ECON 211B **Econometrics**

Winter 2017 **Homework 3**

For this homework you will be estimating the effect of laws intended to reduce methamphetamine production. Methamphetamine is an illegal stimulant that can be produced using over the counter medicines. In an attempt to reduce its production states restricted the sale of the over the counter products that can be used to make methamphetamine. Please evaluate the effect of these restrictions on methamphetamine production as measured by the number of labs seized. For more details on the interventions and the data please see Are Supply-Side Drug Control Efforts Effective? Evaluating OTC Regulations Targeting Methamphetamine Precursors, with Nancy Nicosia and Matthew Weinberg, Journal of Public Economics, Vol. 120, pp. 48-61, December 2014.

The file **meth_otc.csv** has records for all 50 states and the District of Columbia for each month Jan 2000 to March 2008. The file includes the following variables

- **state_ab**: State postal code
- **any_law**: Date law regulating OTC medicines that can be used to make methamphetamine went into effect
- **pop_all_fitted**: State population
- **event_date**: Month the record pertains to
- **cov_food_st_person**: People on food stampls
- **cov_unemp_rate**: Percent unemployed
- **cap_under_2_oz**: Labs with a through put of less 2 oz
- **cap_2_8_oz**: Labs with a through put of 2 8 oz per production run
- **cap_9_oz_or more**: Labs with a through put of 9 oz or more per production run
- **amph_positive**: Percent of workplace drug tests positive for amphetamines

For each question please include documented code.

1. Show that the within estimator

$$\ddot{Y}_{it} = \ddot{X}'_{it}\beta + \ddot{\varepsilon}_{it}$$

is equivalent to the first difference estimator

$$\Delta Y_{it} = \Delta X'_{it}\beta + \Delta\varepsilon_{it}$$

when T = 2.

2. Make a figure showing the time series of the proportion of the population living in states with an OTC restriction in place and the time series of the total number of labs discovered for each of the three sizes. What does the figure reveal?

3. Make a figure with the average number of the three size labs discovered in event time. Center the figure at time 0 (when the law went into effect in the state).

4. Estimate a standard FE model with a post dummy to determine the effect of the law on the number of labs of different sizes. Does it match what you see in the figure you produced in answer to question 4? Use clustered standard errors. How much does clustering affect the SE? Estimate a regression of the following form where OTC_{st} takes on a value of 1 when you are in a post regulation period.

$$Y_{st} = \beta OTC_{st} + \alpha_s + \gamma_t + \epsilon_{st} \tag{1}$$

5. Under what conditions does the estimation above get you consistent estimates. Do you think they are met in this case.

6. What does equation 1 assume about how the treatment effect evolves over time. How does the regression equation 2 improve on this?

7. Run a regression of the number of labs discovered on state FE, time dummies and event time dummies. Plot the estimates of the event time dummies and their confidence intervals. Interpret the figure and compare it with the one from question 2. Did the laws reduce the number of labs? Does the effect look persistent? You should estimate a regression of the following form

$$Y_{st} = \sum_{j=-12}^{24} \pi_j 1(\tau_{st} = j) + \alpha_s + \gamma_t + \epsilon_{st} \tag{2}$$