Homework 3

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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.

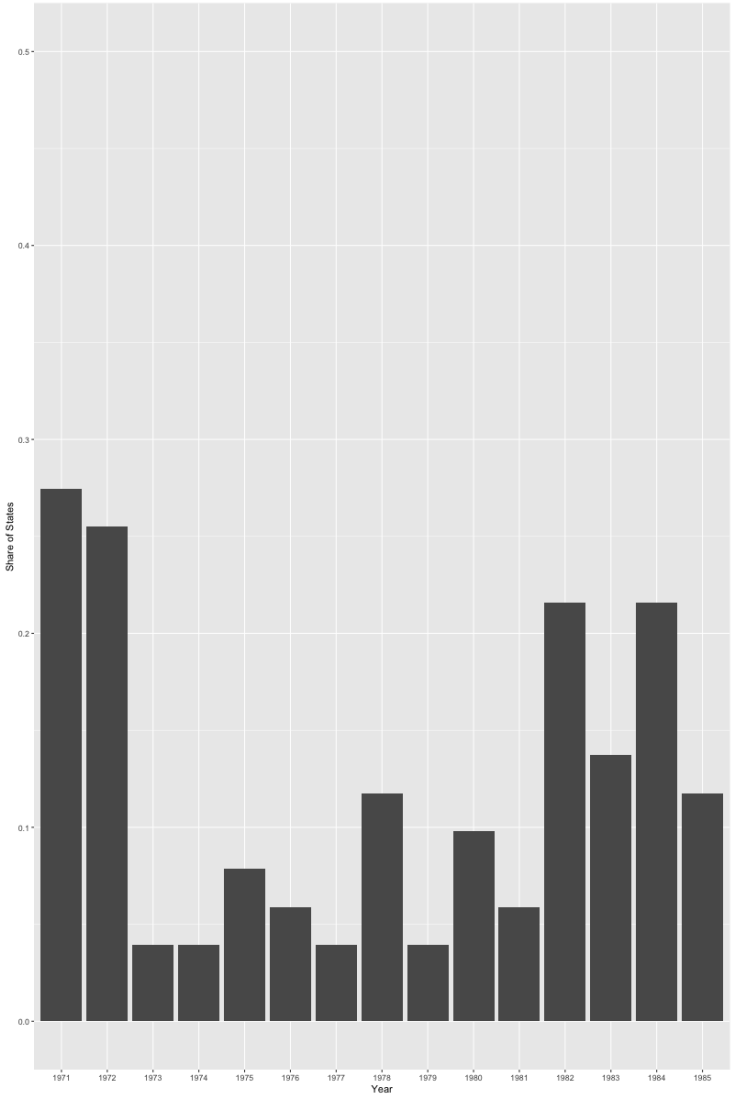

Figure 1: Proportion of states with cigarette tax changes (1970-1985).

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.

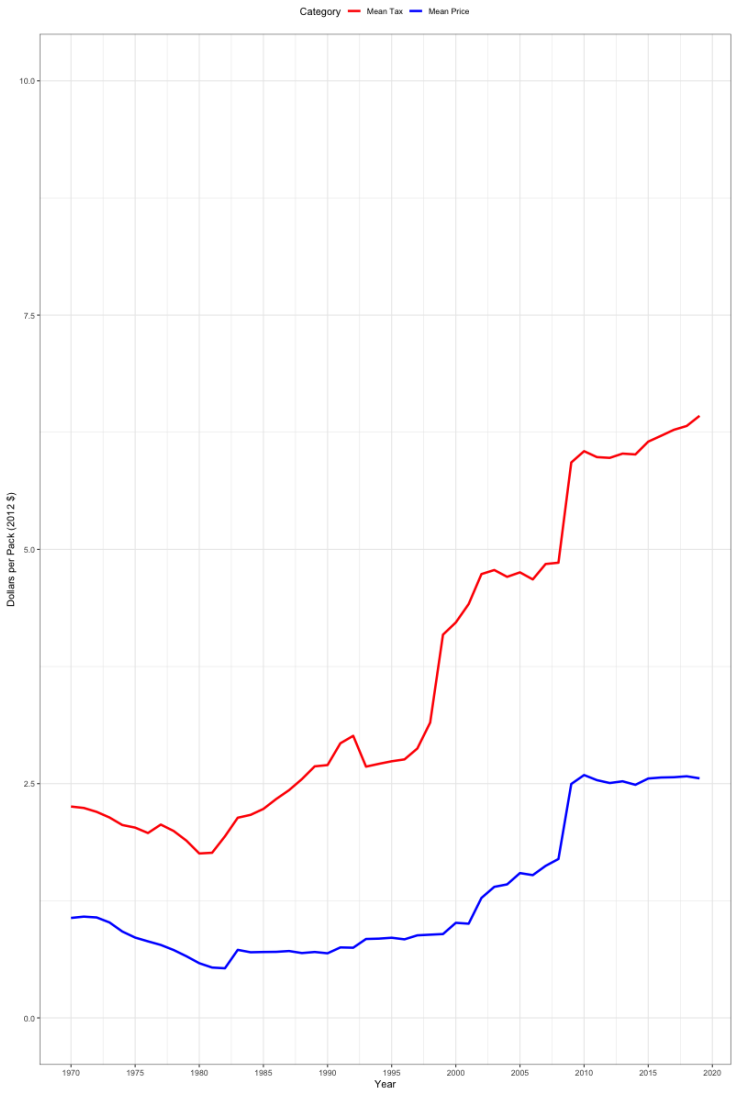

Figure 2: Average cigarette tax and price (1970-2018).

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.

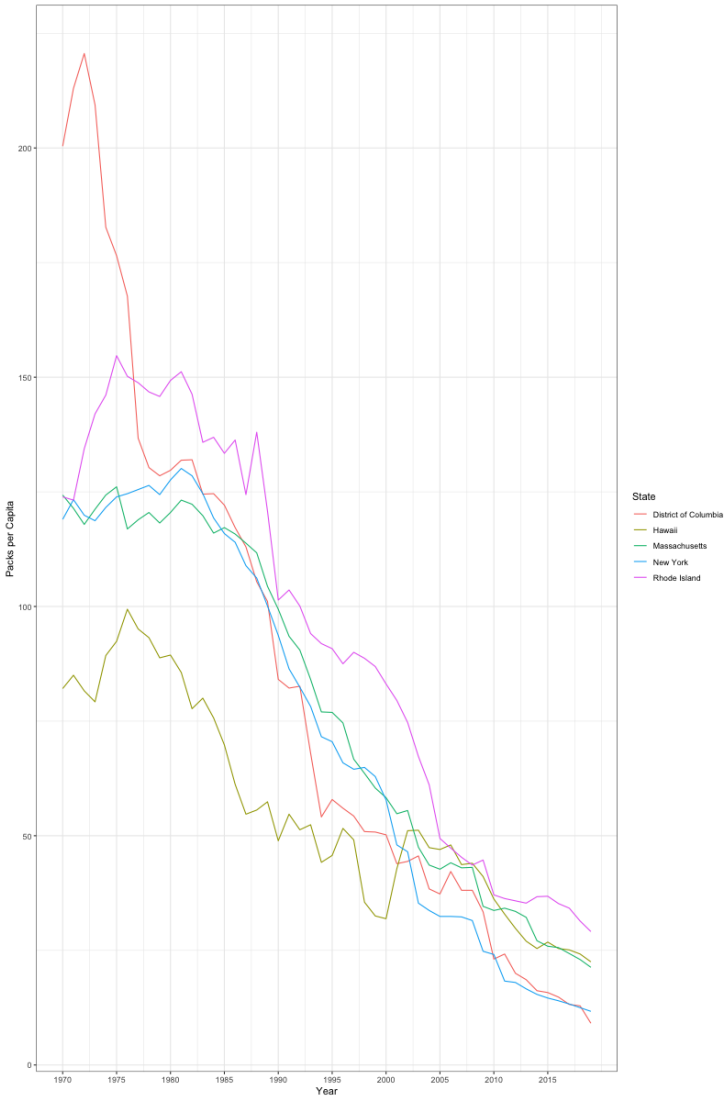

Figure 3: Cigarette sales per capita for top 5 states with highest price increases.

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.

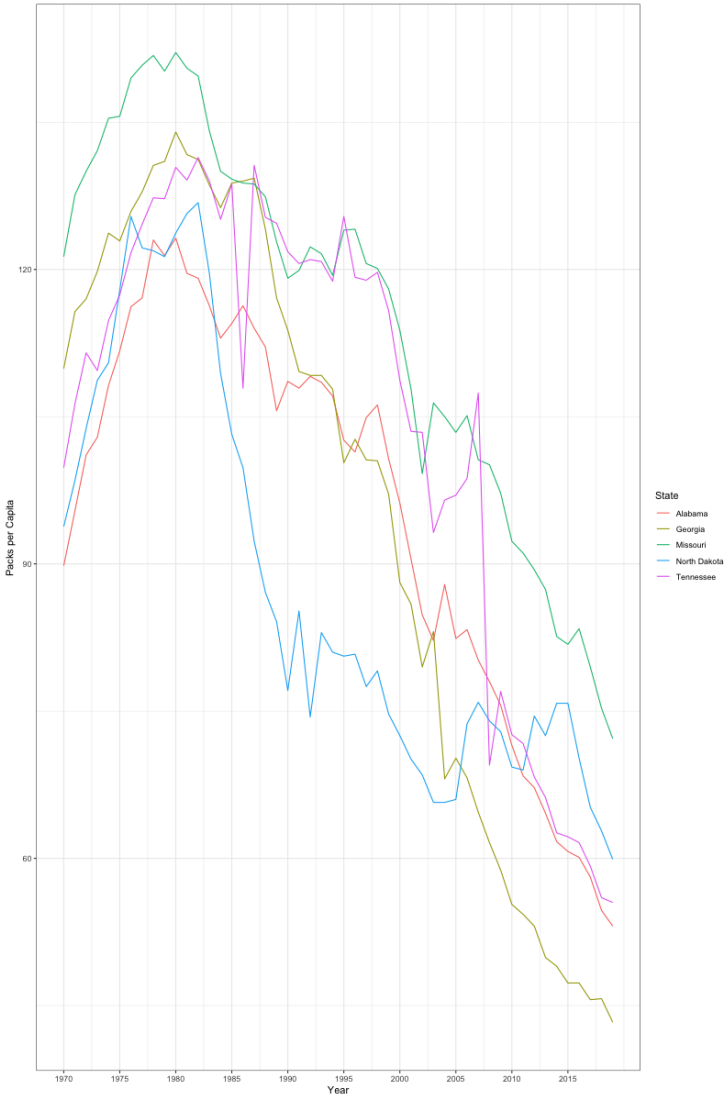

Figure 4: Cigarette sales per capita for top 5 states with lowest price increases.

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

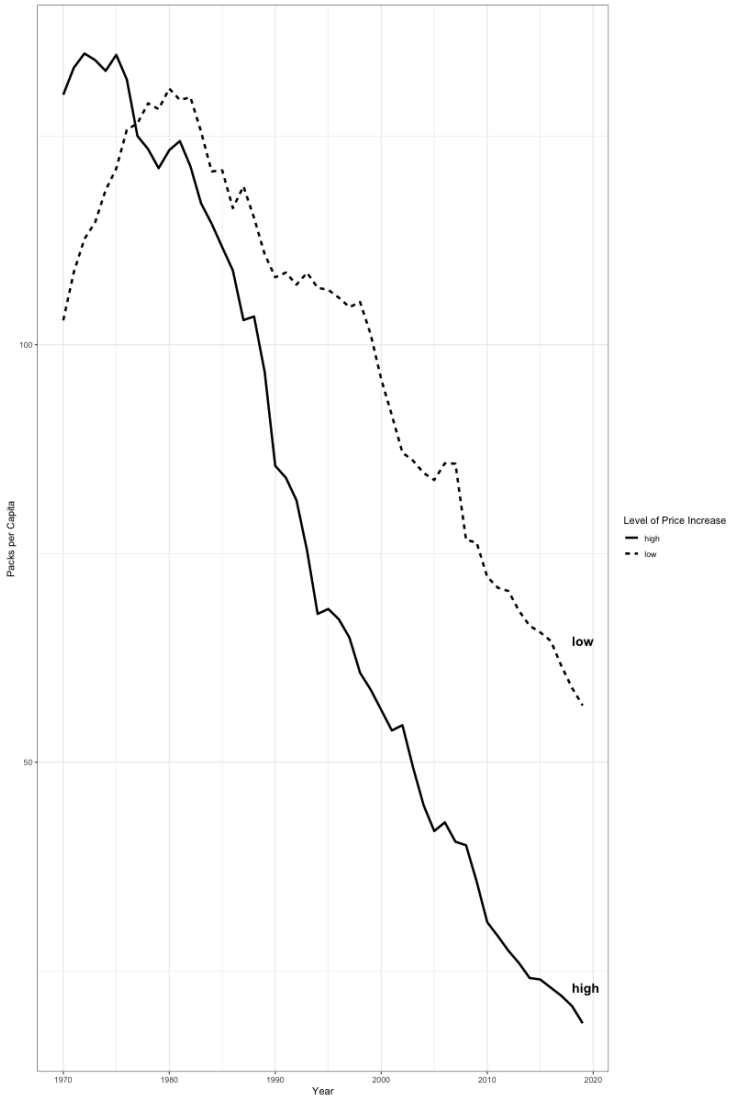

Figure 5: Comparison of cigarette sales trends: Highest vs. lowest price increases. The high prices have a steeper change from 1970 to 2020 compared to the low prices.

Estimate ATEs

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.

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?

Question 8: Show the first stage and reduced-form results from the instrument.

Question 9: Repeat questions 1-3 focusing on the period from 1991 to 2015.

	1970 - 1990		1991 - 2015	
	OLS	IV	OLS	IV
Estimates				
Log Price	-0.809		-0.998	
	(0.038)		(0.026)	
Fitted Log Price		-0.796		-1.158
		(0.071)		(0.029)
R2	0.29	0.29	0.55	0.54
Reduced Form				
Log Tax		-0.207		-0.590
		(0.021)		(0.014)
R2		0.08		0.60
First Stage				
Log Tax		0.260		0.509
		(0.012)		(0.007)
R2		0.29		0.81

Figure 6: Answers to Questions 6 through 9. Interpretation: From 1970 to 1990, the price elasticity of demand for cigarettes was around -0.81 using OLS and -0.80 using IV, meaning a 1 percent increase in price led to about an 0.8 percent drop in sales. From 1991 to 2015, demand became even more sensitive, with elasticity estimates of -1.00 (OLS) and -1.16 (IV). Taxes had a stronger effect on both prices and sales in the later period, likely because of stronger tobacco regulations and changing attitudes about smoking.

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

- Cigarette demand became more elastic over time as seen in both OLS and IV estimates.
- The IV estimates are consistently larger in magnitude, suggesting that OLS underestimates price elasticity due to potential endogeneity.
- The demand shift may be explained by stricter regulations, increased health awareness, and availability of smoking alternatives.
- Higher taxes, smoking bans, and advertising restrictions made consumers more price-sensitive.
- Growing knowledge about smoking risks likely increased demand elasticity.
- The rise of vaping, nicotine patches, and other alternatives contributed to higher elasticity.