

## Problem Set #6

For this assignment, you will do two small replications of public policies that (potentially) affect labor markets.

### Enterprise zones and employment

This first section is based on problem 5.4 of Rabe-Hesketh and Skrondal (2012), which itself is based on Papke (1994). The original Papke (1994) paper explores whether an “Enterprise Zone” (EZ) tax subsidy in Indiana cities affected employment, specifically looking at changes in their unemployment claims after a 10 cities were designated EZs in 1983 or 1984.

1. **Preparation.** The data file, posted to Google Drive, is called `ezunem2.dta`. (0)

- Look at the variable labels and familiarize yourself with the data structure.
- Use `xtset` to tell Stata that the data are structured as a panel

2. **Panel Regressions.** Consider the following panel-DD model: (5)

$$\ln(\text{UnemploymentClaims}_{ct}) = \alpha_c + \delta_t + \beta \text{EZ}_{ct} + \varepsilon_{it} \quad (1)$$

1. Use `xtreg` to estimate equation 1 where  $\alpha_c$  is a city  $c$  fixed effect
2. Estimate again, but with  $\alpha_c$  treated as a random effect
3. Estimate the equivalent between estimator for 1
4. Estimated again, now handling the correlation within cities, not with  $\alpha_c$  term, but by including a lagged dependent variable  $\ln(\text{UnemploymentClaims}_{c,t-1})$
5. Estimated a multilevel model using `mixed...`, `mle` that includes a lagged dependent variable at level one and city random effects at level 2.

3. **Reporting and interpretation.** Put these specifications into a well-organized table. How do they differ? What do they show about the association between EZs and unemployment claims? (1)

## Patents and Inventor Migration

Next, we replicate a portion of Akcigit et al. (2016). Akcigit, Baslandze and Stantcheva gather large amounts data on from national patent offices to investigate how income tax rates affect international migration decisions of individual inventors. Their policy variable of interest is the portion of income that inventors get to keep after tax, or one minus their tax rate (which the authors call “retention rate”).

In this section, we will replicate Akcigit, Baslandze and Stantcheva's table 11, which looks at how differences in tax policy affect the decision of US and Canadian inventors to locate in the US or in Canada.

### 4. Migration dataset. (0)

Load dataset `inventor_data2.dta`. This reports information for each inventor from US or from Canada for each year either is observed.

### 5. OLS baseline. Use OLS to estimate the specification (2)

$$ResidUS_{it} = \beta_0 + \sum_c \beta_{1c} 1\{i \in c\} + \beta_{2c} \ln(1 - \tau_{ct}) * 1\{i \in c\} + \mathbf{X}_{ict} \boldsymbol{\theta} + \varepsilon_{it} \quad (2)$$

where the variables are

- $ResidUS_{it}$  is a dummy equal to 1 if  $i$  resides in the United States in year  $t$ , and 0 if they reside in Canada.
- $1\{i \in c\}$ : a set of dummy variables equal to 1 if inventor  $i$  is in productivity group  $c$  and 0 otherwise
- $\ln(1 - \tau_{ct}) * 1\{i \in c\}$ : The log retention rate for group- $c$  inventors in the US for year  $t$ , interacted with  $i$ 's productivity-group dummies
- A large set of control variables  $\mathbf{X}_{ict}$ :
  - A dummy for whether  $i$  is native to the US
  - Log of US patents held by  $i$
  - Age of  $i$
  - A dummy for whether  $i$  works for a multinational firm

- A set of dummy variables for the scientific field  $i$  works in
  - Interactions of US native and year
  - Log of total patent citations
  - Log citations interacted with year
  - Log citations interacted with scientific field dummies
6. **Probit.** Repeat the estimation of the specification (2) in probit form. That is, replicate Akcigit et al. (2016) table 11, first column. (1)
  7. **Selection.** Estimate a Heckman-probit selection version of (2) using a dummy variable for years pre-/post-1994 an instrument for selection into the dataset; 1994 marked an international treaty that standardized patent processes, plausibly providing an exogenous change in the likelihood of patenting (and thus being observed in the data at all). That is, replicate Akcigit et al. (2016) table 11, second column. (2)
  8. **Reporting.** Put the coefficients for the LPM, the uncorrected probit, the Heckman model, and the Heckman first stage into a nicely formatted table. You do not need to present the individual coefficients for the uninteracted quality dummies or for the large set of control variables. (1)

Interpret your results. Does taxation affect the migration of inventors between the US and Canada? Are inventors more likely to patent after 1994? Does this selection affect change the estimated effect of tax rates on migration?

## References

- Akcigit, Ufuk, Salomé Baslandze, and Stefanie Stantcheva, “Taxation and the International Mobility of Inventors,” *American Economic Review*, October 2016, 106 (10), 2930–2981.
- Papke, Leslie E., “Tax policy and urban development: Evidence from the Indiana enterprise zone program,” *Journal of Public Economics*, 1994, 54 (1), 37 – 49.
- Rabe-Hesketh, Sophia and Anders Skrondal, *Multilevel and Longitudinal Modeling Using Stata*, third ed., College Station, TX: Stata Press, 2012.

*Total points: 12*