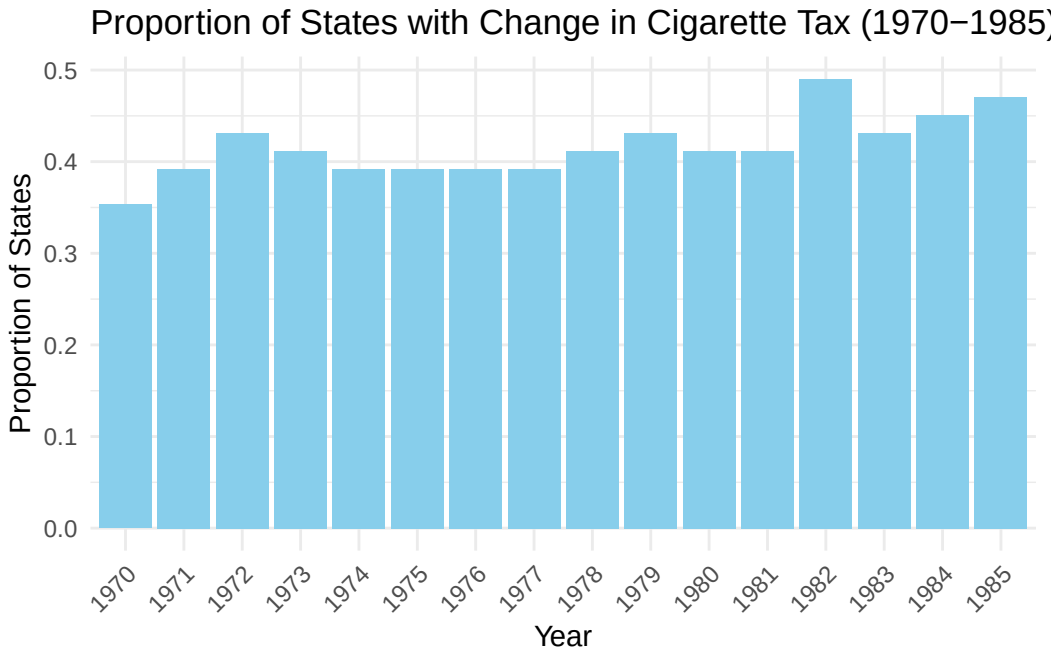
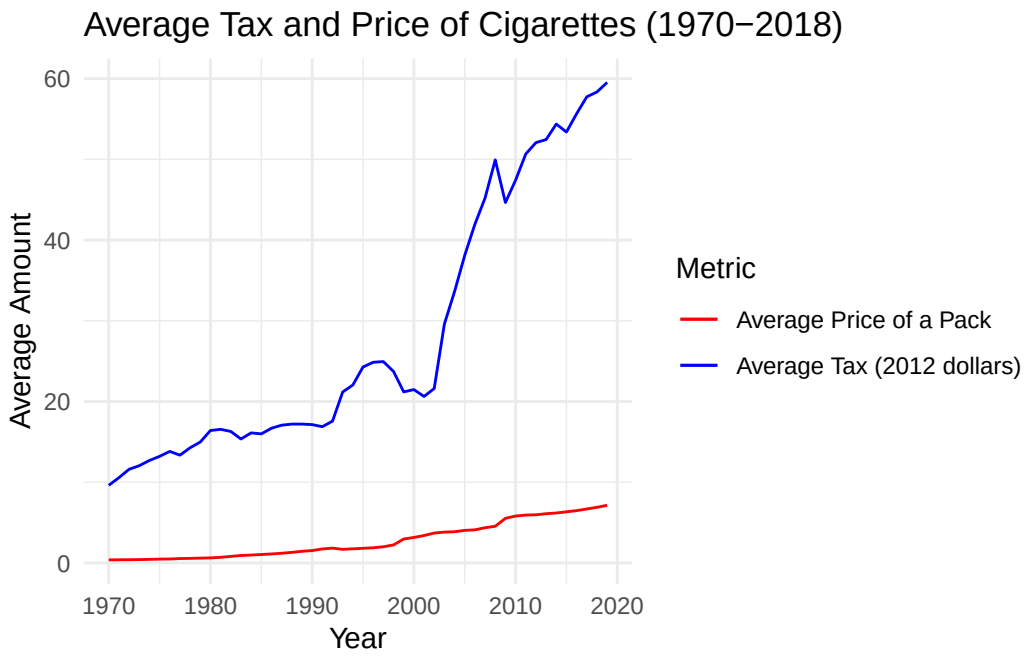
**Git Repository: https://github.com/AlekhyaPidugu/Homework3**

## Question 1

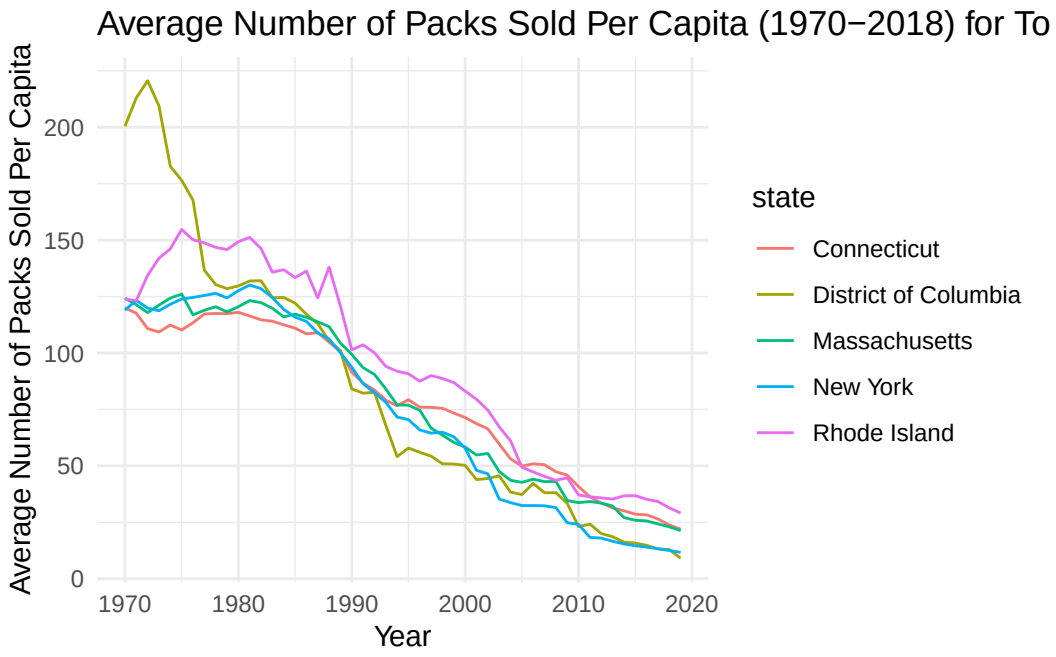

Proportion of States with Change in Cigarette Tax (1970−1985)
Proportion of States
0.0
0.1
0.2
0.3
0.4
0.5
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
Year

## Question 2


Average Tax and Price of Cigarettes (1970−2018)
Average Amount
60
40
20
0
1970
1980
1990
2000
2010
2020
Year
Metric
Average Price of a Pack
Average Tax (2012 dollars)

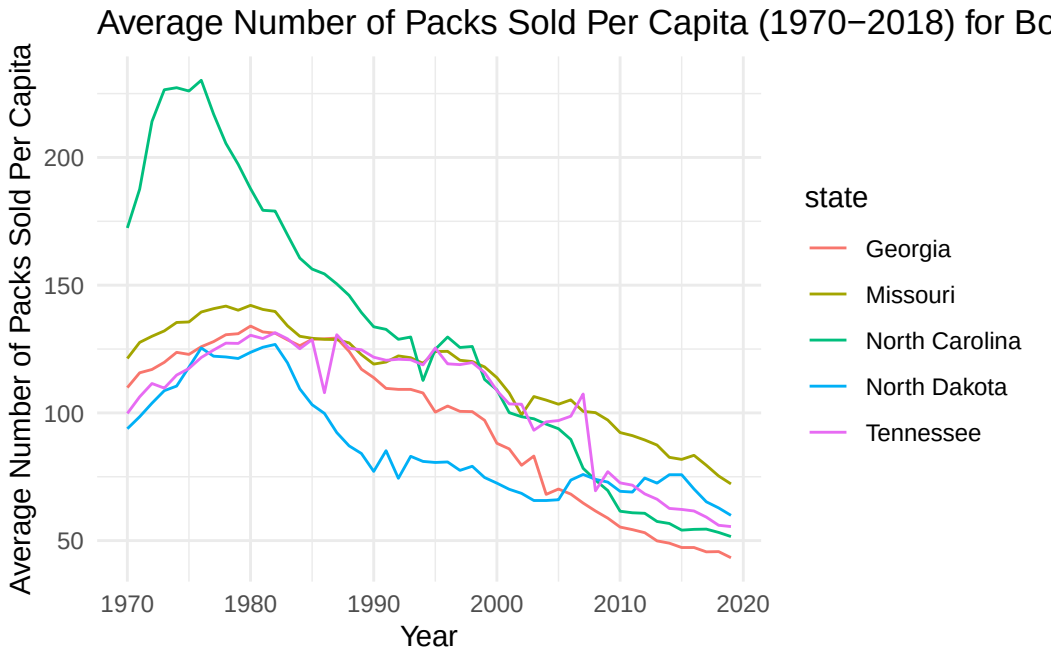
## Question 3

Connecticut
D.C
Massachusetts
New York
Rhode Island



## Question 4

Georgia Missouri
North Carolina
North Dakota
Tennessee



## Question 5

One significant trend to observe is that the bottom five states cigarette prices is not as substantial as the magnitude of the increase in cigarette prices for the 5 states with the highest price raises. The bottom 5 states with the lowest price increases generally demonstrated more stable trends in sales per capita. Although there were fluctuations, the overall trend tended to be less pronounced compared to states with higher price increases.

## Question 6

The estimated price elasticity of demand for cigarettes from 1970 to 1990 is approximately -0.17. The demand for cigarettes during this period is relatively inelastic, suggesting that changes in price have a limited impact on quantity demanded.

## Question 7

The estimated price elasticity of demand for cigarettes from 1970 to 1990 using an instrument (total cigarette tax) for log prices is approximately -0.28. When using an instrument, the estimated price elasticity of demand may differ from estimates without an instrument due to the endogeneity of prices. An instrument helps address potential biases in the estimation by providing exogenous variation in prices.

## Question 8

```
Call:
lm(formula = log(cost_per_pack) ~ log(tax_dollar), data = period_data)

Residuals:
     Min       1Q   Median       3Q      Max
-0.53156 -0.20166 -0.00724  0.16872  0.95553

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)      1.17857    0.03300   35.71   <2e-16 ***
log(tax_dollar)  1.08033    0.02252   47.97   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2625 on 1069 degrees of freedom
Multiple R-squared:  0.6828,    Adjusted R-squared:  0.6825
F-statistic:  2301 on 1 and 1069 DF,  p-value: < 2.2e-16
```

```
Call:
lm(formula = log(sales_per_capita) ~ predicted_log_prices, data = period_data)

Residuals:
     Min       1Q   Median       3Q      Max
-0.75589 -0.08447  0.00043  0.09596  0.80589

Coefficients:
                     Estimate Std. Error t value Pr(>|t|)
(Intercept)          4.710109   0.008214  573.44   <2e-16 ***
predicted_log_prices -0.284348   0.015645  -18.18   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.197 on 1069 degrees of freedom
Multiple R-squared:  0.2361,    Adjusted R-squared:  0.2353
F-statistic: 330.3 on 1 and 1069 DF,  p-value: < 2.2e-16
```

## Question 9

The estimated price elasticity of demand for cigarettes from 1991 to 2015 is approximately -0.67. The demand for cigarettes during this period is relatively inelastic, suggesting that changes in price have a limited impact on quantity demanded. The estimated price elasticity of demand for cigarettes from 1991 to 2015 using an instrument (total cigarette tax) for log prices is approximately -0.76.

```
The estimated price elasticity of demand for cigarettes from 1991 to 2015 using an instrumen
```

```
Call:
lm(formula = log(cost_per_pack) ~ log(tax_dollar), data = period_data)

Residuals:
     Min       1Q   Median       3Q      Max
-0.44006 -0.10954 -0.00173  0.10152  0.55693

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)     1.207168   0.004970  242.91   <2e-16 ***
log(tax_dollar) 0.630010   0.006857   91.88   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1774 on 1273 degrees of freedom
Multiple R-squared:  0.869, Adjusted R-squared:  0.8689
F-statistic:  8442 on 1 and 1273 DF,  p-value: < 2.2e-16
```

```
Call:
lm(formula = log(sales_per_capita) ~ predicted_log_prices, data = period_data)

Residuals:
     Min       1Q   Median       3Q      Max
-0.82897 -0.14423  0.00604  0.14668  1.19203

Coefficients:
                     Estimate Std. Error t value Pr(>|t|)
(Intercept)           5.15751    0.02232  231.12   <2e-16 ***
predicted_log_prices -0.76265    0.01717  -44.41   <2e-16 ***
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.28 on 1273 degrees of freedom
Multiple R-squared:  0.6077,    Adjusted R-squared:  0.6074
F-statistic:  1972 on 1 and 1273 DF,  p-value: < 2.2e-16
```

## Question 10

The elasticity estimate for the period 1970-1990 was approximately -0.17, whereas for the period 1991-2015, it was approximately -0.67. The difference in elasticity estimates could be attributed to changes in consumer behavior, regulatory policies, and socio-economic conditions. For example, increased awareness of health risks associated with smoking could have made consumers more sensitive to price changes in later years.