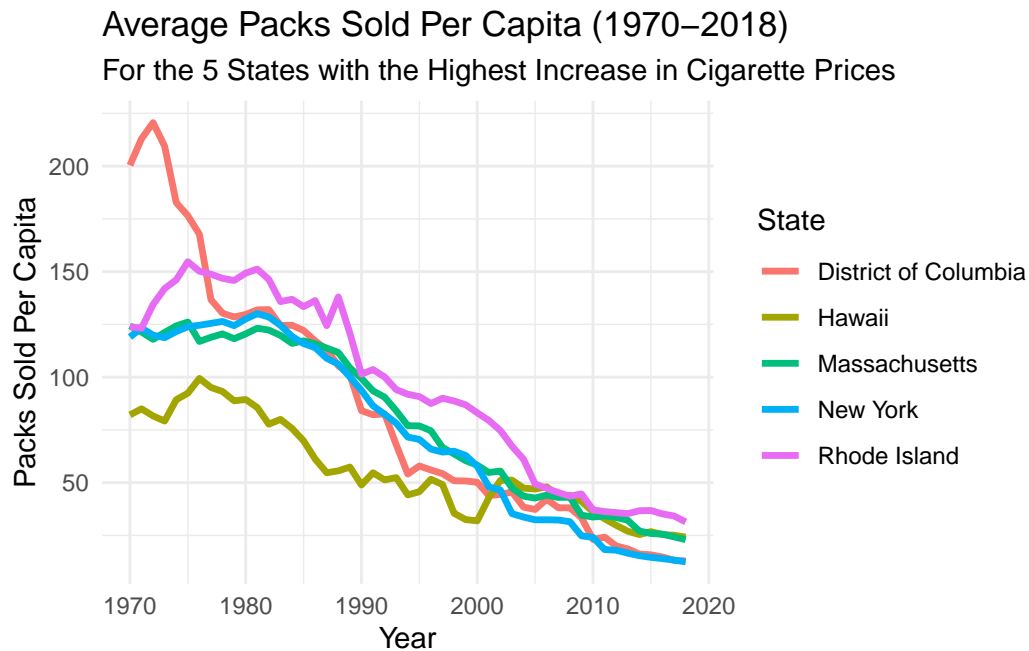


**2. Plot on a single graph the average tax (in 2012 dollars) on cigarettes and the average price of a pack of cigarettes from 1970 to 2018.**

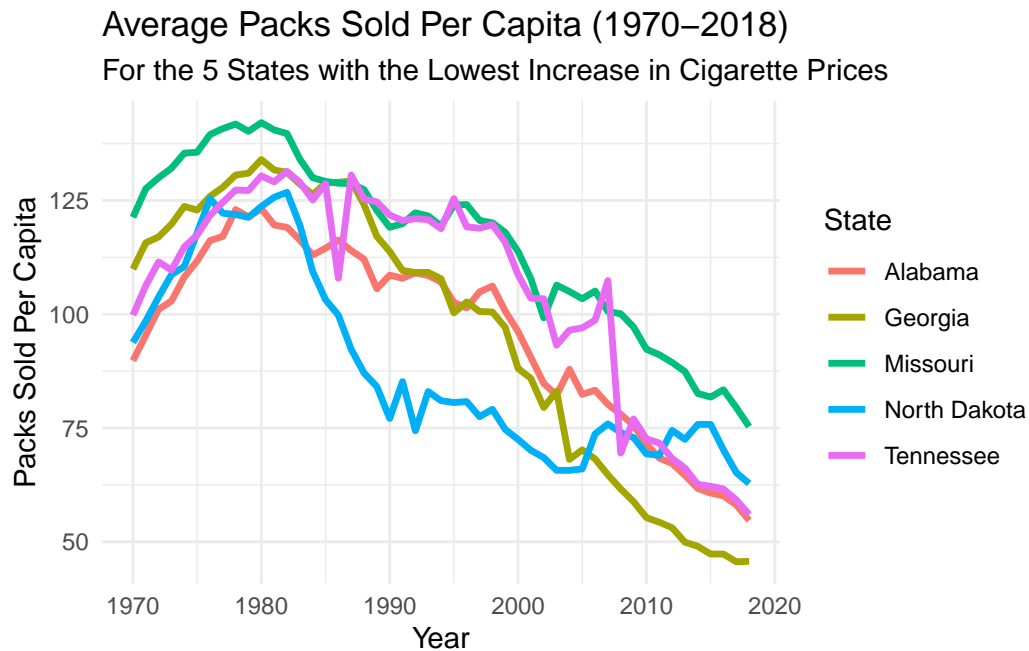
Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.  
i Please use `linewidth` instead.



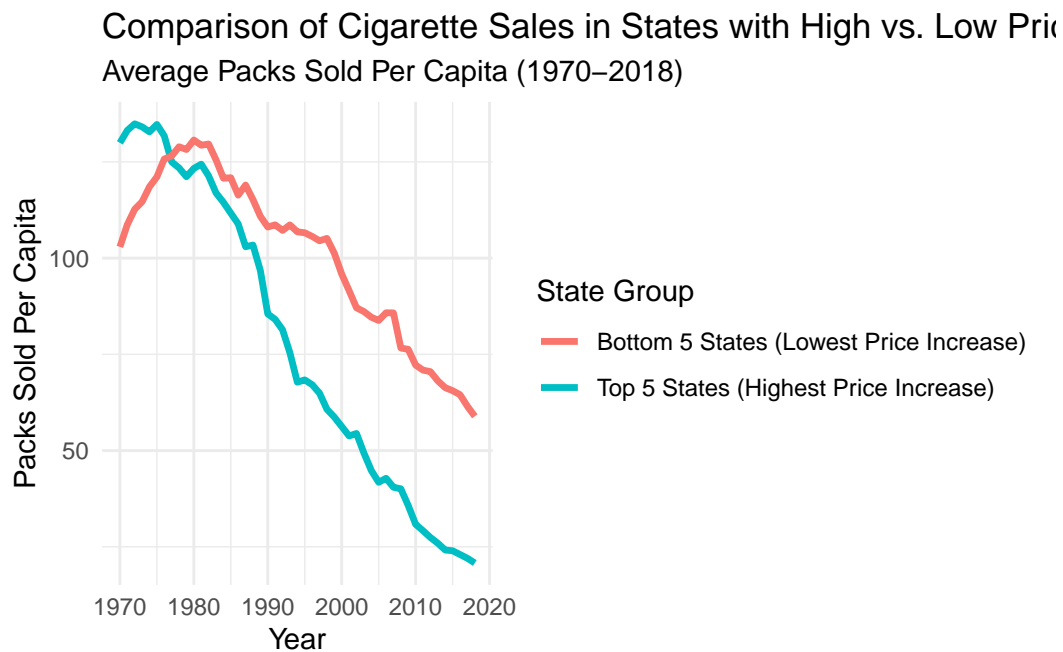
**3. Identify the 5 states with the highest increases in cigarette prices (in dollars) over the time period. Plot the average number of packs sold per capita for those states from 1970 to 2018.**



**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.**



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



**6-9. The estimates for the regressions run in questions 6-9 are shown in the table below.**

	**1970–1990**		**1991–2015**	
	**Elasticity Estimates**			
	OLS	IV	OLS	IV
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
R <sup>2</sup>	0.294	0.294	0.561	0.548
Log Tax		-0.207 (0.021)		-0.591 (0.013)
N		1,071		1,275
R <sup>2</sup>		0.082		0.607
Log Tax		0.260 (0.012)		0.514 (0.007)
N		1,071		1,275
R <sup>2</sup>		0.290		0.812

Interpretation from Question 6: Based on this regression, we conclude that the demand for cigarettes is inelastic. A 1% increase in price would result in a 0.81% decrease in sales.

Interpretation from Question 7: Based on the IV estimate, a 1% increase in price would result in a 0.796% decrease in sales. This estimate is very similar to the estimate yielded from OLS regression, indicating that in this time period, price wasn't affected by much else besides tax, making our Log Tax instrument strong.

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

Based on these estimates, demand for cigarettes was more elastic in the 1991-2015 time period than between 1970 and 1990, with a 1% price increase leading to a 0.997% decrease in sales. This trend is also true of the tax increases. The reduced form estimate shows that a 1% increase in cigarette tax reduced sales by 0.207% in 1970–1990, but by 0.591% in 1991–2015. The difference in elasticity estimates between the two time periods could be due to a growing public awareness of the health risks of smoking, making consumers more responsive to price changes.