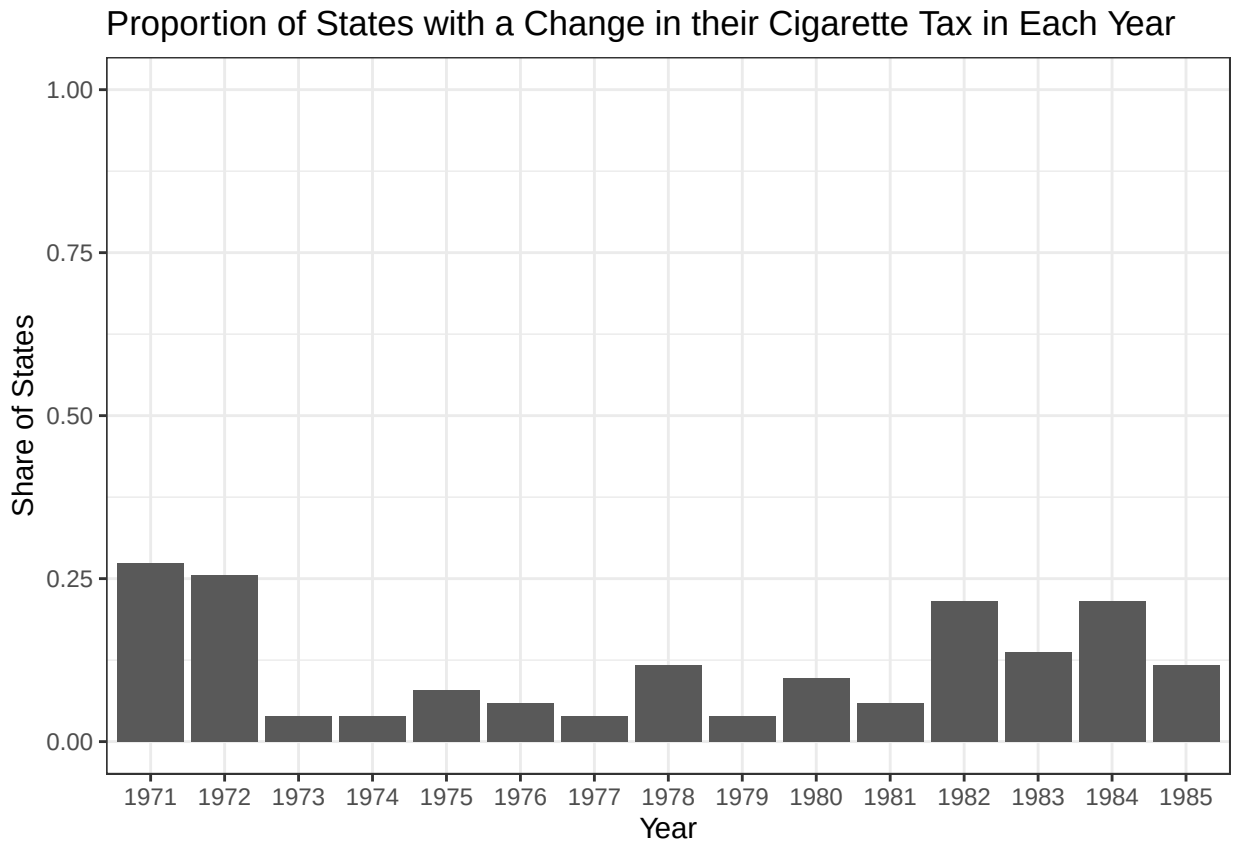
Bhasin-S-hwk3-2

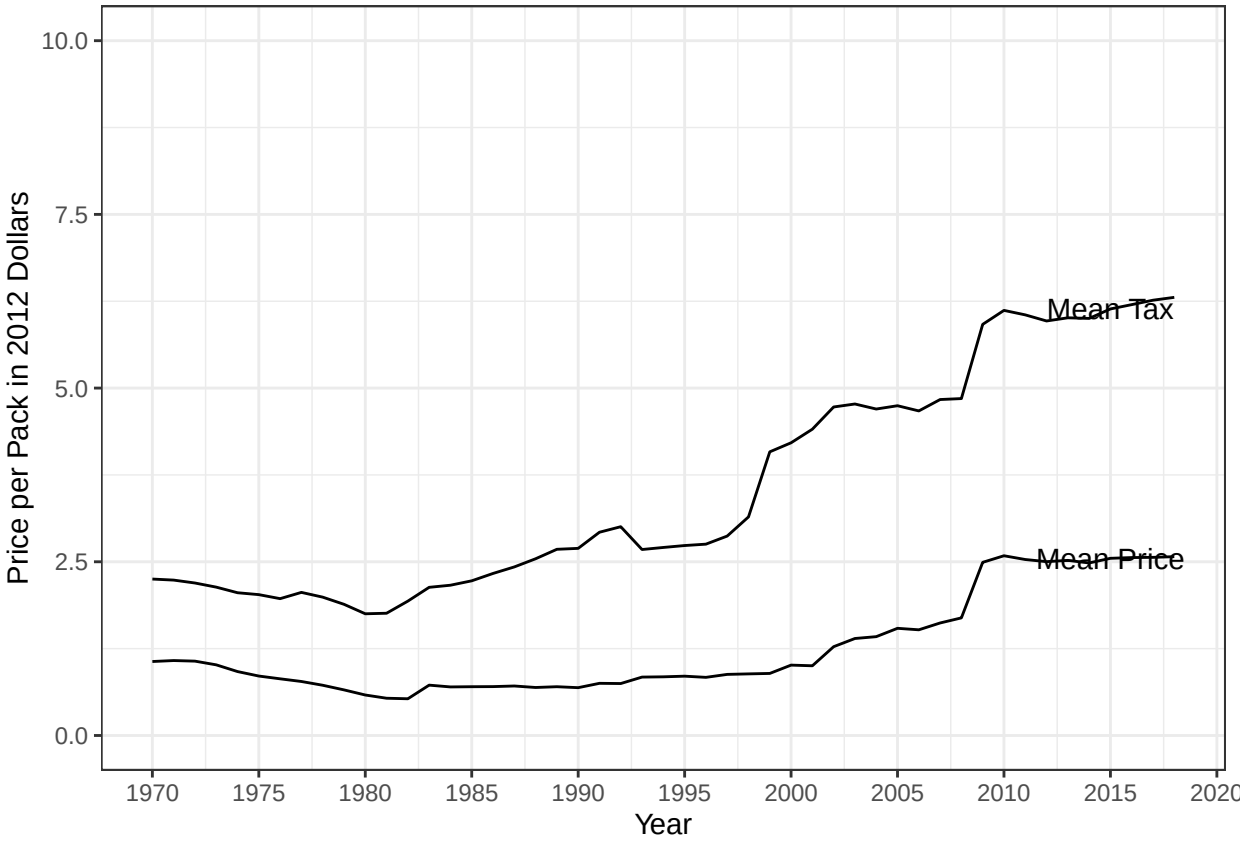
Sachi Bhasin

2023-03-14

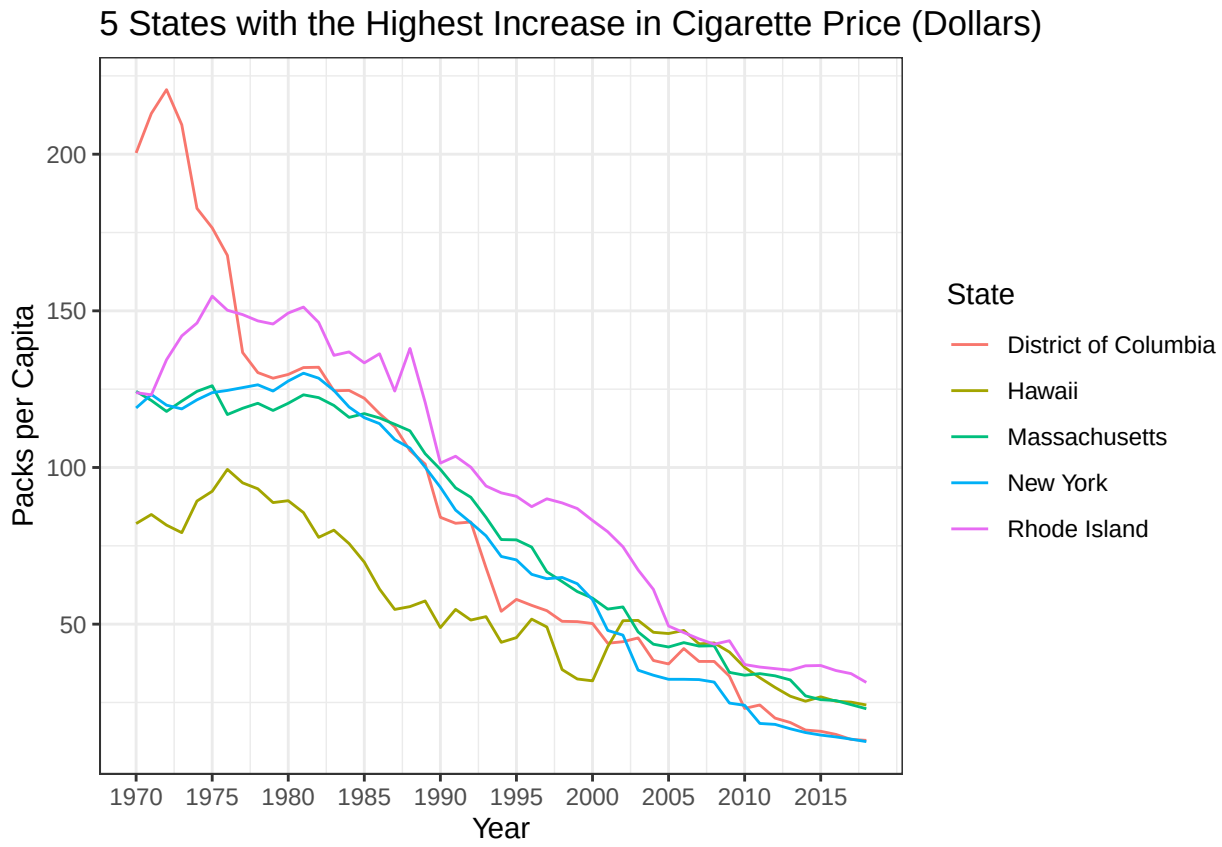
Question 1


Proportion of States with a Change in their Cigarette Tax in Each Year
Share of States
1.00
0.75
0.50
0.25
0.00
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
Year

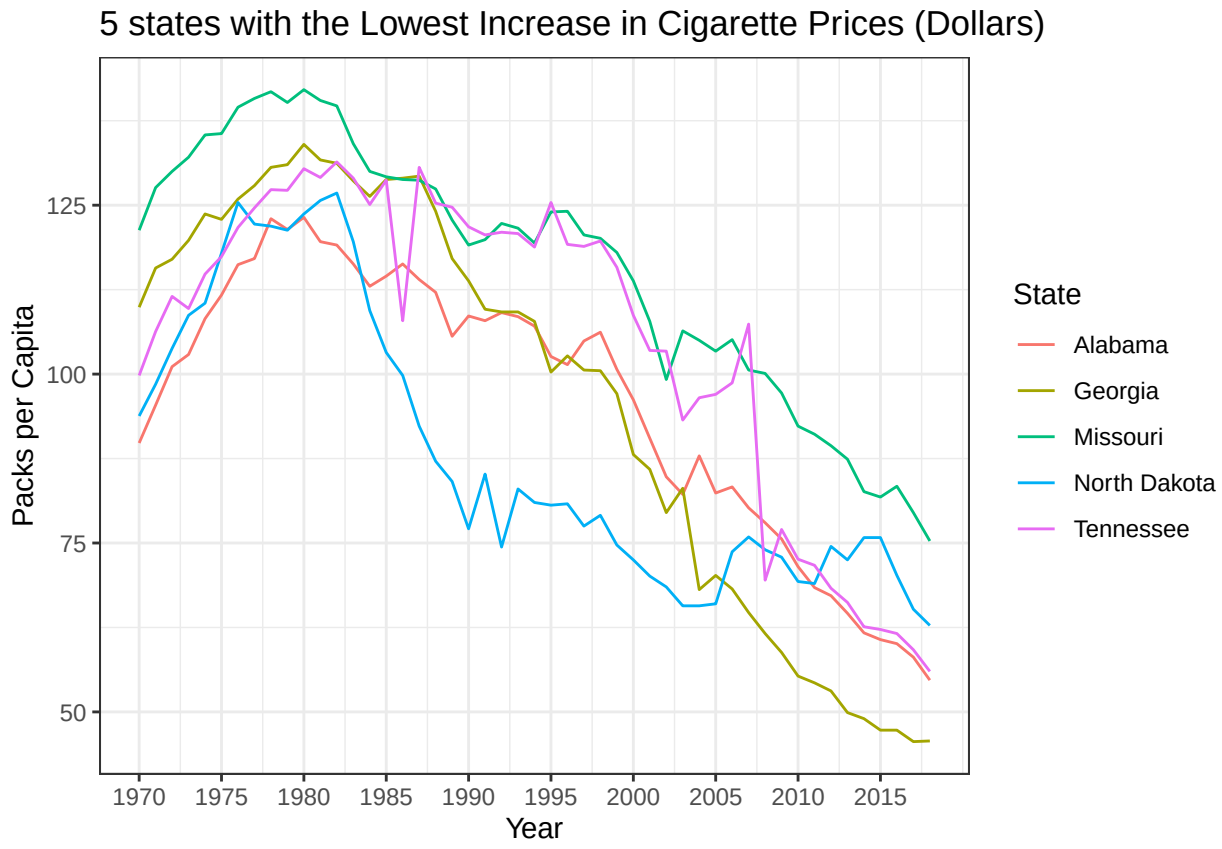
Question 2


10.0
7.5
5.0
2.5
0.0
Price per Pack in 2012 Dollars
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Year
Mean Tax
Mean Price

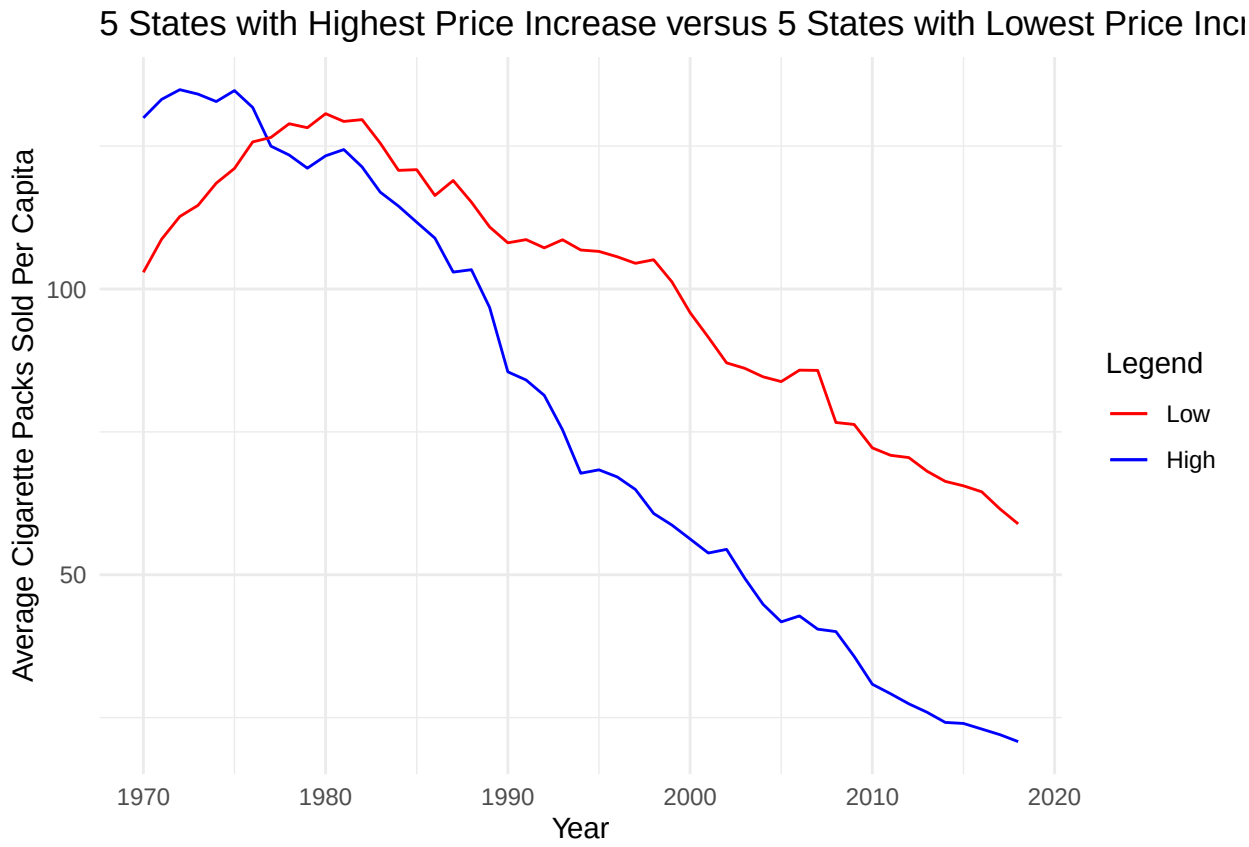
Question 3


5 States with the Highest Increase in Cigarette Price (Dollars)
Packs per Capita
200
150
100
50
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
State
District of Columbia
Hawaii
Massachusetts
New York
Rhode Island

Question 4


5 states with the Lowest Increase in Cigarette Prices (Dollars)
Packs per Capita
125
100
75
50
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
State
Alabama
Georgia
Missouri
North Dakota
Tennessee

Question 5



Sales from the 5 states with the highest price increase has a steeper decline in average cigarette packs sold per capita compared to the 5 states with the lowest price increase. After 1973 till 2018, the five states with the largest price increase have an average lower sales per capita than the average of the five states' sales per capita.

Question 6

```
## OLS estimation, Dep. Var.: ln_sales
## Observations: 1,071
## Standard-errors: IID
##                Estimate Std. Error  t value  Pr(>|t|)
## (Intercept)    5.427381   0.029752 182.4238 < 2.2e-16 ***
## ln_price_2012 -0.809438   0.038366 -21.0980 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 0.189214   Adj. R2: 0.293322
```

An 1% increase in the cost of a cigarette pack is estimated to decrease sales per capita by 0.80 percent on average. It is an inelastic relationship.

Question 7

```
## TSLS estimation, Dep. Var.: ln_sales, Endo.: ln_price_2012, Instr.: total_tax_cpi_2012
## Second stage: Dep. Var.: ln_sales
## Observations: 1,071
## Standard-errors: IID
##                     Estimate Std. Error  t value  Pr(>|t|)
## (Intercept)         5.371519   0.057450 93.49862 < 2.2e-16 ***
## fit_ln_price_2012 -0.736000   0.075141 -9.79490 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 0.189538   Adj. R2: 0.2909
## F-test (1st stage), ln_price_2012: stat = 378.7    , p < 2.2e-16 , on 1 and 1,069 DoF.
##                         Wu-Hausman: stat =   1.29837, p = 0.254767, on 1 and 1,068 DoF.
```

An 1% increase in the cost of a cigarette pack is estimated to decrease sales per capita by 0.74%. The estimates of those with an instrument are different and shows that a change in cost has a slightly smaller impact on sales, making it slightly less elastic. This is because the estimates with an instrument are accounting for the total cigarette tax has on the cost of cigarette packs.

Question 8

```
## OLS estimation, Dep. Var.: ln_price_2012
## Observations: 1,071
## Standard-errors: IID
##                    Estimate Std. Error t value  Pr(>|t|)
## (Intercept)        0.507509   0.013600 37.3182 < 2.2e-16 ***
## total_tax_cpi_2012 0.327178   0.016813 19.4601 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 0.129621   Adj. R2: 0.260895

## OLS estimation, Dep. Var.: ln_sales
## Observations: 1,071
## Standard-errors: IID
##                     Estimate Std. Error   t value  Pr(>|t|)
## (Intercept)         4.997993   0.022863 218.60722 < 2.2e-16 ***
## total_tax_cpi_2012 -0.240803   0.028265  -8.51952 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 0.217912   Adj. R2: 0.062704
```

Question 9

```
## OLS estimation, Dep. Var.: ln_sales
## Observations: 1,428
## Standard-errors: IID
##               Estimate Std. Error  t value  Pr(>|t|)
## (Intercept)    5.75390   0.035602 161.6181 < 2.2e-16 ***
## ln_price_2012 -1.07368   0.023500 -45.6886 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 0.305611   Adj. R2: 0.593846
```

An 1% increase in the cost of a cigarette pack is estimated to decrease sales per capita by 1.07 percent on average. It is an elastic relationship.

```
## TSLS estimation, Dep. Var.: ln_sales, Endo.: ln_price_2012, Instr.: total_tax_cpi_2012
## Second stage: Dep. Var.: ln_sales
## Observations: 1,275
## Standard-errors: IID
##                   Estimate Std. Error  t value  Pr(>|t|)
## (Intercept)        5.89917   0.042095 140.1383 < 2.2e-16 ***
## fit_ln_price_2012 -1.16354   0.028744 -40.4791 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 0.301025   Adj. R2: 0.545382
## F-test (1st stage), ln_price_2012: stat = 4,129.3, p < 2.2e-16, on 1 and 1,273 DoF.
##                         Wu-Hausman: stat =   167.2, p < 2.2e-16, on 1 and 1,272 DoF.
```

An 1% increase in cost per cigarette pack is estimated to decrease sales per capita by 1.16%. The estimates of those with an instrument are different and show that a change in cost has a greater impact on sales, making it more elastic. This may be due to the fact that the cigarette tax is accounted for and its influence on the cost per pack.

```
## OLS estimation, Dep. Var.: ln_price_2012
## Observations: 1,275
## Standard-errors: IID
##                    Estimate Std. Error  t value  Pr(>|t|)
## (Intercept)        0.971123   0.008539 113.7219 < 2.2e-16 ***
## total_tax_cpi_2012 0.307545   0.004786  64.2597 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 0.162972   Adj. R2: 0.764175

## OLS estimation, Dep. Var.: ln_sales
## Observations: 1,122
## Standard-errors: IID
##                     Estimate Std. Error   t value  Pr(>|t|)
## (Intercept)         4.991831   0.022937 217.63429 < 2.2e-16 ***
## total_tax_cpi_2012 -0.246522   0.028413  -8.67629 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## RMSE: 0.222183   Adj. R2: 0.062143
```

Question 10

Yes, they are different. The estimates from 1991 to 2015 are more elastic compared to those from 1970 t0 1990. This Amy be because taxes on cigarette packs increased and the Center for Disease Control emphasized the harmful health effects of smoking, making people for sensitive to the price changes on cigarettes.