Assignment 1 - Key

EC313 - Fall 2025

1. Create a table of averages for the combined federal/state cigarette tax, the cost per pack, and cigarette sales per capita for the years 1979, 1999, and 2019. Comment on the changes in these variables over time. Your table should have the following format

|  |  | year |  |
| --- | --- | --- | --- |
| Variable | 1979 | 1999 | 2019 |
| State Tax Per Pack |  |  |  |
| Fed/State Tax Per Pack |  |  |  |
| Fed/State Tax Percent |  |  |  |
| Cost Per Pack |  |  |  |
| Sales Per Capita |  |  |  |
| Tax Revenue |  |  |  |

**Stata code:**

**tabstat state\_tax\_per\_pack fed\_state\_tax\_per\_pack fed\_state\_tax\_percent cost\_per\_pack cig\_sales\_percapita cig\_tax\_rev if year == 1979 | year == 1999 | year == 2019, by(year) nototal**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Year** | | |
| **Variable** | **1979** | **1999** | **2019** |
| **State Tax Per Pack** | **0.13** | **0.40** | **1.81** |
| **Fed/State Tax Per Pack** | **0.21** | **0.65** | **2.84** |
| **Fed/State Tax Percent** | **34.50** | **21.21** | **38.31** |
| **Cost Per Pack** | **0.60** | **2.96** | **7.14** |
| **Sales Per Capita** | **134.82** | **88.92** | **38.82** |
| **Tax Revenue (millions)** | **72.85** | **154.87** | **332.29** |

**Taxes, either as a dollar amount or as a proportion of the cost of a pack, are increasing over time. Interestingly, tax revenue is increasing over time despite the fact that sales per capital are falling, which combined with the cost per pack suggests that people are smoking less but because the cost per pack is increasing the revenue is rising. This suggest that we are in the inelastic part of the demand curve. Also note that all these numbers are nominal, so part of this is inflation.**

1. Use the **xtsum** command to compute the within-state and between-state standard deviations of the federal/state tax per pack, cost per pack, and sales per capita. Do these variables tend to vary more across states or over time within states? (Notes: the within-state standard deviation measures the variation of a variable over time within each state, whereas the between-state standard deviation measures the variation in a variable across states.)

**Stata code:**

**xtsum fed\_state\_tax\_per\_pack cost\_per\_pack cig\_sales\_percapita**

|  |  |  |
| --- | --- | --- |
| **Variable** | **Within SD** | **Between SD** |
| **Fed/State Tax per Pack** | **1.071** | **0.337** |
| **Cost per Pack** | **2.270** | **0.442** |
| **Sales per Capita** | **35.110** | **22.421** |

**As noted, the within-state standard deviation measures the spread in the data within a state over time, and the between-state standard deviation measures spread across states. In all three cases, the variation is larger within a state over time than it is between states. This suggests that the most important source of change in taxes, costs, and sales occurs over time.**

1. Use the **xtline** command to create a matrix of time series plots of the federal/state tax per pack from 1970 to 2019. Comment on the differences in these time trends across states (Notes: (a) This will create a large set of graphs that could take some time to compute. (b) here are 50 states, so I am not expecting a detailed comparison of all of them. Make general comments, and highlight a few things that stand out).

**Stata code:**

**xtline fed\_state\_tax\_per\_pack**

**All states are trending up in terms of the taxes charged on cigarettes. As noted, some of this is inflation. Nevertheless, some states stand out more than others in terms of larger increases, including New York, DC, Massachusetts, Minnesota, Rhode Island, and Connecticut.**

A chart of graph showing the growth of a company

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1. Save the data to a file called **temp.dta** in the same directory as your dofile and original data file. Then use the **collapse** command to create a dataset with the average of each variable per year. Then on a single plot graph the average federal/state tax per pack and cost per pack from 1970 to 2019. You can do this using the **twoway line** command, noting that to plot two graphs together with the same variable on the horizontal axis you could type **twoway (line y x) (line z x)**. Do these trends suggest anything about the relationship between taxes and prices paid by consumers?

**Stata code:**

**save temp.dta, replace**

**collapse (mean) fed\_state\_tax\_per\_pack cost\_per\_pack, by(year)**

**twoway (line fed\_state\_tax\_per\_pack year) (line cost\_per\_pack year), title(Tax and Cost per Pack)**

**Both are rising at the same time, which suggests that they are positively correlated. We would expect to see in a regression of cost on taxes that the estimated slope is positive. We should, however, be careful with this because there are time trends that could be driving this, in addition to differences across states.**

A graph showing the cost of tax

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1. Open **temp.dta**. Run a regression of cost per pack on federal/state tax per pack using the **regress** command. Interpret the slope and intercept in this regression. Do the results suggest that cigarette taxes are fully passed through to consumers in the form of higher prices? Explain.

**Stata code:**

**use temp.dta, clear**

**regress cost\_per\_pack fed\_state\_tax\_per\_pack**

|  |  |  |  |
| --- | --- | --- | --- |
| **Coefficient** | **Estimate** | **Standard Error** | **P-value** |
| **Intercept** | **0.73** | **0.190** | **0.000** |
| **Tax per Pack** | **2.06** | **0.013** | **0.000** |

**The results say that a $1 increase in taxes per pack leads to a $2.64 increase in the cost per pack. This says that 2.5 times the taxes are passed on to consumers, which should raise suspicions about potential bias in the estimate.**

1. Repeat the same regression, but this time add a dummy variable for each state, and a dummy variable for each year (sometimes called **fixed effects**). Why are the results different from the previous question? Do the results suggest that cigarette taxes are fully passed through to consumers in the form of higher prices? (Note: do not report the coefficients of all the dummy variables. Just report the coefficients of the federal/state tax per pack and the intercept).

**Stata code:**

**regress cost\_per\_pack fed\_state\_tax\_per\_pack i.state\_abbr i.year**

|  |  |  |  |
| --- | --- | --- | --- |
| **Coefficient** | **Estimate** | **Standard Error** | **P-value** |
| **Intercept** | **0.81** | **0.032** | **0.000** |
| **Tax per Pack** | **1.20** | **0.008** | **0.000** |

**When we hold constant state fixed effects we control for all fixed differences across states, and focus on the changes within state over time. When we control for year effects we control for changes over time that affect all states identically, like inflation. Once we hold this all constant, we see that taxes are a bit more than fully passed on to consumers.**

1. Run a regression of sales per capita on federal/state tax per pack with the fixed effects for state and year. Interpret the slope and intercept in this regression. Do the results suggest that higher cigarette taxes reduce cigarette sales? Explain.

**Stata code:**

**regress cig\_sales\_percapita fed\_state\_tax\_per\_pack i.state\_abbr i.year**

|  |  |  |  |
| --- | --- | --- | --- |
| **Coefficient** | **Estimate** | **Standard Error** | **P-value** |
| **Intercept** | **120.786** | **2.736** | **0.000** |
| **Tax per Pack** | **-8.82** | **0.644** | **0.000** |

**When we estimate a similar relationship with sales per capita, we see that an increase in taxes of $1 per pack reduces sales per capita by about 9 packs per year.**

1. Draw a demand and supply graph that illustrates the estimated effects of cigarette taxes on cigarette prices and sales. Explain how your graph relates to the results of the previous two questions, and indicate the economic incidence of the cigarette tax.

**This one is a bit tricky. What we estimated is that the consumer price increases by more than the tax, and cigarette sales fall. This suggests that the demand curve is not totally vertical, and at the same time the tax is more than passed on to consumers.**

**The tax shifts the supply curve to the left. One way for a tax overshift and reduction in equilibrium quantity to happen is if the supply curve shifts up by more than the amount of the tax. See drawing below. The consumer price is above the old equilibrium price by more than the amount of the tax, and quantity falls from Q0 to Q1. This also implies that the price producers receive is higher than the previous equilibrium.**

