Inequality and the Process of Development

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Economic Growth and Comparative Development

The Classical Theory

Inequality is beneficial for growth (in the post-industrialization stage)

Keynes (1920), Kaldor (1957)

- The marginal propensity to save increases with income
- Inequality channels resources towards individuals whose marginal propensity to save is higher

$\Longrightarrow$ increases aggregate savings & capital accumulation

$\Longrightarrow$ enhances the development process

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The Neoclassical Paradigm

The Representative Agent Approach

- Rejects the role of heterogeneity, and thus income distribution, in economic growth
  - Growth Process $\Rightarrow$ Income Distribution
  - Income Distribution $\not\Rightarrow$ Growth Process

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The Modern Perspective: Origins

Galor and Zeira (1988, 1993)

- Unlike the Neoclassical Paradigm

  Income Distribution $\Rightarrow$ the growth process

- Unlike the Classical Perspective

  Underlined the adverse effect of Inequality on the growth process

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The Credit Market Imperfections Approach: Assumptions

Main assumptions:

- Credit market imperfections
  - Differences in the interest rates for borrowers and lenders

    and either

- Fixed investment cost in education or in other individual-specific projects

    or

- Saving and bequest rates are increasing function of wealth (Moav, (2002) Galor and Moav (2004))

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- Inequality affects occupational choices: skilled vs. unskilled workers or entrepreneurs vs. workers
    - Non-poor economies:
        - Inequality $\Longrightarrow$ under-investment in human capital (inv't projects) that is transmitted across generations $\Longrightarrow$ lower output growth in the short-run and in the long-run
    - Poor economies:
        - Inequality permits some investment in HC (inv't projects) and may thus promote output growth
- The human capital channel is consistent with evidence (Perotti (1996))

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Echoes the hypothesis of the CMI Approach

- Inequality is harmful for the growth process
  - Inequality $\Longrightarrow$ political pressure for redistribution
  - Higher (distortionary) taxation $\Longrightarrow$ lower investment and slower economic growth

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Gender inequality is harmful for the growth process

Galor-Weil (AER 1996)

- Gender inequality reduces the opportunity cost of raising children more than it reduces household income

$\Longrightarrow$ increases fertility

$\Longrightarrow$ reduces human capital investment (quantity-quality trade-off)

$\Longrightarrow$ lowers female labor force participation

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Galor and Moav (2004):

- Captures the changing role of inequality in the growth process
- Unifies the Classical and the Modern Paradigms
- Provides an intertemporal reconciliation between conflicting viewpoints about the effect of inequality on economic growth
- Underlines the role of inequality in triggering socio-political transition (Galor-Moav-Vollrath (2009), Galor-Moav (2006))

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A Unified Theory of Inequality and Development

- A unified theory of the dynamic implications of inequality on the growth process
- Places the dominating modern theories within a broader unified structure
- Provides an intertemporal reconciliation between the Classical viewpoint and the Modern perspective

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Main Hypothesis

- The replacement of physical capital accumulation by human capital accumulation as a prime engine of economic growth has changed the qualitative impact of inequality on the process of development
- Early stages of industrialization: physical capital accumulation is a main engine of growth $\Longrightarrow$
  - Inequality enhanced development by channeling resources towards individuals whose marginal propensity to save is higher
- Later stages of development: the return to human capital increases due to capital-skill complementarity and human capital became the prime engine of growth $\Longrightarrow$
  - Inequality, due to credit constraints, is harmful for growth

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Central Argument

Fundamental asymmetry between:

- Human capital accumulation
- Physical capital accumulation

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Human Capital vs. Physical Capital Accumulation

- Human capital is embodied in humans $\Longrightarrow$
  - Physiological constraints subjects its accumulation *at the individual level* to diminishing returns
  - The accumulation of human capital would be larger if it would be widely distributed among individuals in society
- Physical capital is not embodied in humans $\Longrightarrow$
  - Physical capital accumulation may benefit from the concentration of wealth among individuals whose marginal propensity to save is larger

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Inequality and Physical and Human Capital Accumulation

- **Inequality** is conducive for **physical capital** accumulation, as long as the marginal propensity to save rises with income
- **Inequality** is harmful for **human capital** accumulation, as long as credit constraints are binding

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Inequality and Growth in Different Stages of Development

- **Inequality** stimulates economic growth in stages of development in which **physical capital** accumulation is the prime engine of growth
- **Inequality** is harmful for economic growth in stages of development in which **human capital** accumulation is the prime engine of economic growth and credit constraints are still binding

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The Galor-Zeira Model

- Overlapping-Generations economy
- $t = 0, 1, 2, 3, ...$
- One good
- 3 factors:
  - $K \equiv$ Physical capital
  - $L^s \equiv$ Skilled Labor
  - $L^u \equiv$ Unskilled Labor

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Production

Total output produced

$$Y_t = Y_t^s + Y_t^u$$

- Production in the skilled-intensive sector:

$$Y_t^s = F(K_t, L_t^s) \equiv L_t^s f(k_t); \qquad k_t \equiv K_t / L_t^s$$

- Production in the unskilled-intensive sector:

$$Y_t^u = aL_t^u$$

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Total output produced

$$Y_t = Y_t^s + Y_t^u$$

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$$r_t = f'(k_t) \equiv r(k_t)$$

- Skilled labor:

$$w_t^s = f(k_t) - f'(k_t)k_t \equiv w^s(k_t)$$

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Factor Prices

- Small open economy
- World interest $= r$

$$\Longrightarrow$$

$$\begin{aligned} r_t &= r \\ k_t &= f'^{-1}(r) \equiv k \\ w_t^s &= w^s(k) \equiv w^s \end{aligned}$$

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Individuals

- Continuum of measure 1
- Each Individual has 1 parent and 1 child
- Identical in:
  - Preferences
  - Innate abilities
- Differ in:
  - Parental income $\Rightarrow$ Inv't in HC

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Member of Generation t: Period of Life

- First period of life (Period t):
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- Second period of life (Period $t+1$):
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Member of Generation t: Endowment and Preferences

- Time endowment:
  - 1 units of time in each period
- Capital endowment:
  - $b_t \equiv$ capital inherited in 1^{st} period
- Preferences:

$$u^t = \alpha \ln c_{t+1} + (1-\alpha) \ln b_{t+1} \qquad \alpha \in (0,1)$$

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Second period budget constraint:

$$c_{t+1} + b_{t+1} \leq \omega_{t+1}$$

$c_{t+1} \equiv$ consumption

$b_{t+1} \equiv$ transfers to offspring

$\omega_{t+1} \equiv$ wealth in period $t+1$

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Member of Generation t: Optimization

$$\{c_{t+1}, b_{t+1}\} = \arg\max[\alpha \ln c_{t+1} + (1-\alpha) \ln b_{t+1}]$$

$$\text{s.t.} \qquad c_{t+1} + b_{t+1} \leq \omega_{t+1}$$

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$$b_{t+1} = (1-\alpha)\omega_{t+1}$$

$$c_{t+1} = \alpha\omega_{t+1}$$

Indirect Utility: $\Longrightarrow$

$$\begin{aligned} v^t &= \alpha \ln \alpha\omega_{t+1} + (1-\alpha) \ln \omega_{t+1} \\ &= [\alpha \ln \alpha + (1-\alpha) \ln(1-\alpha)] + \ln \omega_{t+1} \end{aligned}$$

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Fundamental Assumptions

- Imperfect Capital Markets:

$$r < i \tag{A1}$$

$r \equiv$ interest rate for lender

$i \equiv$ interest rate for borrowers (for inv't in HC)

- Fixed cost of education (Indivisibility of inv't in HC) Weighted average of the payments to teachers, administrators, and maintenance workers in the school system (i.e., weighted average of the wages skilled and unskilled workers):

$$C^H = \theta w^s + (1-\theta) w^u \equiv h > 0 \qquad \theta \in [0,1] \tag{A2}$$

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Income: Unskilled Individuals

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\begin{aligned}
\omega_{t+1}^{u} &= (w^{u} + b_t)(1+r) + w^{u} \\
&= w^{u}(2+r) + (1+r)b_t
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$$\omega^s_{t+1} = \begin{cases} w^s - (h - b_t)(1+i) & \text{if} \quad b_t \le h \\ w^s + (b_t - h)(1+r) & \text{if} \quad b_t \ge h \end{cases}$$

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Assumptions

- Investment in human capital is *not* beneficial for individuals who must finance the entire cost of education via borrowing

$$w^s - (1+i)h < 0 \tag{A3}$$

- Investment in human capital is beneficial for individuals who can finance the entire cost of education *without* borrowing

$$w^s - (1+r)h > w^u(2+r) \tag{A4}$$

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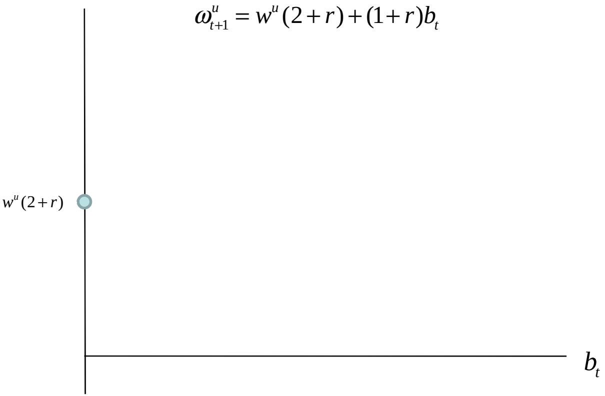

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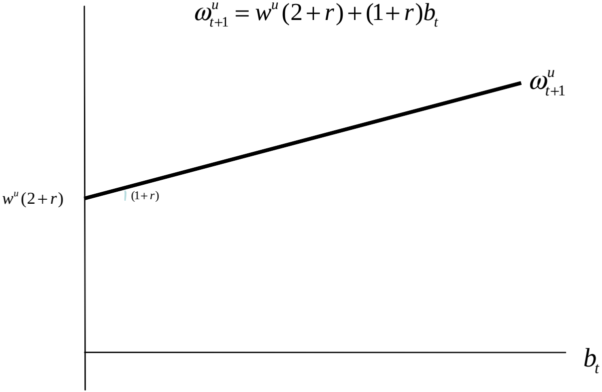
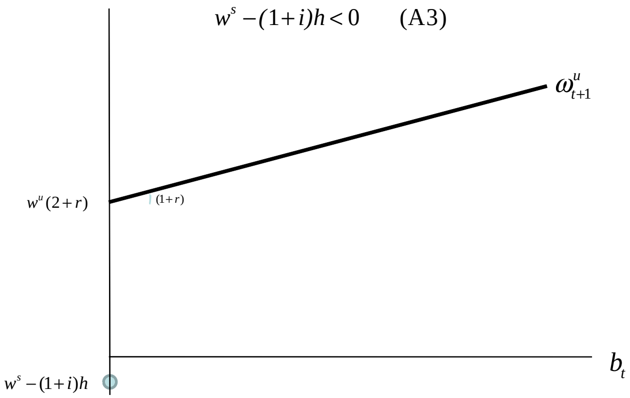


Income from Being Skilled Worker: Borrowers



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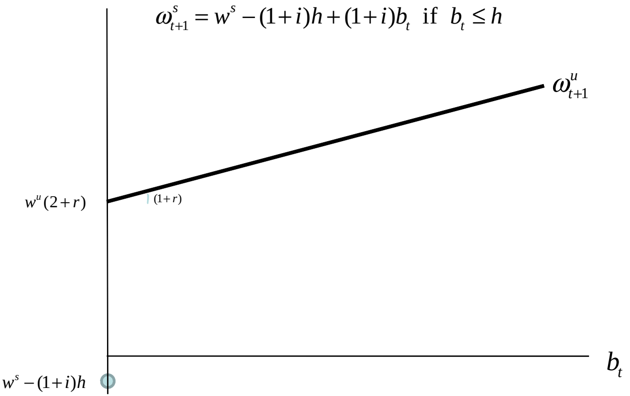

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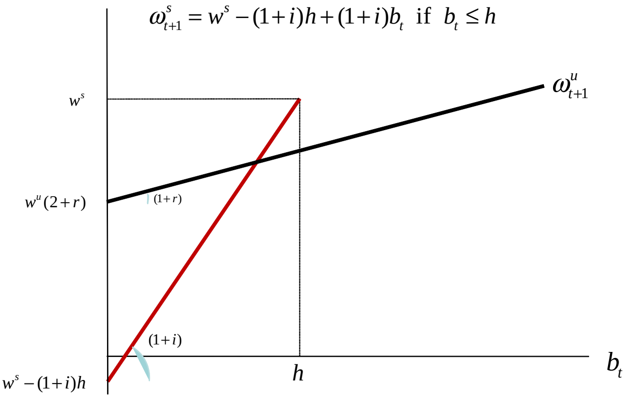

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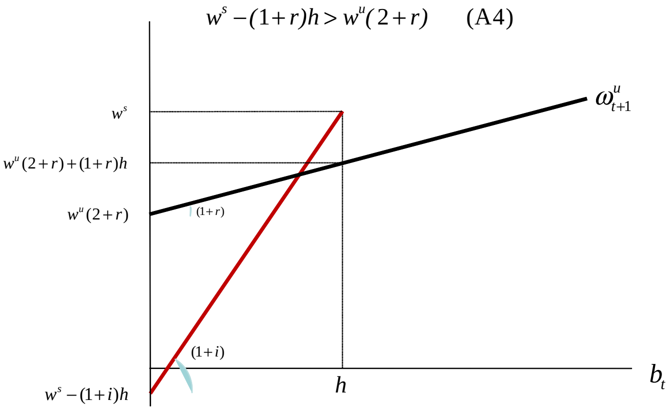
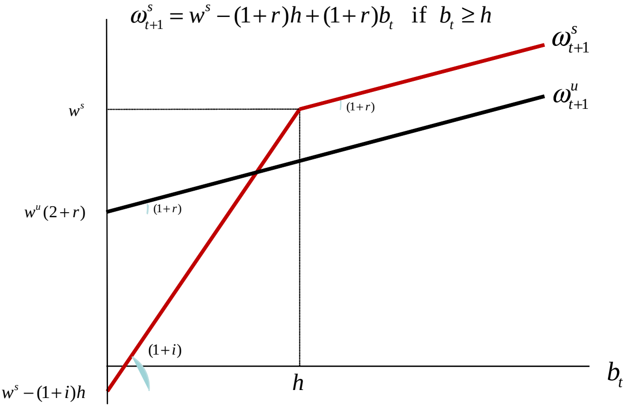
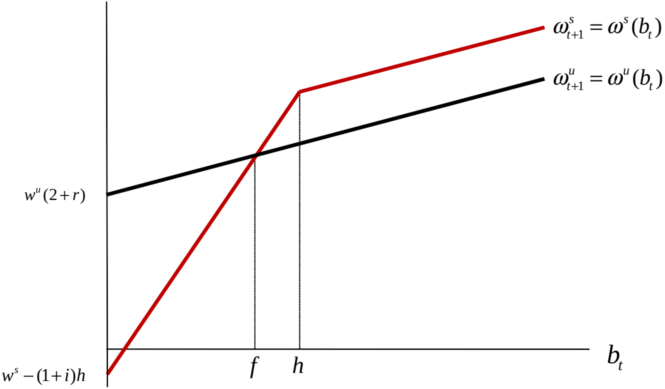


Income from Being Skilled Worker: Lenders



Bequest and Occupational Choice



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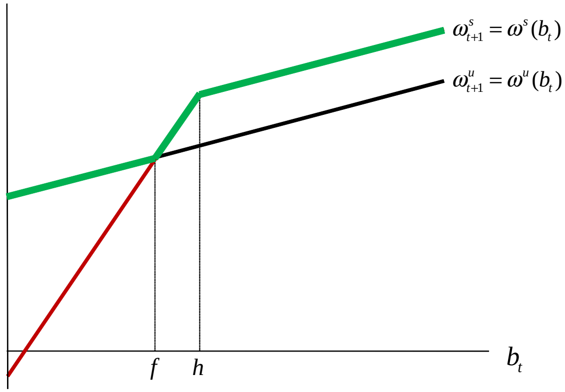

Bequest and Occupational Choice

$$b_t \quad \begin{cases} < f & \rightarrow x^u_{t+1} > x^s_{t+1} \text{ (individual } t \text{ becomes unskilled)} \\ > f & \rightarrow x^u_{t+1} < x^s_{t+1} \text{ (individual } t \text{ becomes skilled)} \end{cases}$$

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Bequest Dynamics

$$b_{t+1} = (1-\alpha)x_{t+1}$$

$$b_{t+1} = \begin{cases} (1-\alpha)[w^u(2+r)+(1+r)b_t] & b_t \in [0,f] \\ (1-\alpha)[w^s-(1+i)h+(1+i)b_t] & b_t \in [f,h] \\ (1-\alpha)[w^s-(1+r)h+(1+r)b_t] & b_t \in [h,\infty] \end{cases}$$

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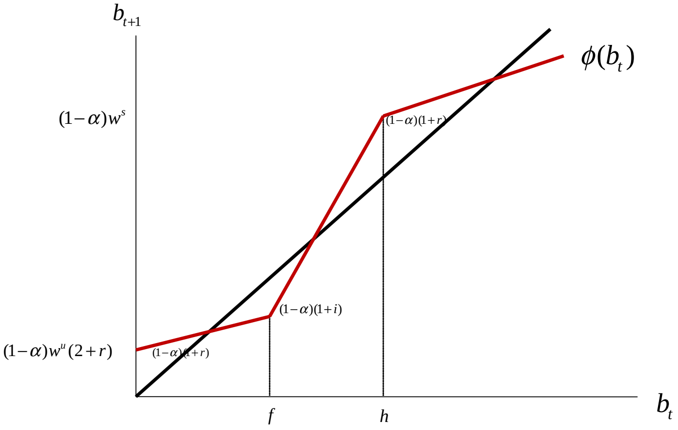
Bequest Dynamics: Sufficiet Conditions for Multiplicity of Steady-Sate

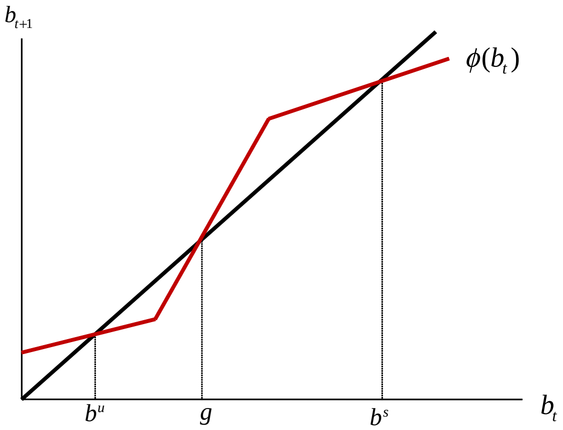
$$
\begin{aligned}
(1-\alpha)(1+r) &< 1 \\
(1-\alpha)(1+i) &> 1
\end{aligned}
\tag{A5}
$$

$$
(1-\alpha)w^s > h \tag{A6}
$$

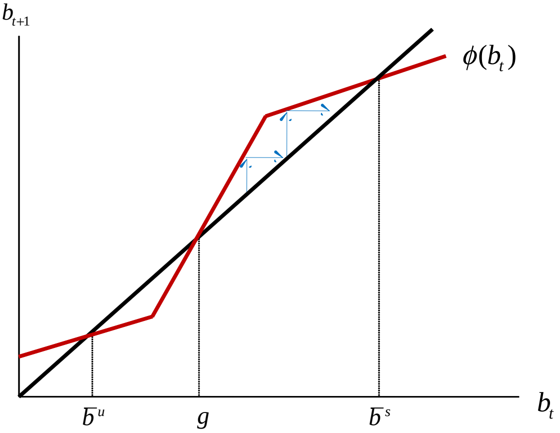
Bequest Dynamics



Bequest Dynamics: Multiple Steady-State Equilibrium



Bequest Dynamics: Stability of High Bequest Equilibrium



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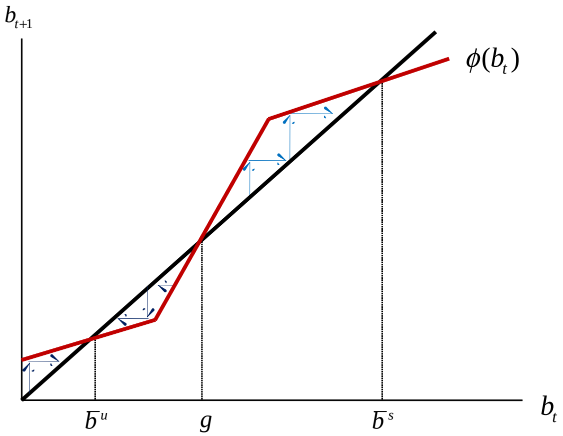
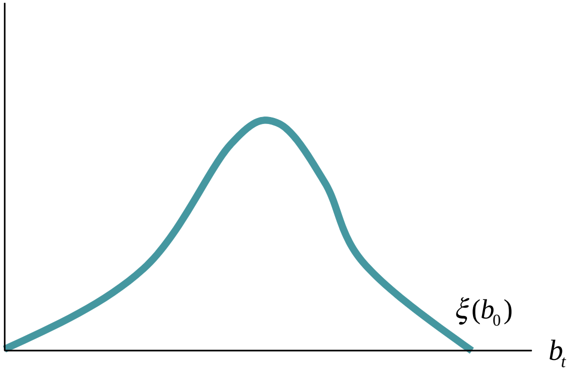


The Distribution of the Inheritance in Period t



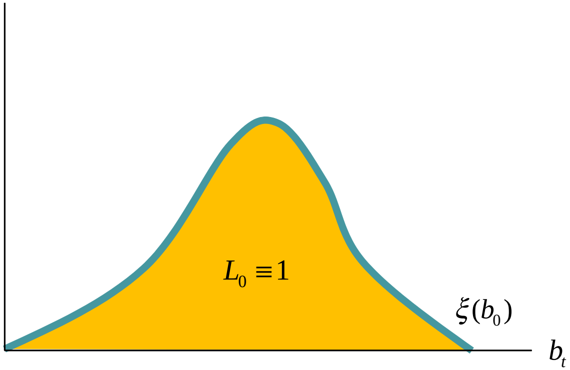
Income Distribution and the Long Run Decomposition of the Labor Force

$\xi_t(b_t) \equiv$ Distribution of inheritance at time t

$\Longrightarrow$

$$L_t = \int_0^\infty \xi(b_t)db_t \equiv 1$$

The Distribution of the Inheritance in Period t



Income Distribution of the Long Run Decomposition of the Labor Force

$$\lim_{t\to\infty} l_t^u = \int_0^g \xi_t(b_t)db_t \equiv \bar{l}^u$$

$$\lim_{t\to\infty} l_t^s = \int_g^\infty \xi_t(b_t)db_t \equiv \bar{l}^s$$

where

$$\partial\bar{l}^s/\partial g < 0$$

and

$$g = \frac{(1-\alpha)[(1+i)h - w^s]}{(1-\alpha)(1+i)-1} > 0$$

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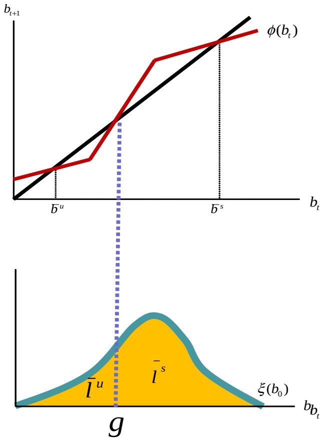
Income Distribution of Skill Composition



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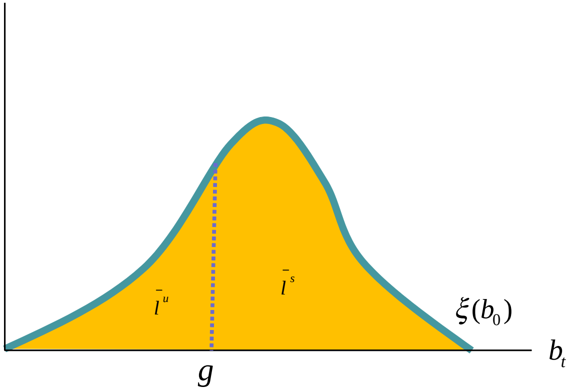

Income Per Capita in the Long Run

- Income of a skilled individual in the second period of life (wage and capital income)

$$I_2^s = w^s + (\bar{b}^s - h)r$$

- Income of an unskilled individual in the second period of life (wage and capital income)

$$I_2^u = w^u + (\bar{b}^u + w^u)r$$

- Income of an unskilled individual in the first period of life (only wage income)

$$I_1^u = w^u$$

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Income Per Capita in the Long Run

- Income of a skilled individual in the second period of life (wage and capital income)

$$I_2^s = w^s + (\bar{b}^s - h)r$$

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Income Per Capita in the Long Run

- Aggregate income in the steady-state

$$\bar{Y} = I_2^s \bar{l}^s + I_2^u \bar{l}^u + I_1^u \bar{l}^u$$

- Aggregate income (note: $\bar{l}^s + \bar{l}^u = 1$)

$$\begin{aligned} Y &= [w^s - rh + r\bar{b}^s]\bar{l}^s + [w^u(2+r) + r\bar{b}^u](1-\bar{l}^s) \\ &= w^u(2+r) + r\bar{b}^u + [(w^s - rh) - w^u(2+r) + (\bar{b}^s - \bar{b}^u)]\bar{l}^s \end{aligned}$$

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$$\bar{y} = \bar{Y}/2$$

Income Per Capita in the Long Run

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Skill Composition and Income Per Capita in the Long Run

- An increase in the fraction of skilled workers increases income per capita in the steady-state

$$\frac{\partial \bar{y}}{\partial \bar{l}^s} = [(w^s - rh) - w^u(2+r) + (\bar{b}^s - \bar{b}^u)]/2 > 0$$

since

$$w^s - (1+r)h > w^u(2+r)$$

$$\bar{b}^s > \bar{b}^u$$

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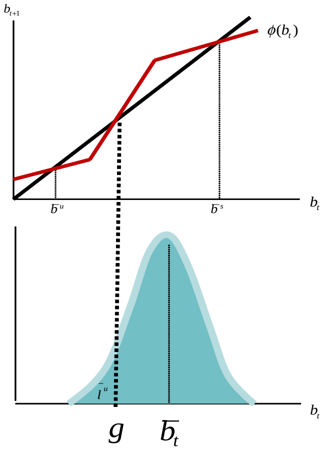
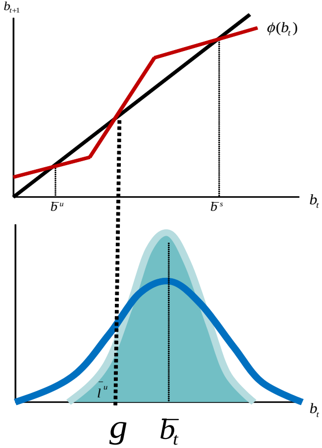
Inequality and Development: Rich Economies



Rich Economies: Inequality is Harmful for Development

Inequality reduces human capital formation



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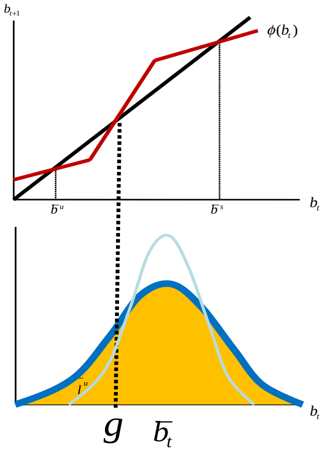

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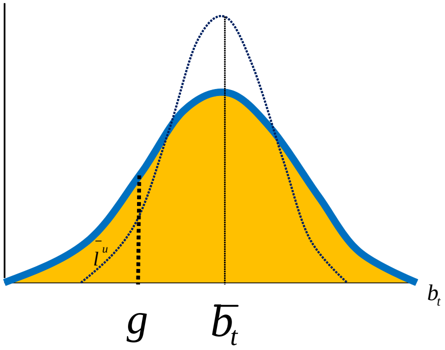
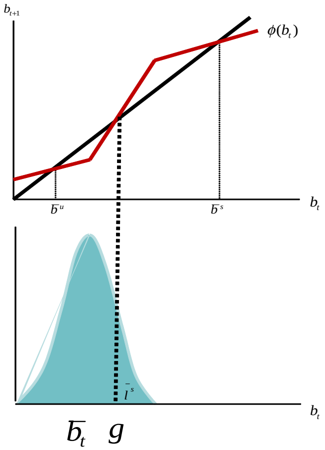
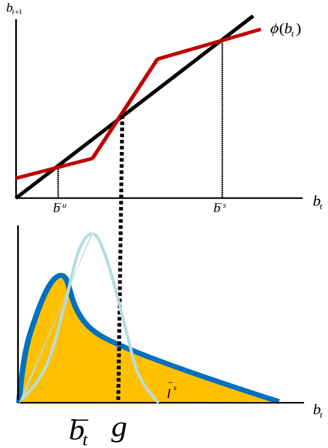


Inequality and Development: Poor Economies



Poor Economies: Inequality may Benefit Development

Inequality stimulates human capital formation



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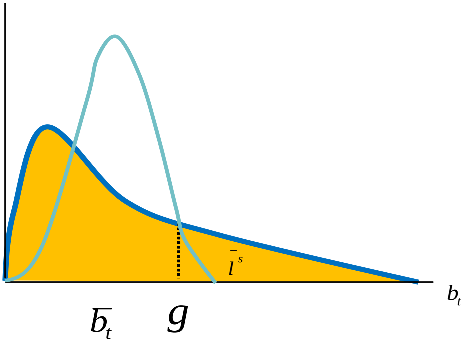

Robustness

The qualitative results are robust to:

- Education cost that is indexed to wages
- Labor augmenting technical change
- Shocks the outcome of investment in human capital, as long as wages are endogenous
- Concave production function of human capital (Moav (EL, 2002), Galor-Moav (RES, 2004))

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Robustness: Technological Progress and Endogenous Education Cost

Labor Augmenting Technological Progress: increases the productivity of workers in both the skilled-intensive and the unskilled intensive sector.

- Production in the skilled-intensive sector

$$Y_t^s = F(K_t, A_t L_t^s) \equiv A_t L_t^s f(k_t); \qquad k_t \equiv K_t / A_t L_t^s$$

- Production in the unskilled-intensive sector

$$Y_t^u = A_t a L_t^u$$

- Technological progress

$$A_{t+1} = (1+\lambda)A_t \qquad \lambda > 0.$$

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Factor Prices

$$w_t^s = A_t[f(k) - f'(k)k] \equiv A_t w^s$$

$$w_t^u = A_t a \equiv A_t w^u$$

$$r_t = r$$

Cost of Education

- Weighted average of the payments to teachers, administrators, and maintenance workers in the school system
- $\Rightarrow$ Weighted average of the wages skilled and unskilled workers

$$C_t^H = \theta A_t w^s + (1-\theta) A_t w^u \equiv A_t h$$

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x^u_{t+1} &= (A_t w^u + b_t)(1+r) + A_{t+1} w^u \\
&= A_t w^u (2 + r + \lambda) + (1+r) b_t
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$$x^s_{t+1} = \begin{cases} A_{t+1}w^s - (A_t h - b_t)(1+i) & if \quad b_t \leq A_t h \\ A_{t+1}w^s + (b_t - A_t h)(1+r) & if \quad b_t \geq A_t h \end{cases}$$

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$$x^s_{t+1} = \begin{cases} A_t[w^s(1+\lambda) - (1+i)h] + (1+i)b_t & if \quad b_t \leq A_t h \\ A_t[w^s(1+\lambda) - (1+r)h] + (1+r)b_t & if \quad b_t \geq A_t h \end{cases}$$

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Threshold level of Bequest for Becoming Skilled Worker in Period t

$$f = \frac{A_t\{w^u(2+r) - [w^s - (1+i)h] - \lambda(w^s - w^u)\}}{(i-r)}$$

$$\frac{f_t}{A_t} = \frac{A_t\{w^u(2+r) - [w^s - (1+i)h] - \lambda(w^s - w^u)\}}{(i-r)} \equiv \hat{f} > 0$$

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Bequest Dynamics

$$b_{t+1} = \begin{cases} (1-\alpha)\{A_t w^u(2+r+\lambda) + (1+r)b_t\} & b_t \in [0, f] \\ (1-\alpha)\{A_t[w^s(1+\lambda) - (1+i)h] + (1+i)b_t\} & b_t \in [f, A_t h] \\ (1-\alpha)\{A_t[w^s(1+\lambda) - (1+r)h] + (1+r)b_t\} & b_t \in [A_t h, \infty] \end{cases}$$

Bequest Dynamics

Let $\hat{b}_{t+1} \equiv b_{t+1}A_{t+1}$

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Sufficient Conditions for Multiple Steady-States

$$(1-\alpha)(1+r) < (1+\lambda)$$

$$(1-\alpha)(1+i) > (1+\lambda)$$

$$w^s(1+\lambda) - (1+i)h < 0$$

$\Rightarrow$ The system is characterized by multiple steady-state, where the unstable equilibrium

$$\hat{g} = \frac{(1-\alpha)[(1+i)h - w^s(1+\lambda)]}{[(1-\alpha)(i+i) - (1+\lambda)]} > 0$$