Homework 3 - Research in Health Economics

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1 Summary of the data

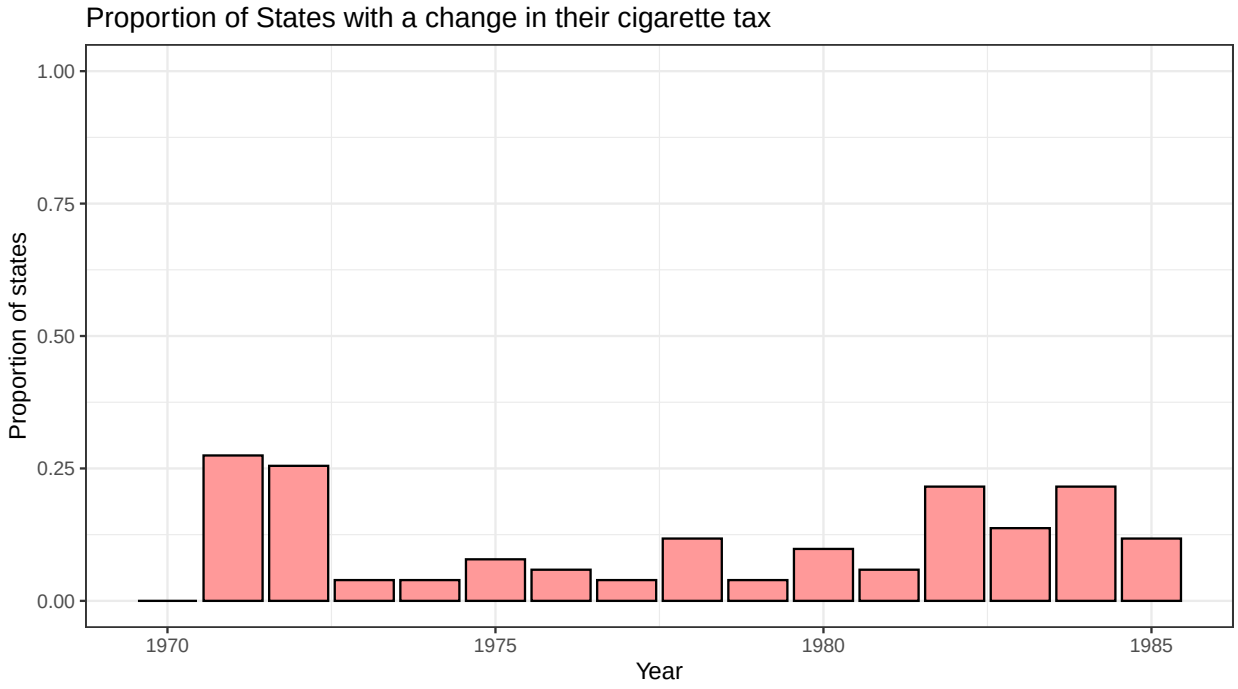

Figure 1: Proportition of states with a cigarette tax change

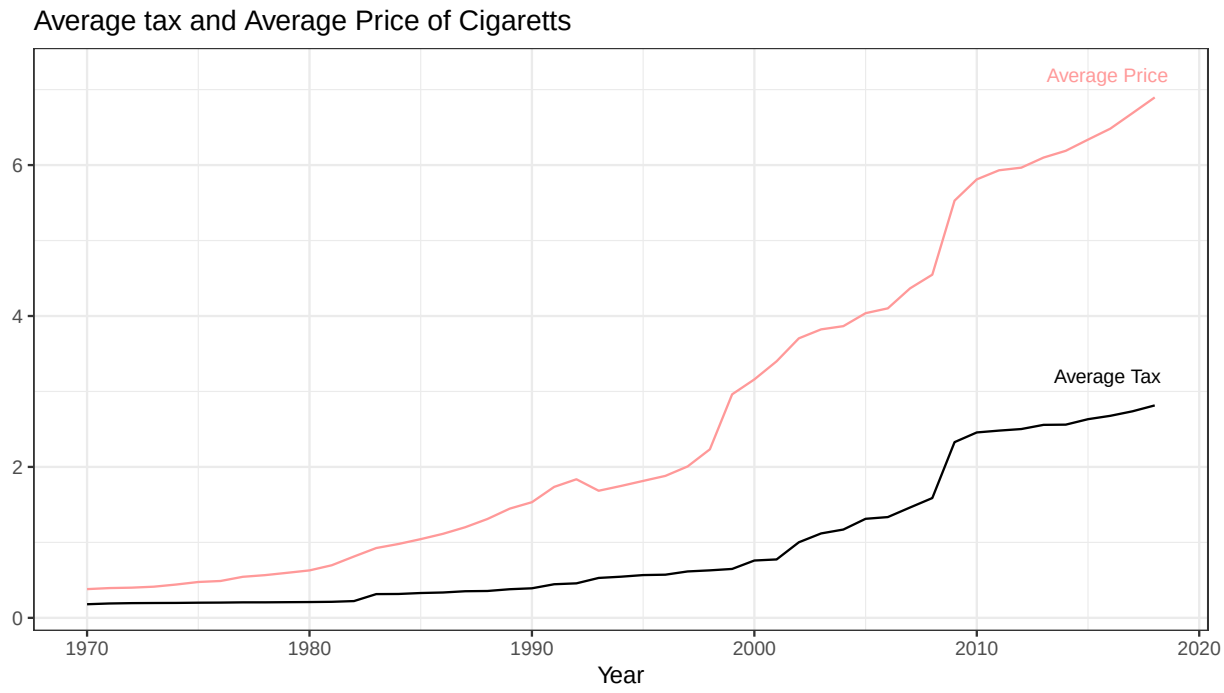

Figure 2: Average Tax vs. Average Price of cigarettes

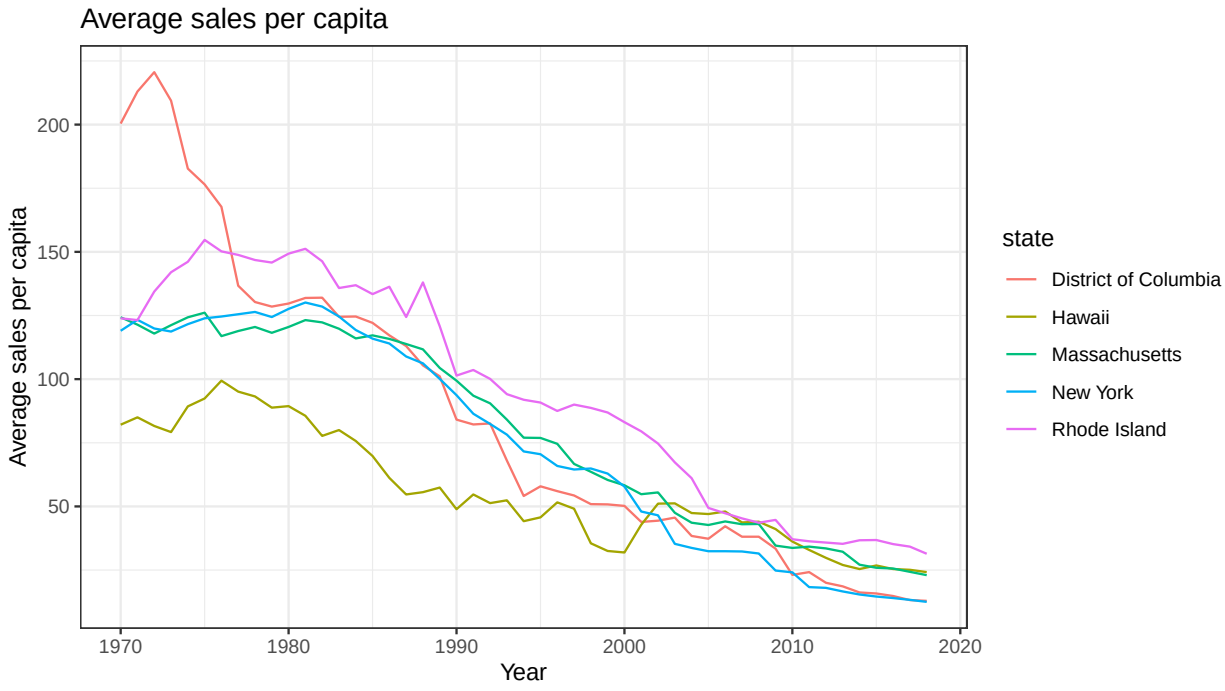

Figure 3: Average sales per capita for the states with the highest tax changes

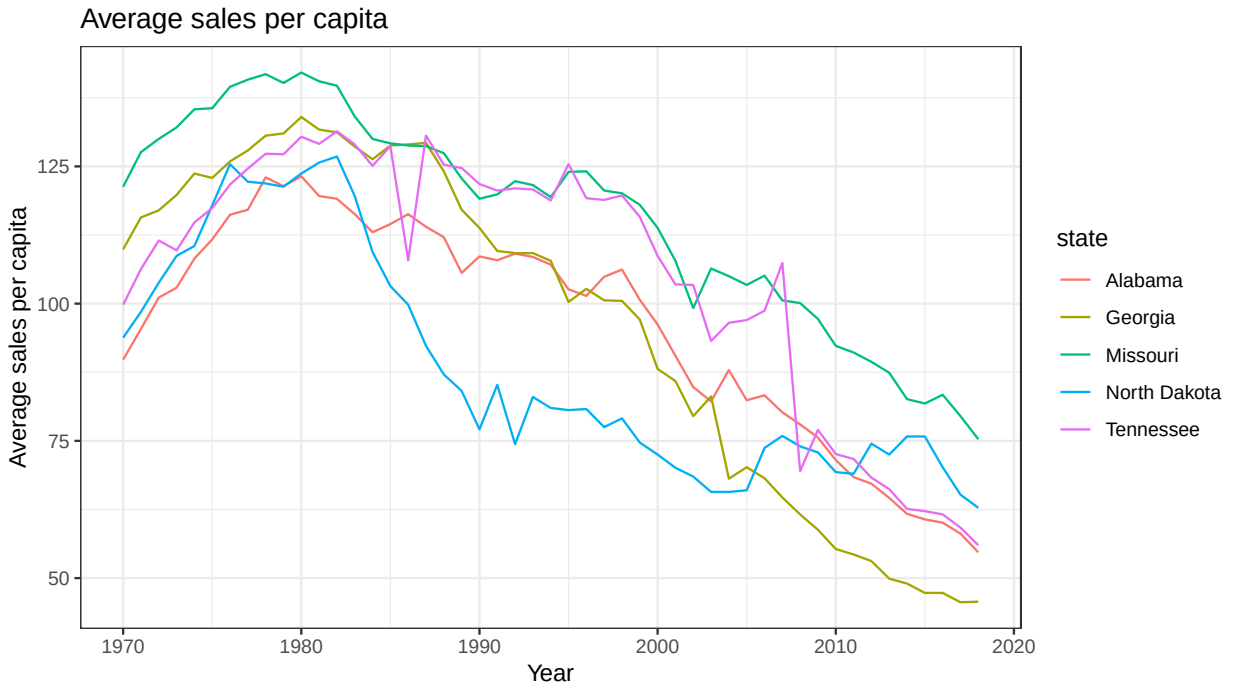

Figure 4: Average sales per capita for the states with the lowest tax changes

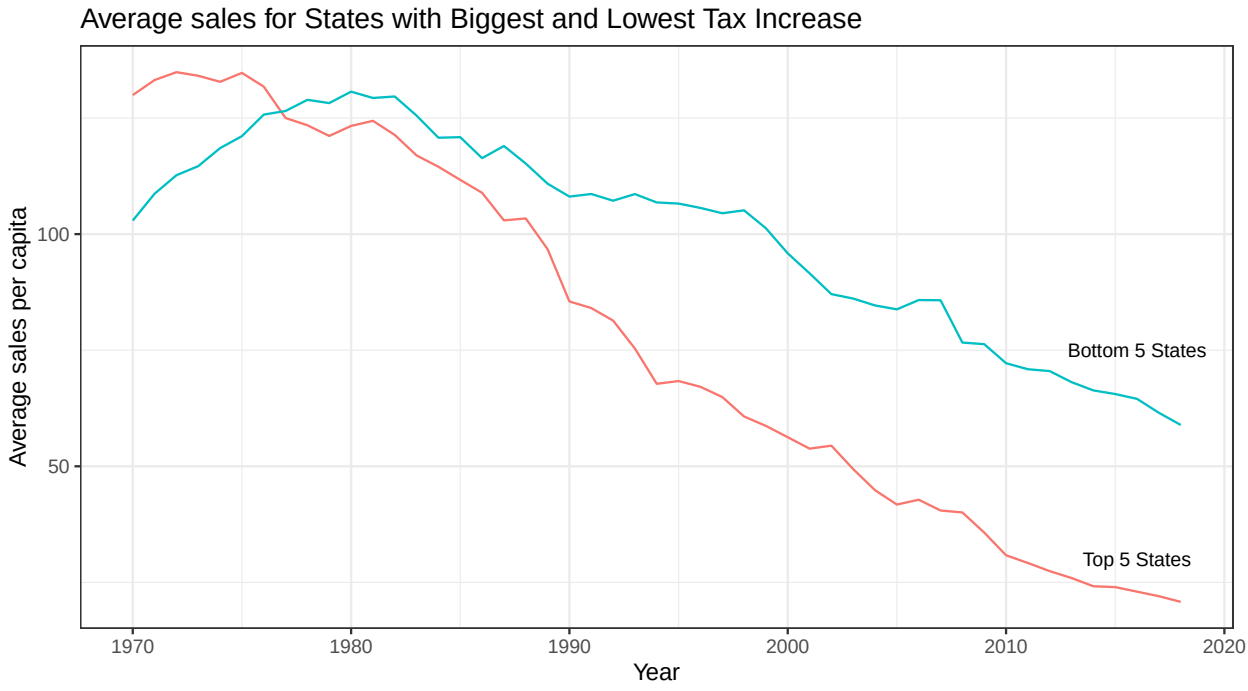

Figure 5: Average sales per capita for the states with the highest tax changes

2 Esimates of the ATE

2.1 Price elasticity of demand for cigarettes using OLS (1970 - 1990)

In table 1, one can observe that using OLS, the elasticity of the demand for cigarettes in the years 1970-1990 is -0.81. This indicates that the demand is inelastic, which is what we would expect given that cigaretts are an addictive good.

2.2 Price elasticity of demand for cigarettes using IV (1970 - 1990)

Similarly, using total taxes as an instrument, Table 1 shows that the estimate of the elasticity of demand for cigarettes is -0.74. This result is similar, though not identical to the previous one. This coefficient still indicates that the good is inelastic, but now it's slightly more inelastic.

There are a variety of reasons why the estimates could be different. First of all, either OLS or IV may be biased. Omitted variables could bias OLS, and a violation of the exclusion restriction could bias the IV. Another possible reason is that the lack of variation in tax changes in this time shown in Figure 1, could invalidate the instrumental variable.

2.3 Show First stage and reduced form for instrumental variable

Table 2, shows the First-stage and Reduced- Form from the Instrumental Variable, where the First-stage looks at the effect of taxes on the price and the Reduced-Form examines the relationship between taxes and sales.

2.4 Price elasticity of demand for cigarettes (1991 - 2015)

Using OLS, the elasticity of demand for 1991-2015 is -1. This means that for these years, the demand for cigarettes is elastic. Similarly, using Tax as an Instrumental Variable the estimated elasticity becomes -1.16.Again, both these estimates are similar, though not identical. The elasticity estimated by the Instrumental Variable is more elastic than the one estimated by OLS.

2.5 Comparison between elasticities between 1970-1990 and 1991-2015

From 1970 to 1990, the estimated elasticity was inelastic, while the estimated elasticity for 1991-2915 is elastic. The elasticity estimated with OLS is likely to be biased in both cases, as there are variables such as the political party of a state, that are correlated with sales and price of cigarettes. For the instrumental variable, as discussed in class, the estimate for 1991-2015, is likely to be more accurate and representative, since most of the variation in taxes occurred from 2000 to 2010, and we are estiamting a Local Average Treatment Effect, where most of the variation occured.

Table 1: Estimates of the price elasticity of demand for cigarettes

	1970 - 1990		1991 - 2015	
	OLS	IV	OLS	IV
Log Price	−0.809	−0.736	−0.997	−1.164
	(0.038)	(0.075)	(0.025)	(0.029)
Num.Obs.	1071	1071	1275	1275
R2	0.294	0.292	0.561	0.546
R2 Adj.	0.293	0.291	0.561	0.545
AIC	−522.8	−519.1	516.0	560.9
BIC	−512.8	−509.2	526.3	571.2
RMSE	0.19	0.19	0.30	0.30
Std.Errors	IID	IID	IID	IID

Table 2: First stage and reduced Form of IV

	1970 - 1990		1991 - 2015	
	First Stage	Reduced Form	First Stage	Reduced Form
Tax	0.327***	−0.241***	0.308***	−0.358***
	(0.017)	(0.028)	(0.005)	(0.008)
Num.Obs.	1071	1071	1275	1275
R2	0.262	0.064	0.764	0.585
R2 Adj.	0.261	0.063	0.764	0.584
AIC	−1333.0	−220.3	−1003.9	446.5
BIC	−1323.1	−210.4	−993.5	456.8
RMSE	0.13	0.22	0.16	0.29
Std.Errors	IID	IID	IID	IID

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$