Persistent Inequality and Occupational Choice

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Based on work with
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General context

• At the macro-level, there is evidence that ‘initial conditions’ created in colonial times – in particular, economic and political inequality – still affect (under)development today (Engerman and Sokoloff 1997; Acemoglu, Johnson and Robinson 2001, 2012; Banerjee and Iyer 2002; Albouy 2012)

• At the micro-level, many empirical studies looking at

$$y'_{t+1} = (1-\beta)\bar{y} + \beta y'_t + \varepsilon$$

for economic status variables like schooling, income, wealth, or consumption find significant persistence across generations (Mulligan 1999; Björklund and Jäntti 2009)
General context

• Neoclassical view: Standard production technologies with decreasing returns imply equalization (‘convergence’ in battle with ‘luck’)

• More recently, a large theoretical literature derives persistent inter-household inequality in earnings and human capital, and different long-run macroeconomic performance from
  – capital market imperfections
  – indivisibilities in occupational choice
  – local feedback effects

(Loury 1981; Ray 1990, 2006; Galor and Zeira 1993; Banerjee and Newman 1993; Ljungqvist 1993; Freeman 1996; Maoz and Moav 1999; Mookherjee and Ray 2003; …)

• This lecture explores some of the key mechanisms discussed in this literature, in a simple two-occupation model that focuses on individual investment incentives and endogenous wage effects

Outline

• Baseline model
• Model with heterogeneous ability
• Model with local spillovers
• (Policies)
Baseline model

• Simple variation of Mookherjee and Ray (2003)
  • Single consumption good produced with decreasing marginal returns;
    unskilled and skilled inputs are essential for production;
    work in skilled occupation requires prior educational investment $c$

$\Rightarrow$ Equilibrium skilled wage $w_s(\lambda)$ falls in economy-wide skill ratio $\lambda$;
  unskilled wage $w_u(\lambda)$ rises in $\lambda$;
  for very big $\lambda^b$ are equal, but huge inequality for $\lambda \approx 0$

• At each date $t = 0, 1, 2, \ldots$ a household $h$ divides its income $w^h$ between consumption and educational investment $1(h) \in \{0, 1\}$ so as to maximize

$$u(w^h \cdot c \cdot 1(h)) + v(1(h) \cdot w_s + (1 - 1(h)) \cdot w_u)$$

with decreasing marginal utility from consumption

• No loans, no financial bequests

Results for the baseline model

• A competitive equilibrium is a sequence $\{\lambda_t\}_{t \geq 0}$ s.t. given $\lambda_0$ and agents’ anticipation of $\lambda_{t+1}$, individual decisions result in $\lambda_{t+1}$; it is a steady state if $\lambda_t = \lambda$ for all $t$

• Result:
  1. Persistent inequality and no social mobility in any steady state.
  2. There exists a continuum of steady states, ordered by human capital, per capita income, and social equality.
Intuition

1. Cost for skill acquisition requires wage premium for skilled; decreasing marginal utility then implies that $c$ is a smaller utility sacrifice for the rich

$\Rightarrow$ Skilled parents always have greater net benefits from investing

$\Rightarrow$ No simultaneous upward and downward mobility

2. For some $\lambda^*$ sufficiently high (i.e., skilled wage premium low), skilled are indifferent and unskilled strictly do not want to invest

$\Rightarrow$ This $\lambda^*$ is a steady state;
unskilled’s strict preference will be preserved by small decreases of $\lambda$

Illustration

[Diagram showing steady state skill ratios]
Remarks on baseline model

• If marginal utility were constant then $C_u$ and $C_s$ would be equal and constant, giving rise to a unique steady state $\lambda^*$; indifference of skilled and unskilled at $\lambda^*$ allows for social mobility

• Social mobility is also possible and scope for history-dependence is drastically reduced if heterogeneous agents are considered: steady states with mobility generically are locally unique (Mookherjee and Napel 2007; Napel and Schneider 2008)

• History-dependence is similarly reduced if fertility is endogenized (Mookherjee, Prina and Ray 2012)

• Set of steady states shrinks to a singleton when $k \to \infty$ different occupations are considered (Mookherjee and Ray 2003)

• Multiplicity and history-dependence even with constant marginal utility may result from other sources, such as local spillovers (Mookherjee, Napel and Ray 2010a,b)

More general heterogeneous abilities

• Heterogeneous learning abilities reflected by i.i.d. random costs of education with c.d.f. $F$ on $[0, \infty]$, parent $i$ observes realization $c_i^t$ before deciding

  $\Rightarrow$ Subjective costs of education now depend on cost type; possibly, some skilled families disinvest while some unskilled families invest

• Result:
  Given some technical conditions, steady states with mobility are generically locally unique and finite in number; steady states without mobility can co-exist

• If latter are ruled out on empirical grounds, scope for short-run policies to affect long-run performance is limited; or comes from other sources

• Given two mobile steady states, human capital, income per capita, equality and mobility are all ordered the same way
Model with local spillovers

- Now let households have fixed locations on an interval, described by a ‘well-behaved’ density $f$

- Each household provides skilled or unskilled labor on the economy-wide competitive market, but local social interaction creates spillovers in human capital investment incentives (Bénabou 1993, 1996; Durlauf 1994)

Model with local interaction (2)

- We have explored two different channels for spillovers:
  1. Subjective gross benefits have a social component; e.g., they increase in parental aspirations $a^h$ for their offspring, i.e.,
     \[ \nu(w_s, a^h) - \nu(w_n, a^h) \uparrow \text{ in } a^h, \]
     where $a^h$ increases in the neighborhoods’ average earnings
  2. Objective investment costs have a social component; e.g., cost of acquiring skill is a decreasing function $c(x_i)$ of the “learning effectiveness” $x_i$ at location $i$

- Both have the same macroeconomic implications, but can lead to different welfare conclusions

- Here, concentrate on cost-driven spillovers with
  \[ x_i = \eta \mu_i + (1-\eta)\lambda, \]
  where $\mu_i$ is the fraction of skilled in the local peer group of agents at location $i$, and $\eta \in (0,1)$ captures importance of local interactions

- The “local peer group” is a neighborhood centered at $i$ of width $\varepsilon$
Model with local interaction (3)

- In order to focus on geography dependence rather than history dependence of inequality, assume linear utility now → implicitly disregarding capital market imperfections (see Carneiro and Heckman 2002; Heckman and Krueger 2003 on CMI empirics)
- Hence, households located at $i$ prefer to invest if $B \equiv v(w_s) - v(w_u) > c(x_i)$
- A (steady state) equilibrium is a distribution of skills, an aggregate skill level $\lambda$, and wages $w_s$ and $w_u$ s.t.
  1. wages are consistent with the aggregate skill level
  2. the aggregate skill level is consistent with the distribution of skills
  3. the distribution of skills results from optimal decisions by all households, given the wages and the local learning effectiveness implied by the distribution of skills

Segregated vs. unsegregated equilibria

- We can distinguish (at least) two geographical patterns
  - segregated equilibria, where locations are partitioned into alternating intervals of skilled and unskilled agents with a width $\geq 2\varepsilon$,
  - and unsegregated equilibria, where $\mu_i \equiv \lambda$

- Result:
  Segregated and unsegregated equilibria co-exist.
  The welfare properties depend on skill-intensity of technology.
“Globalization” can be reflected by
- smaller weight on local vis-à-vis global interactions, i.e., $\eta \downarrow$,
- wider local neighborhoods, i.e., $\varepsilon \uparrow$, or
- lower geographical mobility costs (initially assumed to be prohibitive)

Neither affects the macro properties of unsegregated equilibria; there are implications for regular segregated equilibria.

Recall: a rise in the aggregate skill ratio $\lambda$ is associated with
- higher per capita income
- lower wage inequality between skilled and unskilled
- lower skill acquisition costs for all individuals

and hence greater welfare.

### Illustration

Both aspects of “globalization” can increase or decrease skills and inequality; they may reinforce or cancel each other:

![Diagrams illustrating the effects of globalization on skills and inequality](image)
Two social groups

- As an alternative to a continuous location space with overlapping neighborhoods, one may consider two “locations” $i = 0$ or $1$, corresponding to two social groups (e.g., natives vs. immigrants) (Bowles, Loury and Sethi 2009)
- “Segregated” equilibria correspond to societies with $\mu_0 \neq \mu_1$
- One may distinguish equilibria in which
  - all immigrants are unskilled ($\Rightarrow$ the “marginal agent” is a native)
  - all natives are skilled ($\Rightarrow$ the “marginal agent” is an immigrant)

Policies

- Analysis of interventions like income redistribution, education subsidies / fees, etc. requires a non-naïve bequest motive unless parents can be “tricked” into feeling better off
- For the baseline model augmented by a dynastic bequest motive, Mookherjee and Ray (2008) have shown superiority of conditional transfers over unconditional ones
- Interventions that raise dynastic utility of the unskilled also reduce everybody’s incentives to invest; this makes the analysis complicated …
- With enough transparency about talents and the ability to appropriate returns from adults who benefitted from policy as children, government can improve welfare; welfare effects of anonymous redistribution and / or fee-subsidy schemes are still an open question
Conclusion

• The baseline model and its variations capture *some* reasons for why inequality can be expected to persist when ‘lumpy’ investments related to occupational choice are required and capital markets are imperfect

• We presume, but would need to study more, that they complement other sources of persistence (e.g., political economy, statistical discrimination, social identities)

• In case of multiple equilibria, it may be relatively easy to induce a long-term welfare improvement; but because of ramifications on agents’ investment incentives, hence aggregate output, the effects of standard policies are much harder to predict than one might think