

Homework 3

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Here is the link to my GitHub Repository: <https://github.com/kpollard8/Homework3>

Here are my answers for Homework 3. I do the coding in a separate R script, but here is the cleaned-up version. I run the analysis separately, save the workspace with only the summary stats, figures, and tables that I need, and then load the workspace in the final qmd. My analysis file with answers and code to all the questions is available in the analysis folder.

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

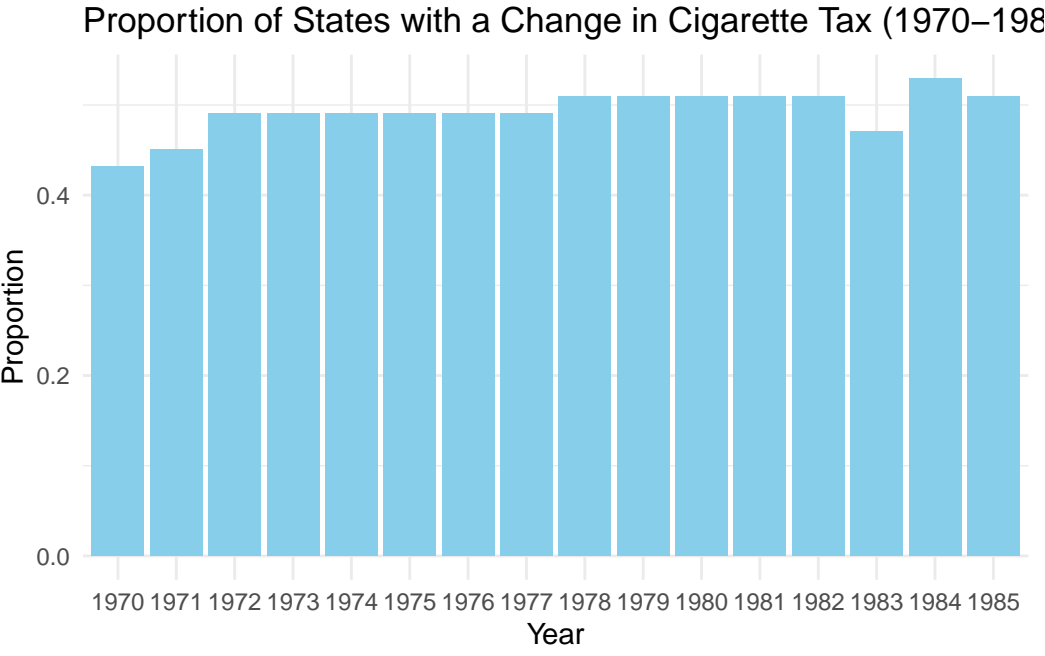


Figure 1: Question 1 Graph

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.

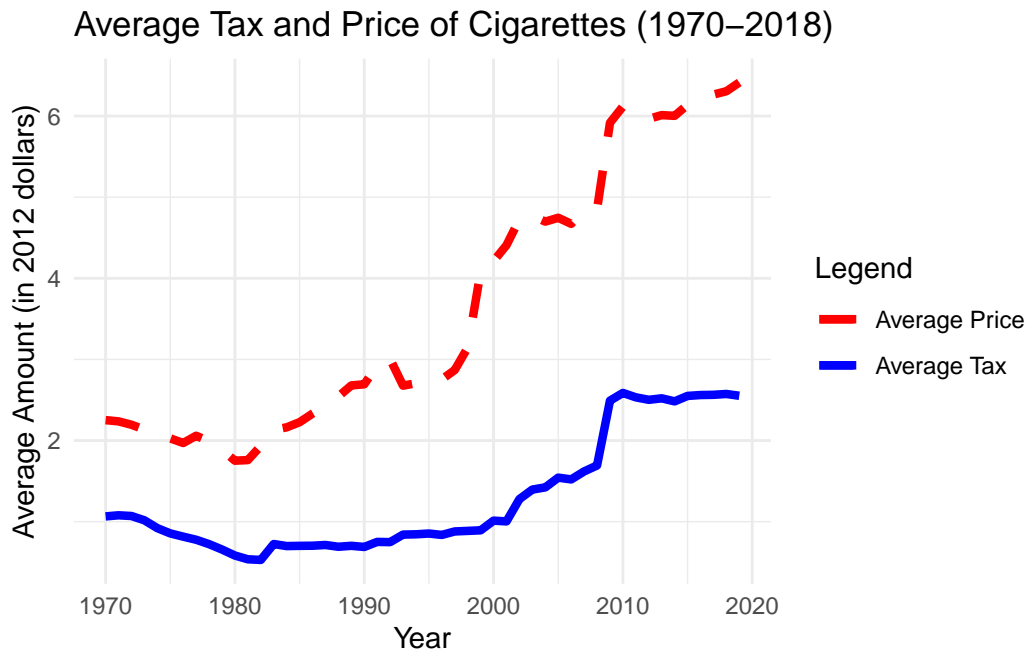


Figure 2: Question 2 Graph

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.

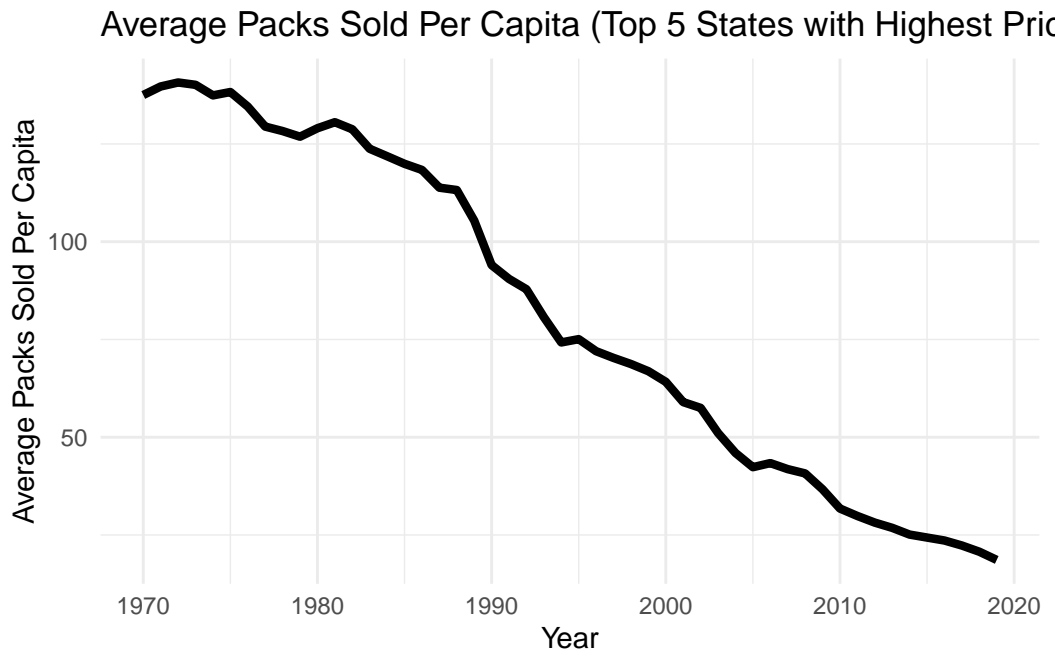


Figure 3: Question 3 Graph

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.

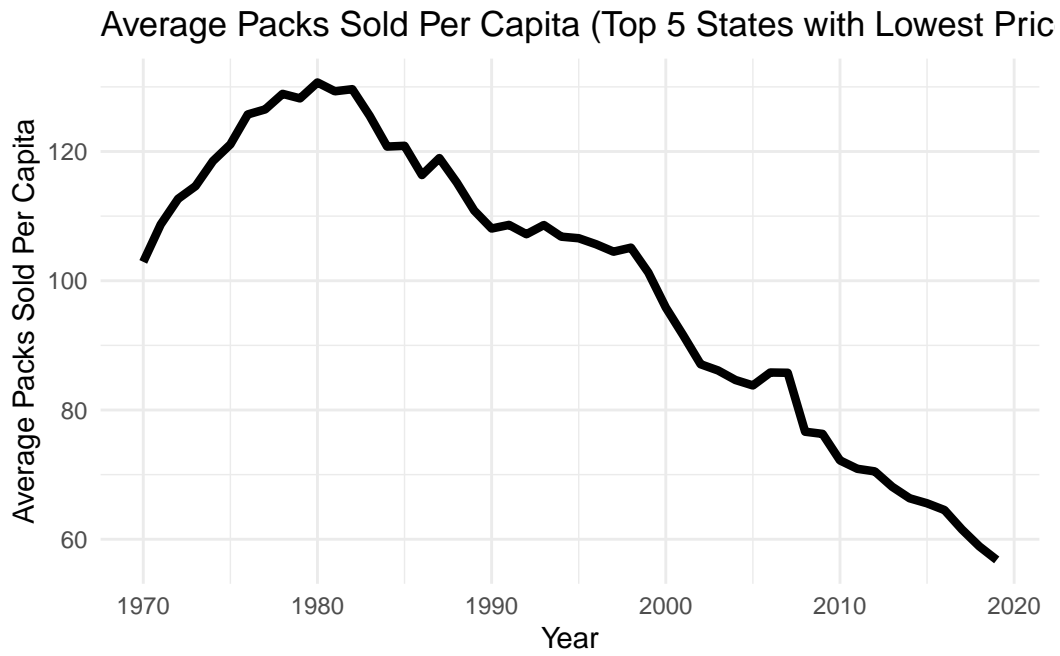


Figure 4: Question 4 Graph

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

Both graphs are overall decreasing average packs sold from 1970 to 2020. However, there is a clear difference between the two from 1970 to 1980. In the states with the lowest price increases, sales were still increasing from 1970 to 1980. After 1980, sales started to decline, but at a slower rate than the 5 states with the highest price increase. One can infer that all states decreased sales as cigarette smoking became less common due to health issues, but the states with the lowest price increases still had increasing sales until 1980, and their rate of decline was slower with some fluctuations of increases.

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.

regression_table

Table 1: Log Regression

Coefficients	Standard Errors
4.7504020	0.0081159
-0.1715396	0.0138295

The intercept (4.750402) represents the estimated log sales when log prices are zero. This value is highly significant (p value very small) indicating a strong positive relationship between log prices and log sales. The coefficient for log prices (-0.171540) represents the estimated change in log sales for a one-unit increase in log prices. This coefficient is also highly significant, with another very small p value, suggesting a negative relationship between log prices and log sales.

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?

Table 2: IV Model for Question 7

	Variable	Coefficient	Standard Error
(Intercept)	log_prices	4.7101093	0.0081283
log_prices	ln_tax_2012	-0.2843483	0.0191772

The estimated intercept is 4.710109, which represents the estimated log sales when log prices are zero. This value is highly significant, with a p value close to 0, indicating a strong positive relationship between log prices and log sales when using the instrument.

Coefficient for Log Prices (Price Elasticity): The estimated coefficient for log prices is -0.284348. This coefficient represents the estimated change in log sales for a one-unit increase in log prices, considering the influence of the instrument. It is highly significant (small p value), suggesting a negative relationship between log prices and log sales, indicating that as log prices increase, log sales tend to decrease.

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

First stage

log_prices	<NA>
-0.2843483	NA

Reduced Form

(Intercept)	log_prices
4.7101093	-0.2843483

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

Question 6 repeated for 1991-2015

Table 3: Log Regression Repeated

Coefficients	Standard Errors
4.7504020	0.0081159
-0.1715396	0.0138295

Question 7 repeated for 1991-2015

Table 4: IV Model for Question 7

	Variable	Coefficient	Standard Error
(Intercept)	log_prices	4.7101093	0.0081283
log_prices	ln_tax_2012	-0.2843483	0.0191772

Question 8 repeated for 1991-2015

First stage

```
log_prices      <NA>
-0.2843483      NA
```

Reduced Form

```
(Intercept)  log_prices
  4.7101093  -0.2843483
```

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

The coefficient for log prices remains consistent across both time periods. Specifically, the coefficient for log prices is approximately -0.1715 in both regressions, indicating a similar magnitude of the price elasticity of demand for cigarettes in both periods.

The intercept values also remain consistent between the two periods, with estimated log sales of approximately 4.7504 when log prices are zero. These intercept values are highly significant in both regressions, indicating a strong positive relationship between log prices and log sales.

Additionally, both sets of estimates use the total cigarette tax (\ln_tax_2012) as an instrument for log prices, which helps address potential endogeneity issues. The coefficients for \ln_tax_2012 are approximately -0.2843 in both regressions, suggesting a significant negative relationship between \ln_tax_2012 and log prices, as expected.