Galor and Zeira (1993)

Background: early 90's, growth theory using rep. agent approach; no link btw. income distribution (within countries) and economic development

In the data: poor countries have bigger income inequality

Ex: Latin America vs. North America

Called for theory linking income distribution and growth

2-period OLG model

<u>Young</u> earn $w_n > 0$

<u>Old</u> earn $w_s > w_n$ if investing $h > 0$ when young and w_n if not

Consumption, c, only when old

Bequest, b, to (single) child

Utility

$$u_t = \alpha \ln(c_t) + (1-\alpha) \ln(b_t)$$

y_t = resources when old

$$y_t = c_t + b_t$$

$$\Rightarrow \quad \boxed{b_t = (1-\alpha) y_t \; ; \; c_t = \alpha y_t}$$

Max utility:

$$u_t = \alpha \ln[\alpha y_t] + (1-\alpha)\ln[(1-\alpha)y_t]$$

$$\boxed{u_t = \ln(y_t) + \underbrace{\left[\alpha \ln(\alpha) + (1-\alpha)\ln(1-\alpha)\right]}_{\varepsilon}}$$

Interest rates

* If agent is lender, interest is r

  Here: r exogenous

* If agent is borrower, interest is i

Deriving expr. for i

* z = spending by bank to track agent (chosen by the bank)
* βz = cost to agent of defaulting; β exogenous $(\beta > 1)$
* Bank zero profit: $di = dr + z$
* Agent must not run: $(1+i)d = \beta z$

$$\boxed{z = \frac{(1+i)d}{\beta}}$$ from agent not running

$$\boxed{di = dr + \underbrace{\left(\frac{(1+i)d}{\beta}\right)}_{z}}$$ from zero profit in bank sector

$$\beta di = \beta dr + (1+i)d$$

$$id(\beta - 1) = \beta dr + d$$

$$i = \frac{\beta r + 1}{\beta - 1} = \underbrace{\left(\frac{1}{\beta - 1}\right)}_{>0} + \underbrace{\left(\frac{\beta}{\beta - 1}\right)}_{>1} r$$

$$\boxed{i > r}$$

Borrowers face higher interest rate than lenders

* If agent with <u>inheritance x_t</u> chooses <u>not</u> to invest h to become skilled:

$$Y_t = Y_{n,t} = \underbrace{W_n}_{\text{2nd period labor income}} + \underbrace{(x_t + W_n)(1+r)}_{\text{saving + interest from prev. period}}$$

* If same agent chooses to <u>become skilled</u>, income depends on X_t and interest

<u>If $x_t \geq h$:</u> no need to borrow

$$Y_t = Y_{s1,t} = \underbrace{W_s}_{\text{2nd period labor income}} + \underbrace{(x_t - h)(1+r)}_{\text{saving + interest from prev. period}}$$

If $x_t < h$: needs to borrow

$$\boxed{y_t = y_{sb,t} = \underbrace{w_s}_{\text{2nd period labor income}} - \underbrace{(h - x_t)(1+i)}_{\text{payback of loan + interest}},}$$

To ensure some agent chooses to get skilled, must assume:

$$y_{sl,t} > y_{n,t}$$

$$\Rightarrow \boxed{w_s - h(1+r) > w_n(2+r)}$$

Else, agent with $x_t > h$ would choose to be unskilled, and so would other agents

When do agents with $x_t < h$ become unskilled?

When $y_{sb,t} > y_{n,t}$

$$\Rightarrow \quad w_s - (h - x_t)(1+i) > w_n + (x_t + w_n)(1+r)$$

$$\Rightarrow \quad x_t \left[(1+i) - (1+r)\right] > w_n(2+r) - w_s + h(1+i)$$

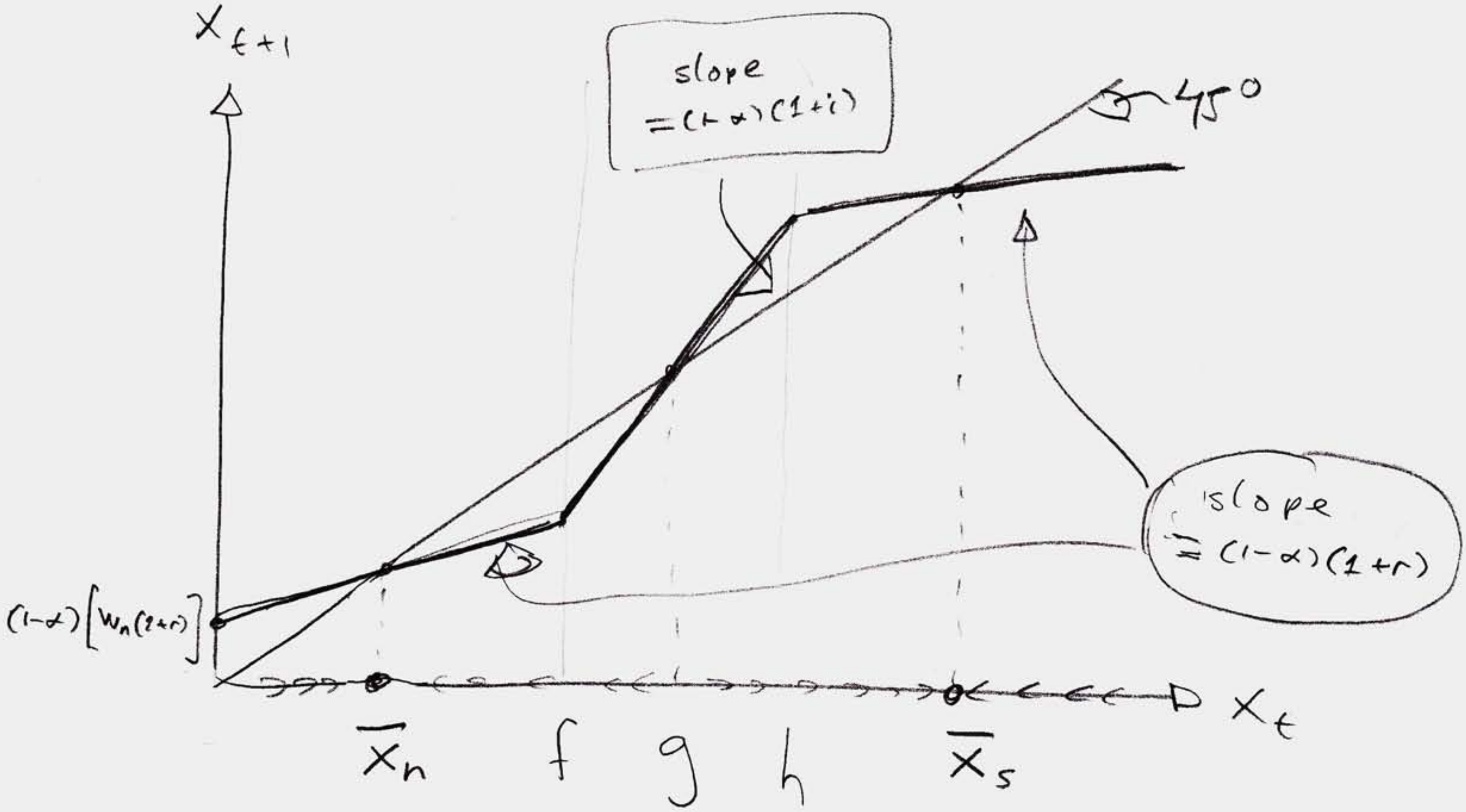
$$\Rightarrow \quad \boxed{x_t > \underbrace{\left(\frac{1}{i-r}\right)\left[w_n(2+r) + h(1+i) - w_s\right]}_{f}}$$

Thus: agents with $x_t > (<) f$ choose (not) to become skilled

Dynamics

$$x_{t+1} = b_t = (1-\alpha)\ln(y_t)$$

$$x_{t+1} = \begin{cases} (1-\alpha)\left[w_n + (x_t + w_n)(1+r)\right] & \text{if } x_t < f \\ (1-\alpha)\left[w_s + (x_t - h)(1+i)\right] & \text{if } x_t \in [f, h) \\ (1-\alpha)\left[w_s + (x_t - h)(1+r)\right] & \text{if } x_t > h \end{cases}$$



$$\overline{x}_n = \left[\frac{1-\alpha}{1-(1-\alpha)(1+r)}\right] w_n(2+r)$$

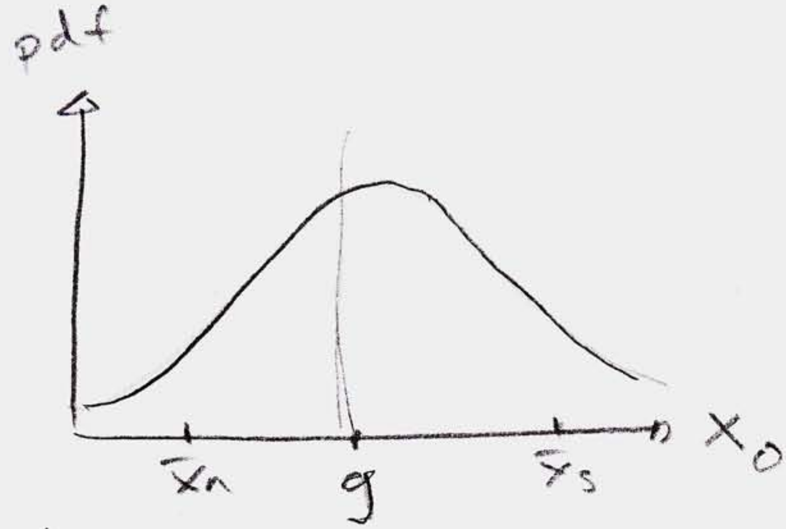
$$\overline{x}_s = \left[\frac{1-\alpha}{1-(1-\alpha)(1+r)}\right] \left[w_s - h(1+r)\right]$$

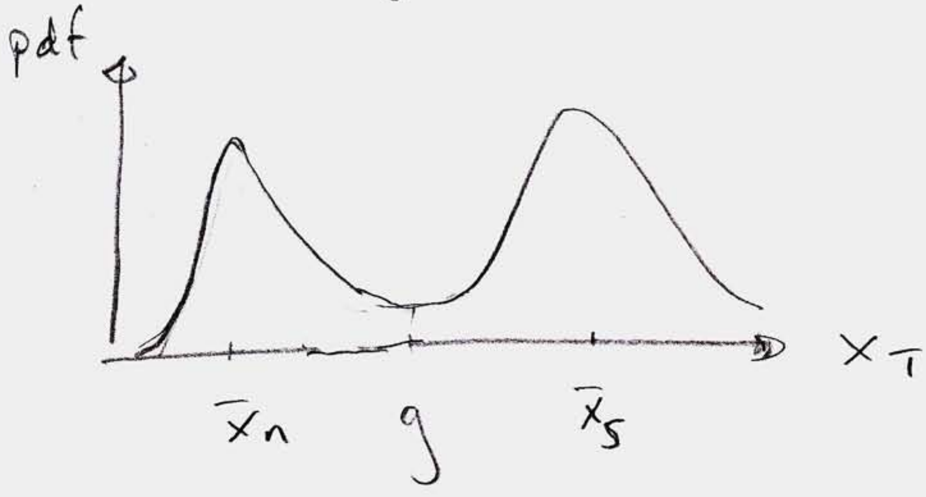
$$g = \frac{(1-\alpha)\left[h(1+i) - w_s\right]}{(1+i)(1-\alpha) - 1}$$

Dynasties starting with $x_0 < g$ end up in steady state with $x = \overline{x}_n$; those with $x_0 > g$ converge to $x = \overline{x}_s$

Aggregate economy

* Converges to steady state where fraction of population is skilled, reminder unskilled





* Larger fraction below g initially
  $\Rightarrow$ larger fraction unskilled in long run