

# **Homework 3**

**Research in Health Economics, Spring 2024**  
**<https://github.com/riadharnidharka/Econ470HW3>**

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

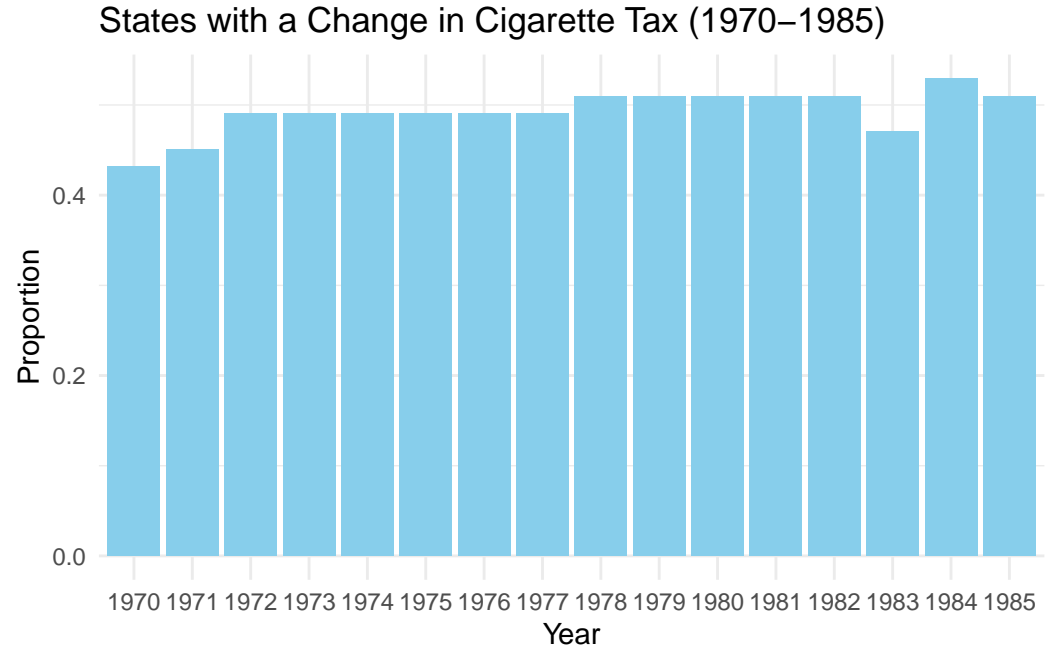


Figure 1: States with a Change in Cigarette Tax (1970-1985)

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.

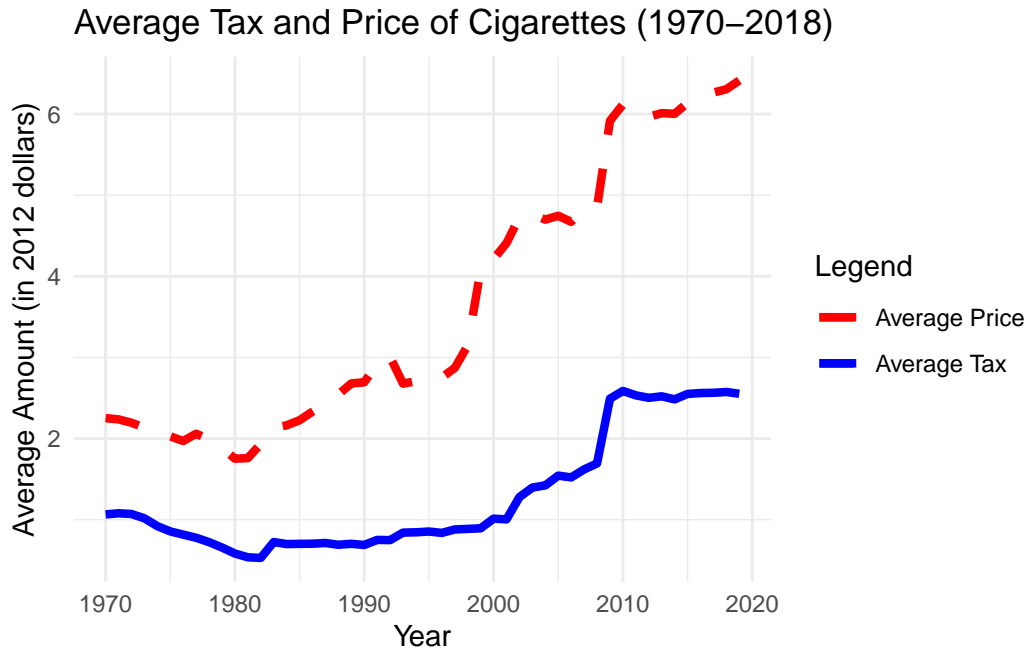


Figure 2: Avg tax and Price

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.

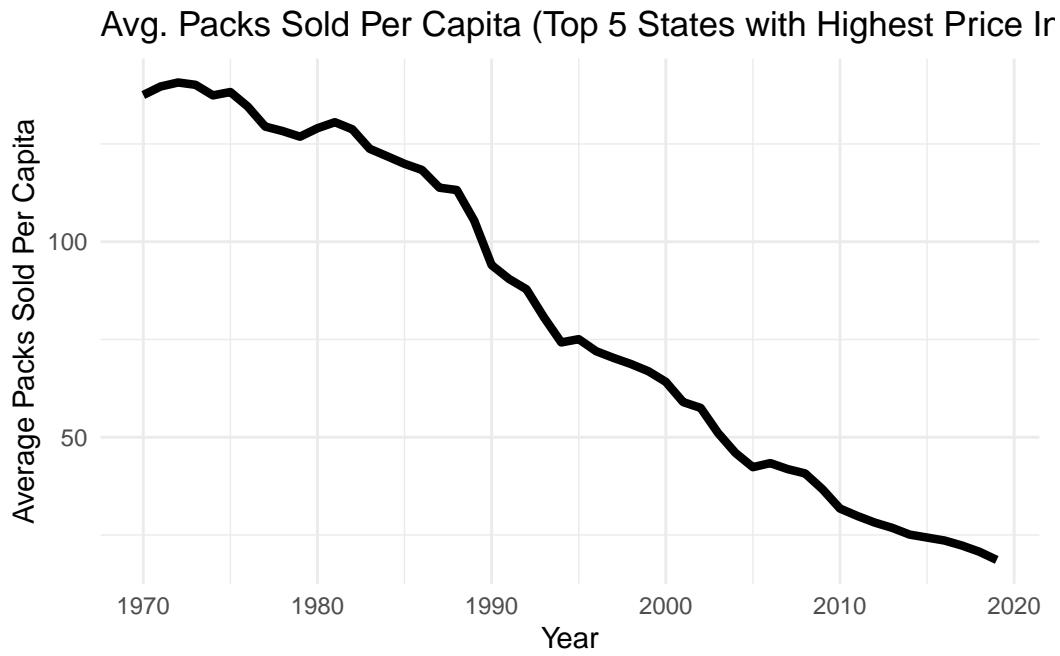


Figure 3: Avg Packs Sold

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.

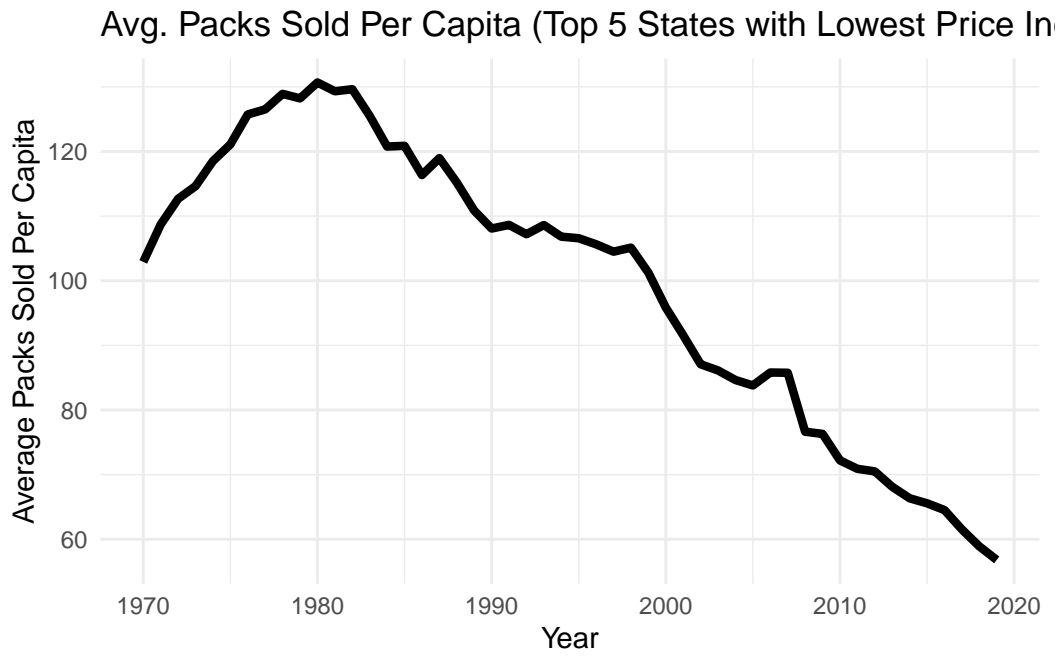


Figure 4: Avg Packs Sold

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

The states with the 5 highest prices's sales steadily fall over time. However, the 5 states with the lowest prices's sales peaks around 1980, and then starts to fall. Therefore, for these states with the lowest prices, the decline in sales occurs later than for the states with the highest prices.

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.

Call:

```
lm(formula = log_sales ~ log_prices, data = data_subset)
```

Coefficients:

(Intercept)	log_prices
4.7504	-0.1715

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?

```
              Estimate Std. Error   t value    Pr(>|t|)
(Intercept)  4.7101093 0.009055756 520.12328 0.000000e+00
log_prices   -0.2843483 0.017248970 -16.48495 1.422151e-54
attr(,"df")
[1] 1069
attr(,"nobs")
[1] 1071
```



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

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

Question 6 Repeat:

```
# A tibble: 2 x 5
  term          estimate std.error statistic  p.value
<chr>         <dbl>     <dbl>     <dbl>    <dbl>
1 (Intercept)    4.75    0.00812    585.    0
2 log_prices   -0.172    0.0138   -12.4 4.18e-33
```

Question 7 Repeat:

```
              Estimate Std. Error  t value      Pr(>|t|)
(Intercept)  5.1575124 0.02464813 209.24556 0.00000e+00
log_prices  -0.7626495 0.01896994 -40.20305 8.04495e-229
attr(,"df")
[1] 1273
attr(,"nobs")
[1] 1275
```

Question 8 Repeat:

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