14.452: Problem Set 1

Due: November 1, 2019 at 2:30 PM

You can turn in the solutions either (i) online via Stellar or (ii) on paper in recitation. No need to submit any code (unless you want to).

Using the data provided, estimate the following two equations:

$$y_{ct} = \alpha D_{ct} + \delta_c + \gamma_t + \varepsilon_{ct} \tag{1}$$

and

$$\Delta y_{ct} = \alpha D_{ct} + \delta_c + \gamma_t + \varepsilon_{ct} \tag{2}$$

where y_{ct} is log of GDP per capita in country c in year t, D_{ct} is a binary democracy index in country c in year t, δ_c are country fixed effects, and γ_t are year fixed effects.

1. Explain why these two specifications lead to different estimates of α.
2. Carefully provide assumptions under which each specification, estimated by ordinary least squares, identifies the causal effect of democracy on GDP per capita. Do you find these assumptions plausible?
3. Estimate an alternative model, for either levels or differences of per capita GDP, that includes lags of the dependent variable as a regressor. Re-state the conditions under which the OLS estimate $\hat{\alpha}$ identifies a causal effect and carefully defend (or criticize) them.
4. Some researchers, worried about omitted variables, might include average education of the population as a regressor. What might be wrong with this practice if the goal is to estimate the causal effect of democracy? What else could one do if he or she is worried about countries with different levels of education experiencing differential changes in GDP per capita and democracy?