

Panel data analysis: Homework 2

Trinity Term 2016

Consider the design of Alex Fourinaies' paper described in the lecture. Since 1885, there have been electoral spending limits imposed on candidates in UK parliamentary elections. The research question is how the level of the spending limit in a given constituency affects the margin of victory in the constituency: do higher spending limits result in larger or smaller margins? Spending limits in this setting are determined by a formula: there is a baseline amount allowed in the constituency (depending on whether it is officially classified as a borough or county constituency) and then there is an additional amount per elector (which again varies depending on whether it is a borough or a county). Crucially, county constituencies are occasionally reclassified as boroughs and vice versa; also, the formula stating how much money is permissible per elector also changes from time to time, and the number of electors in a given constituency is of course always changing.

1. Suppose you looked at a single election and regressed the margin in the election on the spending limit in the constituency. Evaluate the resulting regression coefficient as an estimate of the effect of higher spending limits on margins of victory.
2. Suppose you again looked at a single election and regressed the margin in the election on the spending limit in the constituency plus some control variables. What control variables would you want to include? Evaluate the resulting regression coefficient as an estimate of the effect of higher spending limits on margins of victory.
3. *Tricky question:* Again suppose you looked at a single election. Consider a regression of the constituency margin in the election on the spending limit in the election, with controls including the borough/county indicator, the number of electors, and the interaction between those. How would you interpret the coefficient on the spending limit variable?
4. Now suppose you looked at a pair of elections (e.g. 1900 and 1906, but any pair will be fine) and you regress the *change* in the margin from one election to the next on the *change* in the spending limit in the constituency. How would you interpret the coefficient on the change in the spending limit? Would you want to include any controls?
5. Still considering the first-differences regression above, consider plotting the changes in spending limits on the horizontal axis and the changes

in margins on the vertical axis. What do you think might account for some of the most positive and most negative changes in spending limits?

6. Now considering the first-differences regression with controls, consider the following *partial regression plot*: First, regress the changes in spending limits on the controls you chose in question 4. Then plot these residuals on the horizontal axis; on the vertical axis plot the corresponding changes in margin. (Recall from week 2 that the coefficient of a regression of y on these residuals gives you the same coefficient as the multivariate regression including the controls.) What do you think might account for some of the most positive and most negative residuals on the x -axis?
7. Finally, consider a regression in which all years and constituencies are included. The margin of victory in the constituency is regressed on the spending limit, constituency fixed effects, election fixed effects, an indicator for whether the constituency is a borough or a county, and the number of electors in the constituency. Think again about the partial regression plot for this regression. Where does variation in the horizontal dimension come from? Can you think of any way to critique this design as a way of learning about the effect of higher spending limits in this setting? What is the conditional independence assumption here, and how might it be violated?

Now try applying the above questions to your research design. Obviously you will have to change the label of the outcome, the treatment, the specifications etc., but if you have panel data you should be able to ask equivalent questions about your design.