ECON 8686 Problem Set #1- Differences-in-Differences, Panel Data

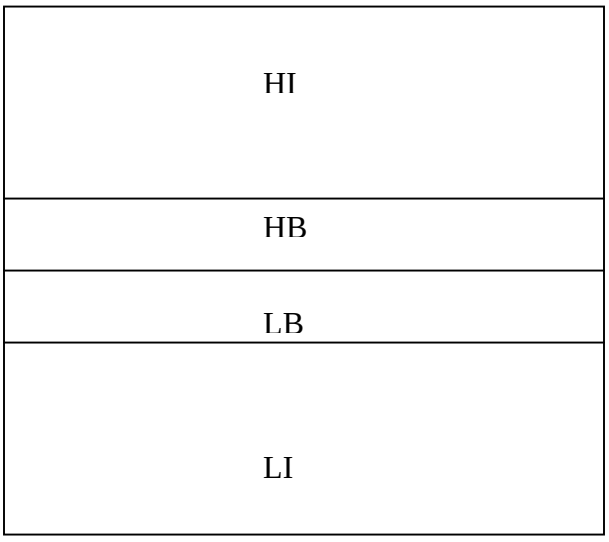
This problem set is based on:
McKinnish,Terra. 2005. "Importing the Poor: Welfare Magnetism and Cross-Border Welfare Migration." *Journal of Human Resources* 40(1):57-76.

The research question is whether poor families in the U.S. migrate to states with higher welfare benefits. The main empirical difficulty is to show that migrants to high-benefit states are moving for welfare benefits, rather than other state amenities (such as strong labor markets) that tend to be positively correlated with welfare benefits.

Most studies of welfare migration, including this one, focus on the Aid to Families with Dependent Children (AFDC) program. AFDC was a welfare program that provided cash payments to low-income single mothers. (It was reformed and renamed Temporary Aid to Needy Families (TANF) in 1996.) Even though it was a federal welfare program, states set their own benefit levels, generating sizeable differences in generosity across states. An important feature for the purpose of this paper is that benefit levels are set at the state level. They do not vary by county within a state.

Part I. Difference-in-Differences Strategy

Assume that the costs of between-state migration are lower for individuals located close to state borders. Consider the simple example for a country with two states illustrated below. The top state is the high-benefit state and the bottom state is the low-benefit state. Area HB contains the counties of the high-benefit state that border on the other state, and area LB is likewise defined for the low-benefit state. Areas HI and LI are the interiors of the two states. If the assumption of differential migration costs is correct, then, the border counties in area HB should disproportionately draw migrants from the border counties in area LB.



Welfare participation should therefore be higher in the border counties of the high-benefit state (H2) relative to the interior counties of the high-benefit state (HI), and welfare participation should be lower in the border counties of the low-benefit state (LB) relative to the interior counties of the low-benefit state (LI). Allowing *W* to be a measure of welfare participation, we can generate the following differences-in-differences formula:

(a) $[\bar{W}_{HB} - \bar{W}_{HI}] - [\bar{W}_{LB} - \bar{W}_{LI}]$

Both interior and border counties in high-benefit states should have higher welfare participation (because participation is more attractive in high benefit states), but the difference between border and interior counties should reflect the differential due to higher welfare migration into border counties. The within-state comparison nets out other state-level unobserved variables.

Consider the following regression model:

(b) $W_{cs} = \alpha_0 + \alpha_1 B_{cs} + \alpha_2 BenDiff_{cs} + \alpha_3 B_{cs} * BenDiff_{cs} + \alpha_4 H_s + \varepsilon_{cs}$

where *B* is an indicator variable that equals one if the county is on the state border, *BenDiff* equals the neighbor's welfare benefit minus own state's welfare benefit (positive if the neighboring state has higher benefits). *H* is an indicator for the high benefit state.

1) If there is welfare-motivated migration, what should be the sign of α_3? Explain.

2) Evaluate $E[(\bar{W}_{HB} - \bar{W}_{HI}) - (\bar{W}_{LB} - \bar{W}_{LI})]$ as a function of the parameters and variatiables in equation (b). In other words, show the relationship between equations (a) and (b). (Hint: notice *BenDiff* for the high-benefit state equals *–BenDiff* for the low-benefit state)

Part II. Cross-Sectional Estimation

The data set Welfmig1.dta contains observations for all counties in the 48 continental states for 1990. The variables are:
AFDCExp: log of per capita AFDC expenditures in county
AFDCBen: monthly AFDC benefit in state (benefit for a family of 4, in 100s of dollars)
Neardist: Distance from county to the closest neighbor state
NeighborBen: monthly AFDC benefit in the closest neighboring state (in 100s of dollars)
State: State ID Code
AFDCExp, *Neardist*, and *NeighborBen* vary at the county level. *AFDCBen* and *State* vary only at the state level.

0) If you are new to STATA, you might find it useful to first look at some additional instructions at the end of this problem set.

1) Estimate:
a)reg AFDCExp AFDCBen
b) reg AFDCExp NeighborBen
and
c) reg AFDCExp AFDCBen NeighborBen
Can the results of a, b or c be interpreted as evidence of welfare migration? Explain

2) Add state fixed-effects. First, use the command:

tab state, gen(std)
Then:
reg AFDCExp AFDCBen NeighborBen std2-std48
Do you obtain a coefficient estimate for AFDCBen? Should you?
[Be careful. STATA will very helpfully drop variables in the case of perfect collinearity, but this can fool you into thinking you are identified when you are not. You can confirm that the coefficient on AFDCBen is not identified in the state fixed-effects model with the alternative estimation:
xtreg AFDCExp AFDCBen NeighborBen, fe i(state)
Likewise, if you estimate
reg AFDCExp NeighborBen std2-std48
notice that STATA no longer drops any of the state indicators]

3) Create a variable that is the difference between neighbor state's benefits and own state's benefits:
gen BenDiff=NeighborBen-AFDCBen
Now compare:
xtreg AFDCExp NeighborBen, fe i(state)
to:
xtreg AFDCExp BenDiff, fe i(state)
Explain the results.

4) We will define a border county as one with a county centroid within 25 miles of a state border. Create the variables:
gen Border25=(neardist<=25)
Estimate:
i) reg AFDCExp Border25
ii) xtreg AFDCExp Border25, fe i(state)
a) Interpret the coefficient on Border25.
b) Explain how Border25 is identified and how this differs between the regression without state fixed-effects (i) and with state fixed-effects (ii).
Give this some careful thought before you answer!

5) Now:
gen BorderBen25=NeighborBen*Border25
and estimate:
reg AFDCExp Border25 NeighborBen BorderBen25
a) Interpret the coefficient on BorderBen25.
b) If there is an unobserved state characteristic that is correlated with welfare benefits, will it bias the coefficient on BorderBen25?

6) Estimate
xtreg AFDCExp Border25 NeighborBen BorderBen25, fe i(state)
a) Did adding the state fixed-effects have a large effect on the coefficient on BorderBen25? Compare, for example, to the effect of adding state fixed-effects on the coefficient on NeighborBen, both here and in questions #1 and #2 above.

b) Look back at your answer to question #5 to explain your answer to (a)

7) Create the variables:
gen Border2550=(neardist>25&neardist<=50)
gen BorderBen2550=NeighborBen*Border2550
Estimate:
xtreg AFDCExp Border25 Border2550 NeighborBen BorderBen25 BorderBen2550, fe i(state)
Interpret the results.

8) Cluster the standard errors at the state level:
xtreg AFDCExp Border25 Border2550 NeighborBen BorderBen25 BorderBen2550, fe i(state) cluster(state)
What has happened to the coefficients? To the standard errors?

Part III: Panel Data Estimation

Welfmig2.dta contains all the same variables as Welfmig1.dta, but for the years 1970-1990, and includes the variable *Year*.

1) Estimate xtreg AFDCExp AFDCBen, fe i(state).
Is the coefficient on AFDCBen identified?

2) Add create and add year effects to the model.
xtreg AFDCExp AFDCBen yr*, fe i(state)
[Note: if you use the more efficient yr* to include year dummies, you must make sure you do not have any other variables that start with "yr"!]
Notice that the coefficient on AFDCBen increases. Can you tell a story for why the model without year indicators understates the effect? Here are some hints: a) What is happening to AFDCBen over time? b) Single mothers are becoming much more common over the 70's and 80's. What is happening to AFDCExp over time (controlling for AFDCBen)?

3) Estimate the model:
xtreg AFDCExp AFDCBen Border25 NeighborBen BorderBen25 yr*, fe i(state)
Interpret the coefficient on BorderBen25

4) Replace state fixed-effects and year fixed-effect with state-year fixed-effects. Is the coefficient on *AFDCBen* identified? What about on *NeighborBen*?
Some different ways to do state-year effects: (don't need report them all in your homework, just one, but should experiment a little to confirm different ways give you the same thing).
gen id=state*100+(year-1900)
tab id, gen(sty)
Estimate:
reg AFDCExp Border25 NeighborBen BorderBen25 sty2-sty1008
or
reg AFDCExp Border25 NeighborBen BorderBen25 sty*, nocons

or
xtreg AFDCExp Border25 NeighborBen BorderBen25, fe i(id)
[Note : you will likely need to increase your memory size and your matrix size to create so many indicator variables and include them in a model:
set mem 100000
set mat 1100]

5) a) Does the welfare migration effect change over time? Create an indicator variable for the years 1980-90 and generate appropriate interaction terms to include in the regression to test this hypothesis.
b) Use this result to explain why your coefficient on BorderBen25 is so much bigger in question #6 in part II compared to question #3 in part III.

New to STATA?

You will find it useful to create .do and a log file.
First, create a text file called something like hw1.do. You can create this file in any text editor. A text editor is available directly through STATA. You simply type in the STATA command:
doedit
and a text window will open up for you to start typing.

You will want your hw1.do file to contain the following commands:

```
clear
set more off
capture log close

set logtype text
log using hw1log.txt, replace

use Welfmig1
reg AFDCExp AFDCBen

etc

clear
use Welfmig2

etc

log close
```

save this file as hw1.do and close the text editor window.

Back in STATA, give the command:

```
do hw1
```

which will run all of the commands in hw1.do and then create the file hw1log.txt with all of the output.

You can then open up the log file in a text editor or word processing program, and type in your answers to the questions to create one document to turn in for your homework. You should also edit unnecessary output (for example, you do not need to keep all of the coefficient estimates for the state-specific dummies), but leave in your STATA commands—this helps me understand what happened if your estimates look odd.

Additional note: when you first open stata, you will need to change directories (e.g. `cd c:/d/labor`) so that your data and your .do files are in the same directory. Or you will need to add a directory path to the dataset filename in your `use` command.