Lectures on Economic Inequality

Warwick, Summer 2016, Supplement 1 to Slides 2

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- Overview: Convergence and Divergence
- Inequality and Divergence: Economic Factors, Part 2
- Inequality and Divergence: Psychological Factors
- Inequality, Polarization and Conflict
- Uneven Growth and Conflict

A General Model with Financial Bequests and Occupational Choice

- Why study this?
- Interplay of financial and human bequests
- No need for persistent inequality in two-occupation model
- Nonconvexities and rich occupational structure
- Now the "curvature" of occupational returns is fully endogenous.

- Production with capital and "occupations".
  - Population distribution on occupations $\boldsymbol{\lambda}$ (endogenous).
  - Physical capital k.
  - Production function $y = F(k, \boldsymbol{\lambda})$, CRS and strictly quasiconcave.
- Training cost function $\mathbf{x}$ on occupations:
  - incurred up front.
  - parents pay directly, or bequeath and then children pay.

Prices

- Perfect competition.
- Return on capital fixed at rate r (international k-mobility).
- Returns to occupational choice: "wage" vector $\mathbf{w} \equiv \{w(h)\}$.
- $\mathbf{w}$ endogenous, together with r supports profit-maximization.

Households

- Continuum of households, each with one agent per generation.
- Starting wealth y; $y = c + b + x(h)$.
- Child wealth $y' = (1+r)b + \mathbf{w}_{t+1}(h)$.
- Parent picks (b, h) to max utility.
- No debt! $b \geq 0$.
- Child grows up; back to the same cycle.

Preferences and Equilibrium

- Preferences: mix of income-based and nonpaternalistic

$$U(c) + \delta[\theta V(y') + (1-\theta)P(y')]$$

- Equilibrium:

- Wages $\mathbf{w}_t$, value functions V_t, and occupational distributions $\boldsymbol{\lambda}_t$ such that at every date t:

- Each family i chooses $\{h_t(i), b_t(i)\}$ optimally
- Occupational choices $\{h_t(i)\}$ aggregate to $\boldsymbol{\lambda}_t$;
- Firms willingly demand $\boldsymbol{\lambda}_t$ at prices $(\mathbf{w}_t, r)$.
- Note: physical capital willingly supplied to meet any demand.

Steady State

- A stationary equilibrium with positive output and wages:
  - $\mathbf{w}_t = \mathbf{w} \gg 0$, and
  - $(k_t, \boldsymbol{\lambda}_t) = (k, \boldsymbol{\lambda})$ for all t, and $F(k, \boldsymbol{\lambda}) > 0$.

Divergence and History: Going Deeper

- Two notions of history-dependence.
- Individual (household destinies depend on past events)
- Economy-wide (multiple distributions of wealth)
  - Former endemic in this model. Latter is what we are after.
- Literature usually studies a small number of occupations (two).
  - Steady-state conditions written as inequalities
- Multiplicities are endemic (as we've seen).

Rich Occupational Structure

- Try the other extreme:

- The set of all training costs is a compact interval $[0, X]$.

- If $\boldsymbol{\lambda}$ is zero on any positive interval of training costs, then $y = 0$.

- Jointly the richness assumption [R].

- Want to investigate economy-wide history-dependence under this assumption.

A Benchmark With No Occupational Choice

- Financial bequests (at rate r) + just one occupation (wage w).

- Parent with wealth y selects $b \geq 0$ to

$$\max U(c) + \delta[\theta V(y') + (1-\theta)P(y')].$$

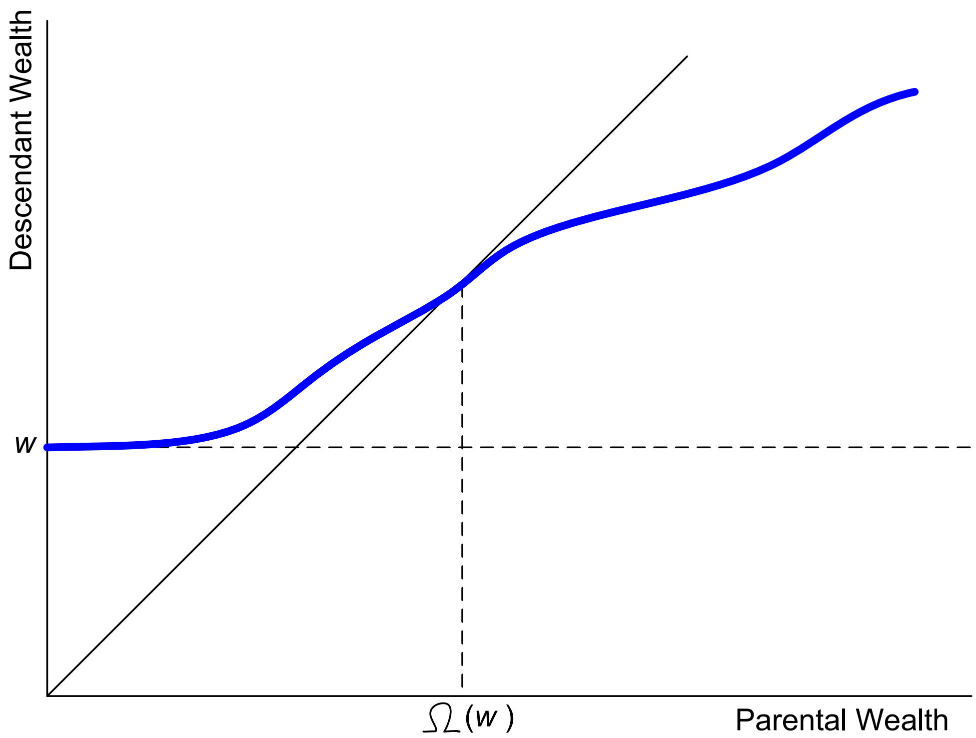
- Child wealth $y' \equiv w + (1+r)b$.

- Depends on (y, r, w); increasing in y.

- Limit wealth $\Omega(w, r)$: intersections with 45^0 line (or ∞).

- [U] $\Omega(\hat{w}, \hat{r})$ independent of initial conditions for all $(\hat{w}, \hat{r})$.

- [F] $\Omega(\hat{w}, r) < \infty$ for all $\hat{w}$.

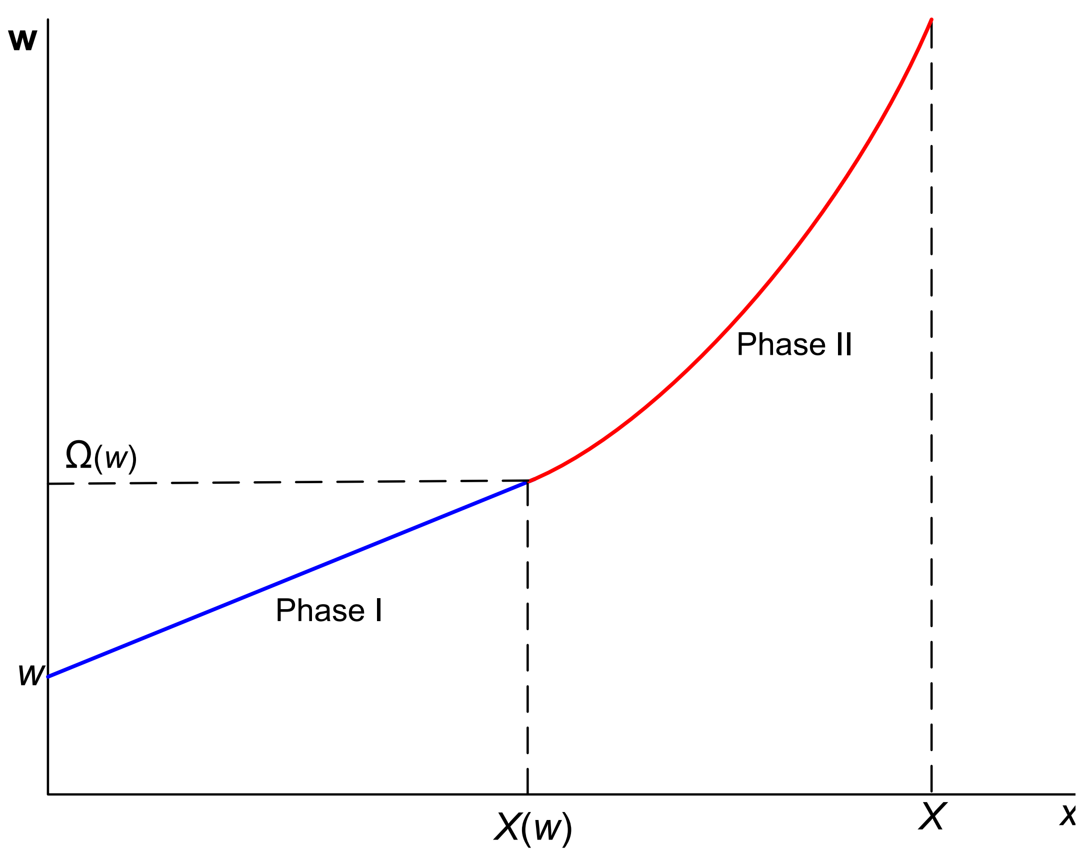


Remarks on [U] and [F]

- Related to limited persistence (cf. Becker and Tomes).
- [U] requires some degree of paternalism in preferences:
  - Recall $U(c) + \delta[\theta V(y') + (1-\theta)P(y')]$
  - Need $\theta < 1$.
- Yet our results will generally extend to the dynastic case.

Back to Occupational Choice

- **Theorem.** Assume [R], [U] and [F].
- Every steady state has wage function **w** continuous in x.
- **w** is fully described by a two-phase property:



- In Phase I **w** is linear in x: there is $w > 0$ such that

$$w(x) = w + (1 + r)x \text{ for all } x \leq \theta.$$

- All families in Phase I have the same overall wealth $\Omega(w, r)$.

- In Phase II, **w** follows the differential equation

$$w'(x) = \frac{U'(w(x) - x)}{\delta[\theta U'(w(x) - x) + (1 - \theta)P'(w(x))]}$$

- with endpoint to patch with I: $w(x) = w + (1 + r)x$ at $x = X(w)$.

- Families located in Phase II will have different wealths.

$$w'(x) = \frac{U'(w(x) - x)}{\delta[\theta U'(w(x) - x) + (1 - \theta)P'(w(x))]}$$

- Note that the shape of a steady state wage function

- depends fundamentally on preferences

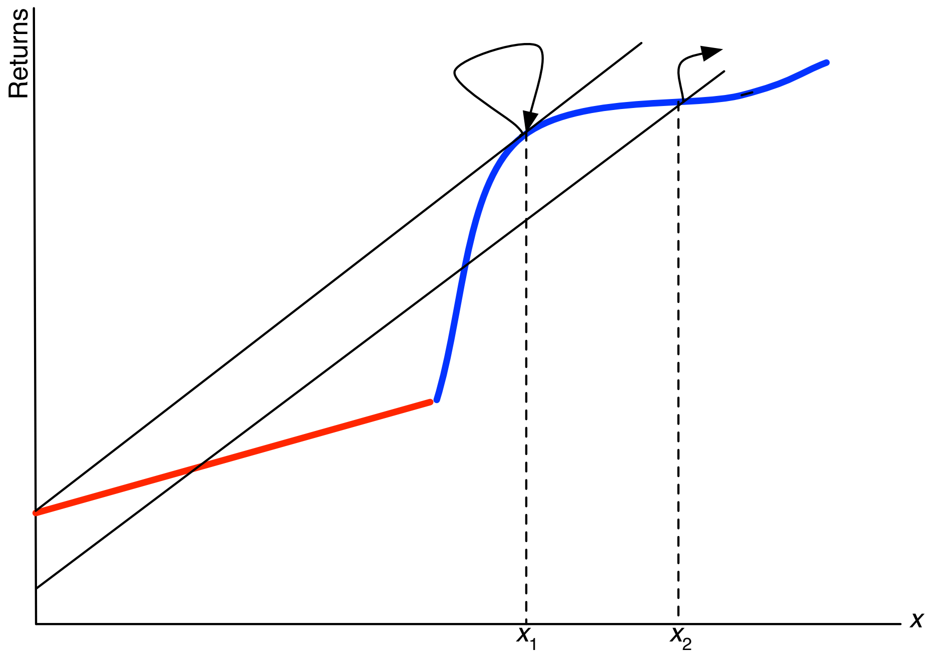
- is independent of technology apart from baseline w

- Define the average return to occupational investment x by

$$\rho(x) \equiv \frac{w(x) - w}{x}.$$

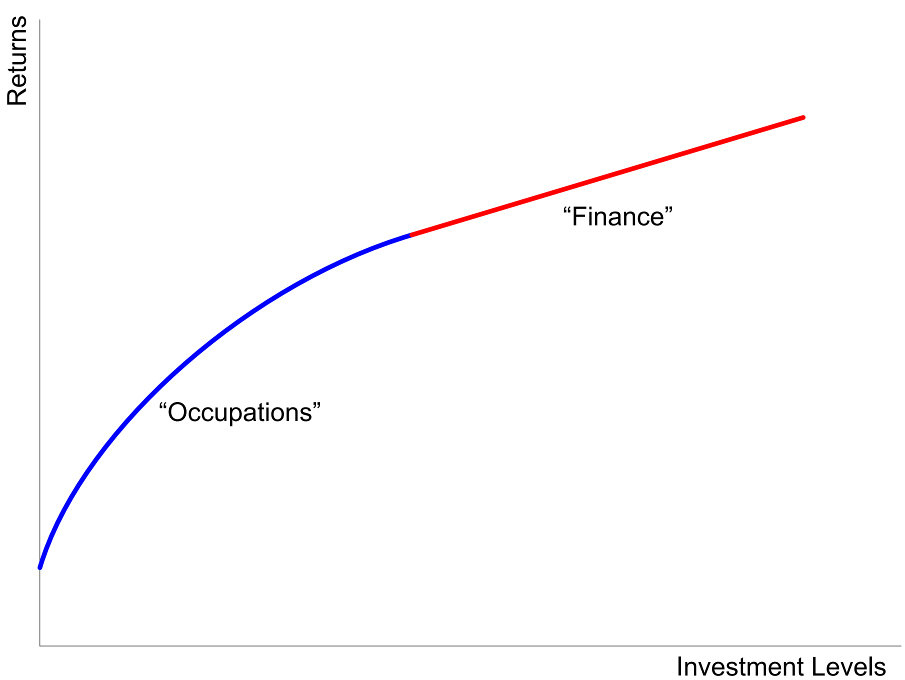
- Theorem. The average return to occupational investment is strictly increasing in x on $[z, X]$.

■ Proof. Suppose not; then:



▪ Contradiction to unique limit wealth in the benchmark model.

■ Theorem stands the usual literature on its head. Compare:



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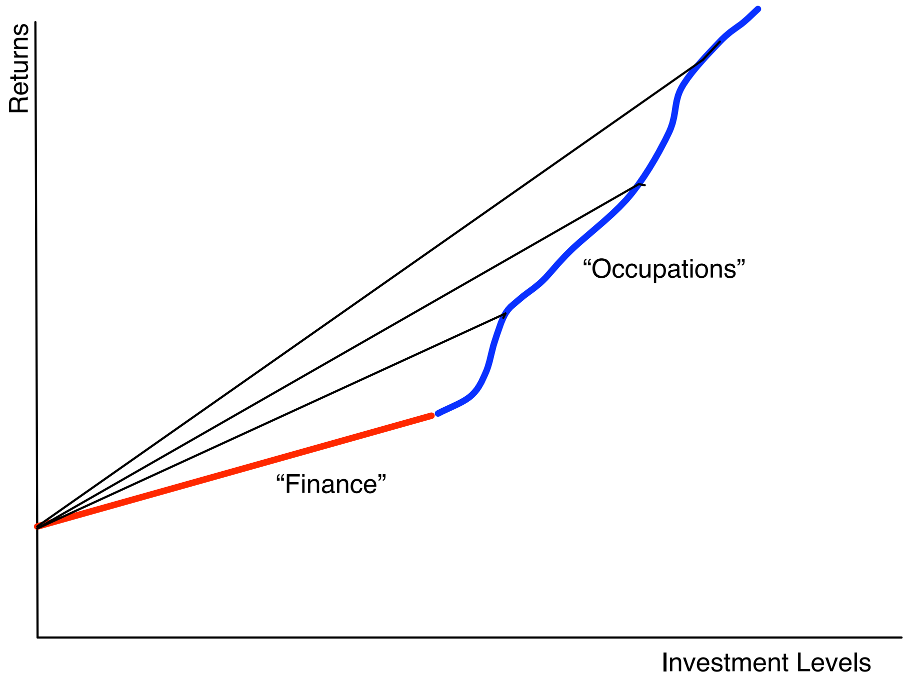


- Increasing occupational returns a (central) testable implication.

Unique Steady State with Rich Occupational Structure

- Now a fundamental difference from two-occupation case:

- Theorem. Assume [R], [U] and [F]. Then there is at most one steady state.

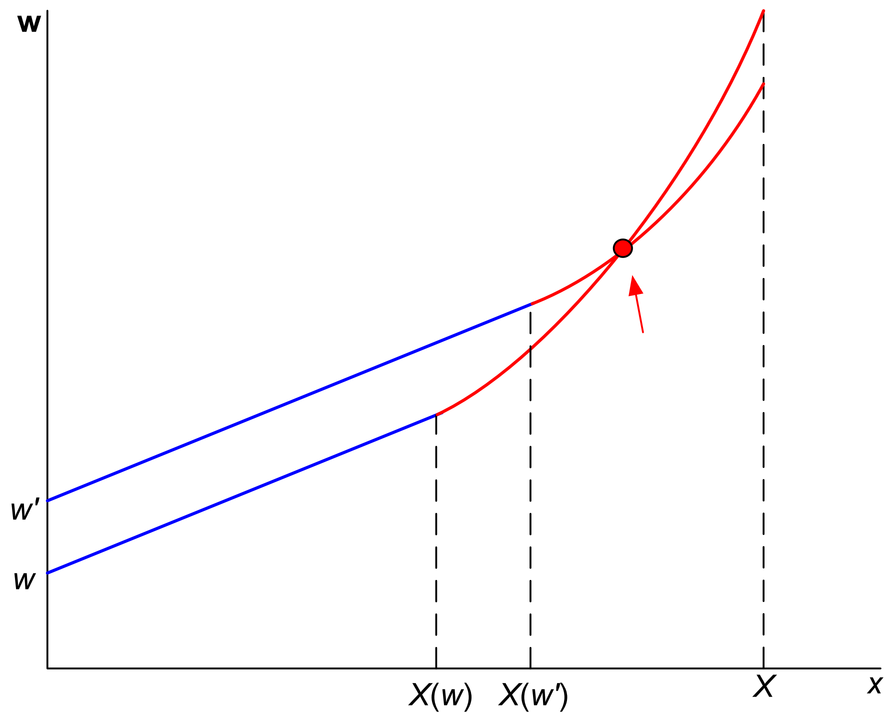
- Proof rests on the fact that two members of the two-phase family cannot cross.

- See succeeding slides.

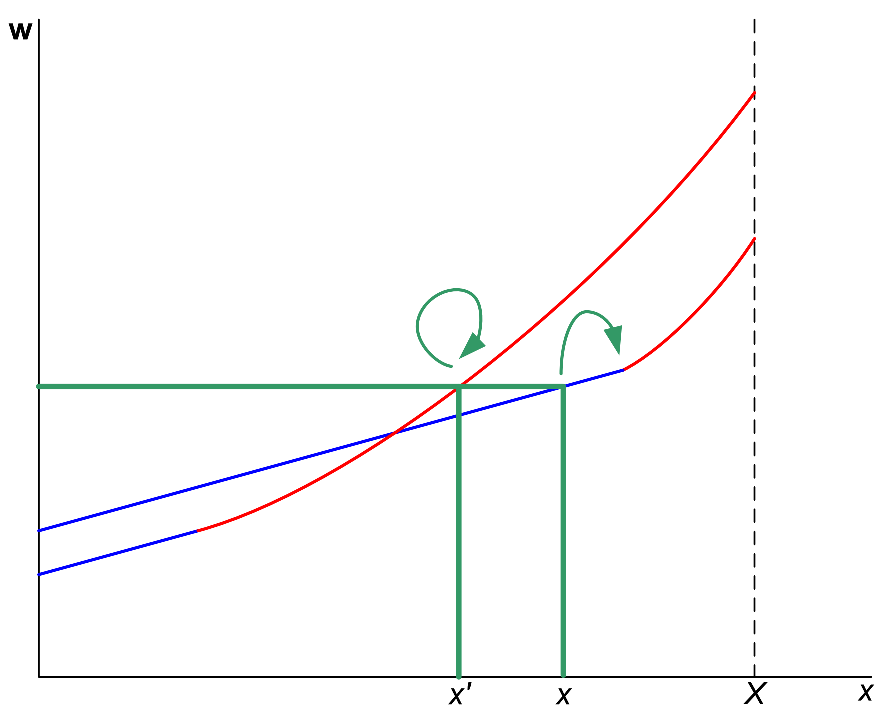
- Once that is settled, then only one intercept wage is possible that supports profit maximization with positive output.

- (For all wages must climb along with intercept wage.)

- No-crossing argument, part I
  - Theory of differential equations won't allow this:



- No-crossing argument, part II
  - Revealed preference argument rules this out:



But What About Divergence?

- In Phase I, there is perfect equality of overall wealth.

- (All families in Phase I must have wealth equal to $\Omega(w, r)$.)

- Families at different occupations in Phase II cannot have the same wealth.

- Thus, "most" inequality comes from nonalienable capital.

> "Labor income inequality is as important or more important than all other income sources combined in explaining total income inequality". [Fields (2004)]

- When is Phase II nonempty?

  - When there is a large occupation span relative to bequest motive.

- Can examine this condition for different situations/applications.

  - Discounting.
  - Poverty, via TFP differences.
  - Growth in TFP, lowers effective bequest motive
  - World return on capital.
  - Globalization: new occupations.

Divergence and History-Dependence

- At the macro-level, history-dependence depends on occupational richness.

- A lot of history-dependence at the individual level.

  - Individual dynasties have to occupy slots that are needed for aggregate production (or utility).

  - Recall the world-economy interpretation, with individuals as countries.

- The distribution as a whole is pinned down, but not who occupies which slot.

Luck versus Markets: Philosophy of Inequality

- Two views on the evolution of inequality:

- Equalization: Inequality an ongoing battle between convergence and "luck"

  - Brock-Mirman (1972), Becker-Tomes (1979, 1986), Loury (1981)...

- Disequalization: Markets intrinsically create and maintain inequality

  - Ray (1990, 2006), Banerjee-Newman (1993), Galor-Zeira (1993), Ljungqvist (1993), Freeman (1996), Mookherjee-Ray (2000)...

- We've explored here the second view.

- Fundamentally based on symmetry-breaking.

- It remains to be seen if this is the right view of the world.