**Panel Data – Practice Questions** (from prior methods comprehensive exam, hence why it starts at question 7)

**April 12 2021**

Read in the ‘*fatalities*’ data. The data come from the US Department of Transportation Fatal Accident Reporting System. The beer tax is the tax on a case of beer, which is an available measure of state alcohol taxes more generally. The drinking age variable is a factor indicating whether the legal drinking age is 18, 19, or 20. The two binary punishment variables describe the state's minimum sentencing requirements for an initial drunk driving conviction. Total vehicle miles traveled annually by state was obtained from the Department of Transportation. Personal income was obtained from the US Bureau of Economic Analysis, and the unemployment rate was obtained from the US Bureau of Labor Statistics.

Names and descriptions of those variables are below. You don’t need to worry about missing data when responding to the questions below.

**state -** state.

**year -** year.

**spirits -** Spirits consumption.

**unemp -** Unemployment rate.

**income -** Per capita personal income in 1987 dollars.

**emppop -** Employment/population ratio.

**beertax** - Tax on case of beer.

**baptist** - Percent of southern baptist.

**mormon -** Percent of mormon.

**drinkage -** Minimum legal drinking age.

**dry -**  Percent residing in “dry” countries.

**youngdrivers -** Percent of drivers aged 15--24.

**miles -** Average miles per driver.

**breath -** Preliminary breath test law?

**jail -** Mandatory jail sentence?

**service-** Mandatory community service?

**fatal -** Number of vehicle fatalities.

**nfatal -** Number of night-time vehicle fatalities.

**sfatal -** Number of single vehicle fatalities.

**fatal1517 -** Number of vehicle fatalities, 15--17 year olds.

**nfatal1517 -**  Number of night-time vehicle fatalities, 15--17 year olds.

**fatal1820 -**  Number of vehicle fatalities, 18--20 year olds.

**nfatal1820 -** Number of night-time vehicle fatalities, 18--20 year olds.

**fatal2124 -** Number of vehicle fatalities, 21--24 year olds.

**nfatal2124 -** Number of night-time vehicle fatalities, 21--24 year olds.

**afatal -** Number of alcohol-involved vehicle fatalities.

**pop -** Population.

**pop1517 -**  Population, 15--17 year olds.

**pop1820 -**  Population, 18--20 year olds.

**pop2124 -** Population, 21--24 year olds.

**milestot -** Total vehicle miles (millions).

**unempus -** US unemployment rate.

**emppopus -**  US employment/population ratio.

**gsp -** GSP rate of change.

7. Create a visualization that tracks the number of alcohol related vehicle fatalities (*afatal*) for AL, AZ, AR, CA, and CO over time. Note, your software may have read the variable *year* in as a factor, be sure to change it to numeric before plotting the data.

8. Create a new variable, Population in 100,000s based on the existing variable *pop*. Run a standard OLS model (that includes all states) predicting alcohol fatalities (*afatal*) by beer tax (*beertax*) and your new population variable (population in 100,000s). Interpret the coefficients on population and beertax. Note, beertax has the opposite effect of the intended policy (higher beertaxes should reduce consumption and reduce the number of alcohol related fatalities). Why might we be finding these counterintuitive effects?

9. Estimate a fixed effects model to assess the impact of the beertax on alcohol fatalities. In your model please control for both state and year fixed effects and include the predictors of population in 100,000s and beertax. Interpret the results. Provide an explanation for why the effect of beertax changed in the fixed effects model?

10. Does the model in question 9 control for differences in total land area for each state? Why or why not?

11. Re-estimate the model from question 9, but now include unemployment (*unemp*). What is the effect of unemployment on alcohol fatalities?

12. Look at your results from question 11 above. Does the model imply that the effects of a one-unit change in beertax results in the same impact on fatalities for all states in the model? If so why, and why is this potentially a problem? How might you improve the model?