Lectures on Economic Inequality

Warwick, Summer 2016, Supplement 3 to Slides 2

Debraj Ray

- Overview: Convergence and Divergence
- Inequality and Divergence: Technical Progress
- Inequality and Divergence: Psychological Factors
- Inequality, Polarization and Conflict
- Uneven Growth and Conflict

The Fourth Fundamental Law of Capitalism

- In the long-run, technical progress must displace labor.

- Large literature on induced technical change:

  Classical: Hicks (1932), Drandakis-Phelps (1965), Kennedy (1964), Salter (1966)

  Recent: Autor-Krueger-Katz (1998), Galor-Maov (2000), Acemoglu (1998, 2002)

- Largely taxonomy of technical progress, or reactions to shocks.
- But my comments here on the ultra-long run.

Outline of the Argument

- Labor is fixed, or grows exogenously.
  - Capital is endogenously accumulated.
- In growing economy, the price of capital relative to labor falls.
  - Induces technical progress that displaces labor.
- "Stability argument": But too fast, otherwise labor will become too cheap.
  - That negates the initial incentive to substitute away from labor.
  - So "in equilibrium," displacement happens gradually. But it must happen.

More Detail

- For simplicity, fix the labor supply at $\bar{L}$.

  (Can easily have exogenous growth.)
- Output produced by capital and labor using Cobb-Douglas:

$$Y = AK^{\alpha}L^{1-\alpha}$$

  - Capitalists accumulate own capital, hire labor at wage w:

$$\max_{L} AK^{\alpha}L^{1-\alpha} - wL$$

- Indirect linear profit function defined on K alone:

$$\pi(\alpha, A, w)K \equiv \alpha A^{1/\alpha} \left(\frac{1-\alpha}{w}\right)^{(1-\alpha)/\alpha} K.$$

  - w is going to be endogenously pinned by $\bar{L}$ (later).

- Capitalists choose an accumulation path $\{K_t\}$ to maximize

$$\sum_{t=0}^{\infty} \delta^t (\text{Dividends})_t = \sum_{t=0}^{\infty} \delta^t \left[\pi(\alpha, A, w_t) K_t - K_{t+1} - c(I_t) \right],$$

  - where $K_{t+1} = (1-d)K_t + I_t$ and $I_t \geq 0$,
  - $\{w_t\}$ is fully anticipated, and
  - c is strictly convex with $c(0) = c'(0) = 0$ and $c'(\infty) = \infty$.

- Equilibrium condition: $L_t = \bar{L}$ for all t.

- In long run steady state, $K_t \to K^*$ such that

$$\delta \pi(\alpha, A, w^*) = \delta \alpha A^{1/\alpha} \left(\frac{1-\alpha}{w^*} \right)^{(1-\alpha)/\alpha} = 1.$$

  - which is the modified golden rule, and

$$(1-\alpha) A \left(K^* / \bar{L} \right)^{\alpha} = w^*,$$

  - which is static profit maximization.

- Now introduce some exogenous growth just as in Solow:
  - $A_t < A_{t+1}$ for all t, and $A_t \to \infty$.

- Then "in the long run" w_t chases A_t to maintain the equality

$$\delta \alpha A_t^{1/\alpha} \left(\frac{1-\alpha}{w_t} \right)^{(1-\alpha)/\alpha} = 1,$$

  - and in particular, $w_t \to \infty$.

- The "chasing relationship":

$$\delta\alpha A^{1/\alpha}\left(\frac{1-\alpha}{w(A)}\right)^{(1-\alpha)/\alpha}=1,$$

- Proposition. For each α, there is a threshold $A^*(\alpha)$ such that
  - $\pi(\alpha, A, w(A))$ is decreasing in α when $A < A^*(\alpha)$, and
  - $\pi(\alpha, A, w(A))$ is increasing in α when $A > A^*(\alpha)$.

- Intuition. $w(A)$ rises faster than A, benefiting from both technical progress and capital accumulation.

- Implication of Proposition.
  - If α endogenously chosen at some cost, the share of capital income in total income will go to 1. [Limit Robotic Economy.]
  - (But not too fast . . . w still has to climb on transition path.)

- Unbounded functional inequality, can translate into unbounded personal inequality if combined with earlier arguments.