IGE and the Pooling Bias

Econ 350

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The Standard Approach to Estimating IGE

$$\ln y_{itc} = \alpha + \beta \ln y_{itp} + \varepsilon_{it} \tag{1}$$

- y_{itp}: measure of parent's permanent income; y_{itc}: measure of child's permanent income;
- $1 - \beta$: IGE
- What happens if there is grouping or heterogeneity? Say, for example, region heterogeneity driven by:
  1. Production technology
  2. Migration costs
  3. Institutions that promote human capital
- Standard estimates of β in (1) are biased upwards

Considering heterogeneity

- Standard estimates cannot identify grouping
- Consider the model

$$\ln y_{itc} = \alpha + \beta(\ln y_{itp} - \gamma_i) + \epsilon_{it} \tag{2}$$

where $\gamma_i = \mu_r$ if "family" i is converging to equilibrium r, for $r = 1, \ldots, R$.

- γ_i represents a fixed displacement determined by the family's (log) income long run equilibrium
- Interpret γ_i as an omitted regressor
- Let $\hat{\beta}$ be the OLS estimate of β in (1), then

$$\operatorname{plim} \hat{\beta} = \beta \left(1 - \frac{\operatorname{Cov}(\gamma_i, \ln y_{itp})}{\operatorname{Var}(\ln y_{itp})} \right) \tag{3}$$

- Plausibly, $\operatorname{Cov}(\gamma_i, \ln y_{itp}) > 0$, so that $\hat{\beta}$ is upward biased[1]

[1] For a complete discussion on this type of bias and statistical inference on β in this context see Bernard and Durlauf (1996).

Considering heterogeneity 2

- Roberts (2013) considers heterogeneity, indexed by r, as follows:

$$\ln y_{irtc} = \alpha_r + \beta_r \ln y_{irtp} + \varepsilon_{irt} \tag{4}$$

- Individuals who belong to r "regress to" $\bar{y}_r = \frac{\alpha_r}{1-\beta_r}$

- Individuals "select" on their private coefficients and standard estimates of β in (1) are biased upwards

Bias corrections

- Let $\hat{\beta}$ denote the estimate for β in (1) and let β denote the true parameter in (4)

1. Assume S.S. for the income process and only allow α_r to vary:

$$\operatorname{plim} \beta = \hat{\beta} - \left(1 - \hat{\beta}\right) \frac{\mathrm{Var}_r(\bar{y}_r)}{\mathbb{E}_r[\mathrm{Var}(y_{rt})|r]} \tag{5}$$

   - Bias increases as variance across regions increases
   - Bias decreases as variance within regions increases

2. Allowing for covariances in mean income measures over generations only implies to subtract from (5) the following term

$$\frac{\mathrm{Cov}(\bar{y}_{rt+1} - \bar{y}_{rt}) - \mathrm{Var}_r(\bar{y}_r)}{\mathbb{E}_r[\mathrm{Var}(y_{rt})|r]} \tag{6}$$