

# Homework Three Submission 3

Safia Read

This is my third submission of the third homework for Econ 470.

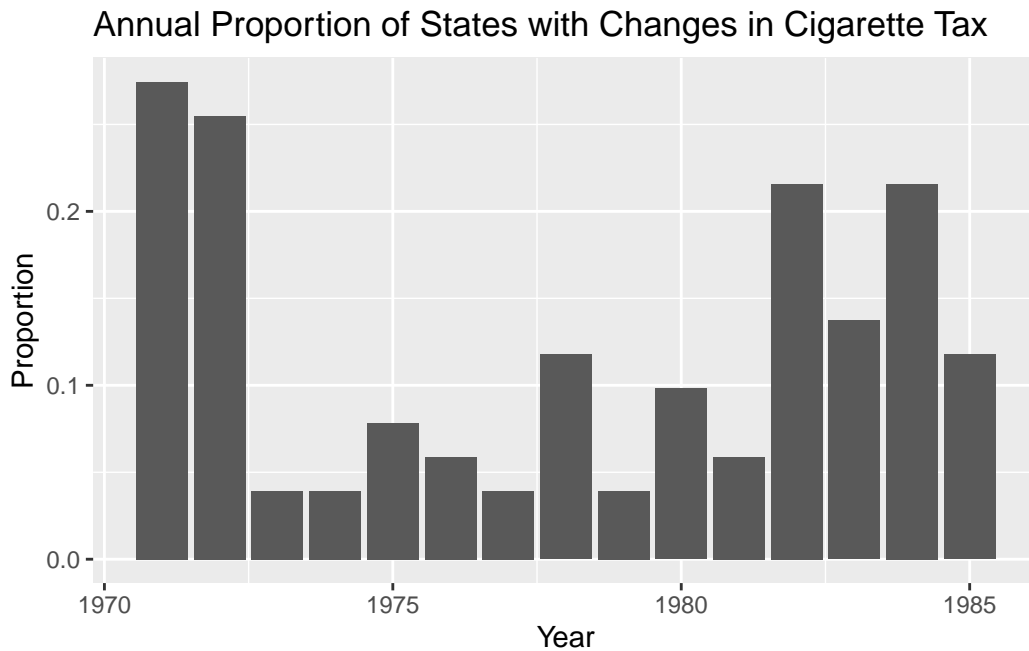
[Link to Github](#)

<https://github.com/safiaread/homework-3>

## Summarize the data

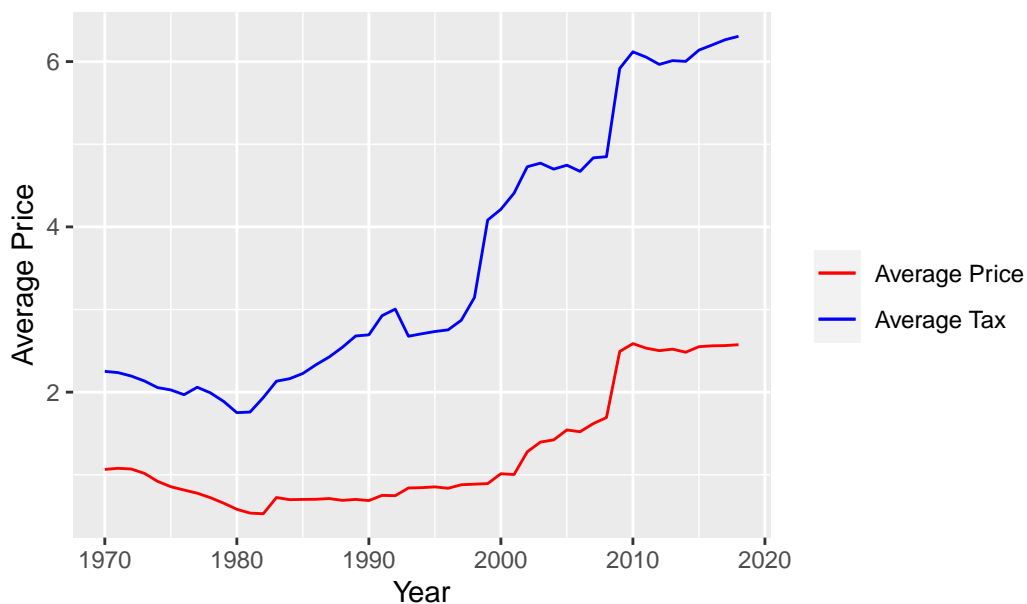
1. Present a bar graph showing the proportion of states with a change in their cigarette tax in each year from 1970 to 1985.

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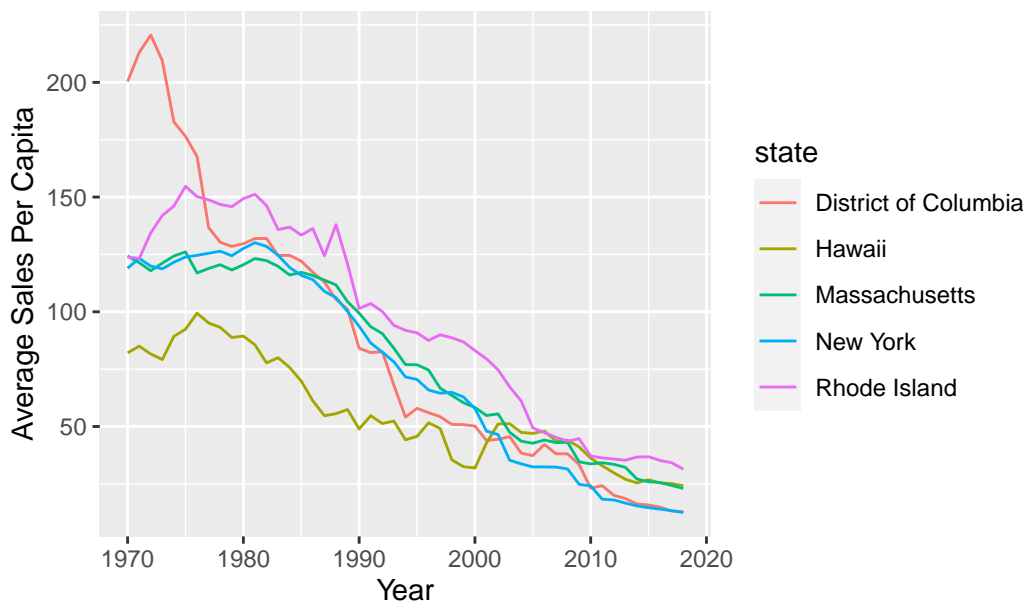
- Plot on a single graph the average tax (in 2012 dollars) on cigarettes and the average price of a pack of cigarettes from 1970 to 2018.

**Average Price and Cigarette Tax Over Time**



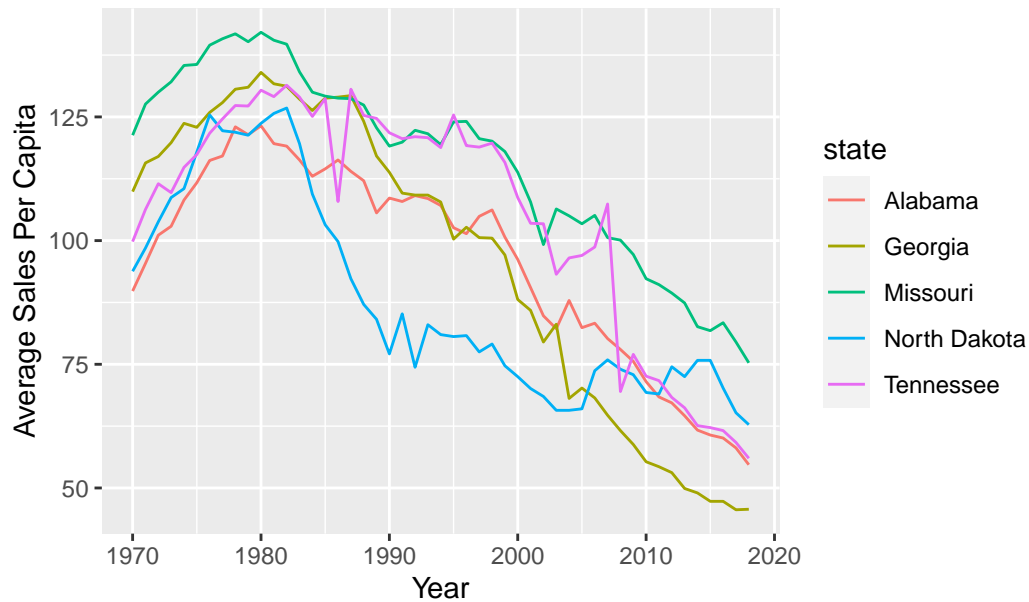
- Identify the 5 states with the highest increases in cigarette prices (in dollars) over the time period. Plot the average number of packs sold per capita for those states from 1970 to 2018.

**Average Sales for States with the 5 Highest Increases in Tax**



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.

### Average Sales for States with the 5 Lowest Increases in Tax

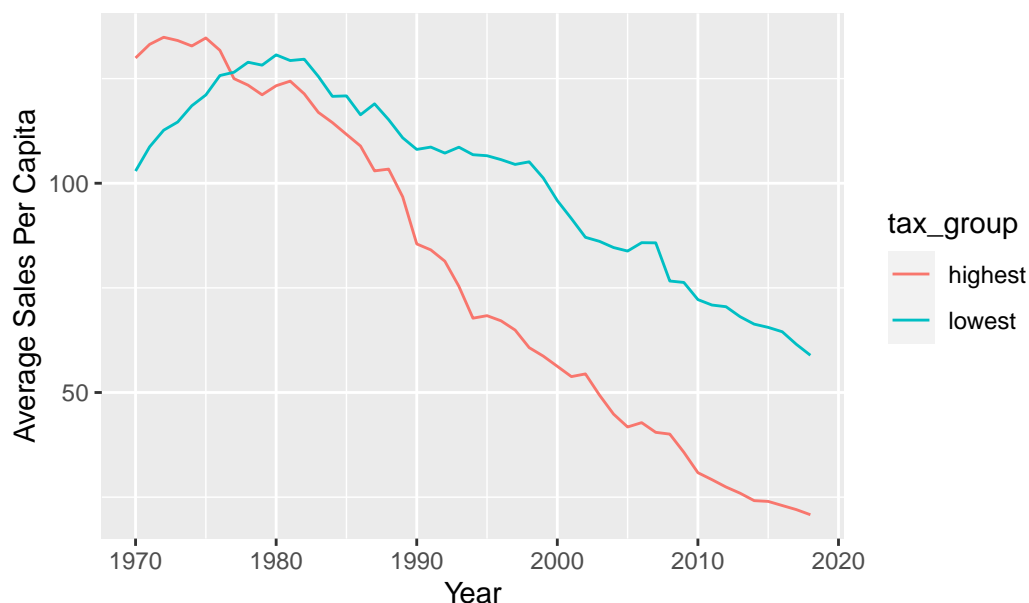


5. Compare the trends in sales from the 5 states with the highest price increases to those with the lowest price increases.

In both groups, average packs sold decreased. However in the states with the lowest price increases, there are still more sales per capita on average.

``summarise()`` has grouped output by 'Year'. You can override using the `` .groups `` argument.

## Average Sales for the States with the 5 Highest and 5 Lowest I



## Estimate ATEs

Now let's work on estimating a demand curve for cigarettes. Specifically, we're going to estimate the price elasticity of demand for cigarettes. When explaining your findings, try to limit your discussion just to a couple of sentences.

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.

The regression coefficient is -0.8094384, which suggests sales and price have an inverse relationship. As price increases we can expect sales to decrease.

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?

Yes, the effect is bigger than without the instrument (-0.7955235 compared to -0.8094384). This is because using tax as an instrument for price can help reduce the effect of confounders, better revealing the true effect.

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

Warning in `model.matrix.default(fml, mf)`: term names will be truncated

The regression coefficient of the first step is 0.2600601. The regression coefficient of the second step is -0.7955235. This is the same as the feols estimate.

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

The regression coefficient is -0.9968136, which suggests sales and price have an inverse relationship. As price increases we can expect sales to decrease.

Yes, the effect is bigger than without the instrument (-1.1500837 compared to -0.9968136). This is because using tax as an instrument for price can help reduce the effect of confounders, better revealing the true effect.

`Warning in model.matrix.default(fml, mf): term names will be truncated`

The regression coefficient of the first step is 0.5135503. The regression coefficient of the second step is -1.1500837. This is the same as the feols estimate.

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

The elasticity estimates for 1991-2015 are less than 1970-1990, showing the price of cigarettes are more inelastic during the first period. This could be because there was more change in price and taxes during the later period, so the inelasticity of the good is better determined.