

Alternative explanations of Poverty traps

Multiple steady-states

versus

Multiple equilibria

Multiple-steady-state poverty trap induced by credit market imperfections

(Galor and Zeira 1993 in *Review of Economic Studies*)

- **Credit market imperfections from asymmetric information:**

Creditor's attempt to avoid borrower's opportunistic behavior causes:

- **credit rationing:** investment is less than optimal, if investor's initial wealth is not large enough
- **interest-rate differential:** to cover monitoring cost, and/or the risk of default, interest rate paid by the borrower is higher than the lender's interest rate.

Galor and Zeira (1993) poverty trap is the combined outcome of:

- **interest rate differential**
- **indivisibility of investment:** suppose there is a indivisible education investment h that individuals must make when young, in order to become skilled workers and attain, when old, skilled-worker wage $w_s > w_u =$ unskilled-worker wage

1. Overlapping generations economy:

- each individual lives for two periods
- when born, in period 1 she receives bequest x from parent
- in period 1 can either work with productivity w_u
- or attend school at the education cost h
- has period 2 productivity w_s , if educated, and w_u , if not educated
- $w_s > w_u$.
- consumes c at end of life
- leaves a bequest b to offspring

2. imperfect international credit markets

- Small country assumption: interest rates r and i are exogenous.
- Credit market imperfections in the form of monitoring costs imply:
- *lender's rate of interest = $r < i$ = borrower's interest rate*

bequest x from parent = initial wealth

assumptions:

1. Investment h in education is profitable, if financed at rate r .
This happens when $x > h$.

Opportunity cost of education is: $h(1+r)$

wage benefit from education is: $w_s - [w_u(1+r) + w_u]$
wage 's' in t+1 value at t+1 of wage 'u' in t wage 'u' in t+1

assumption: $h(1+r) < w_s - [w_u(1+r) + w_u]$

2. investment h in education is non-profitable, if mostly financed at borrower's rate i . This happens if x is sufficiently lower than h , and $i - r$ is large enough.

only 3 cases arise:

value of life income at t+1 of agent born at t

- $x < h$ and j does not invest $\rightarrow y_j = (w_u + x)(1 + r) + w_u$
- $x < h$ and j invests $\rightarrow y_j = w_s - (h - x)(1 + i)$
- $x > h$, j invests $\rightarrow y_j = w_s + (x - h)(1 + r)$

$(w_u + x)$ = investment on credit market by 'the poor'

$(h - x)$ = debt to finance education by 'moderately rich'

$(x - h)$ = investment on credit market by 'the rich'

- Utility is increasing with life-income
- Low wealth individual invests in education *if and only if*:

$$w_s - (h - x)(1 + i) \geq (w_u + x)(1 + r) + w_u$$

life income with education \geq life income without education

- There exists a critical initial wealth f , such that, if and only if $x < f$ the individual does not invest in education

$$x \geq f \equiv \frac{(2 + r)w_u + (1 + i)h - w_s}{i - r}$$

• **Life time utility** function is: $U = (1 - \delta) \log c(t) + \delta \log b(t)$

Max. U subject to $c(t) + b(t) = y(t)$ leads to:

individuals choose to leave a proportional bequest, and to consume a proportional share of life-time income:

$$\rightarrow \quad b(t) = \delta y(t) \quad \textit{proportional bequest}$$

$$\rightarrow \quad c(t) = (1-\delta)y(t) \quad \textit{proportional consumption}$$

Remark:

time t refers to the period in which the individual is born:

$x(t)$ = Bequest (initial wealth) received at the end of period t by the individual born at the beginning of period t

$y(t)$ = life time income (in period t and $t + 1$) of the individual born at the beginning of period t

$\delta y(t)$ = bequest left at the end of period $(t + 1)$, by the individual born at the beginning of period t

thus, we have:

$$x(t+1) = \delta y(t)$$

wealth dynamics : young's wealth at t+1 as function of parent's wealth at t

$$x(t+1) = b(x(t)) = \delta y(t) = \begin{cases} \delta [(w_u + x(t))(1+r) + w_u] & x < f \\ \delta [w_s - (h - x(t))(1+i)] & f \leq x < h \\ \delta [w_s + (x(t) - h)(1+r)] & x \geq h \end{cases}$$

f = critical threshold value of wealth below which investment in education is zero

Wealth dynamics

$$\delta [(w_u (1 + r) + w_u)] + x(t) \delta (1 + r) \quad x < f$$

$$x(t + 1) = b(x(t)) =$$

$$\delta [w_s - h (1 + i)] + x(t) \delta (1 + i) \quad f \leq x < h$$

$$\delta [w_s - h(1 + r)] + x(t) \delta (1 + r) \quad x \geq h$$

↑
Intercept

↑
slope

wealth dynamics: 'historical self-reinforcing'
 leads to multiple steady states

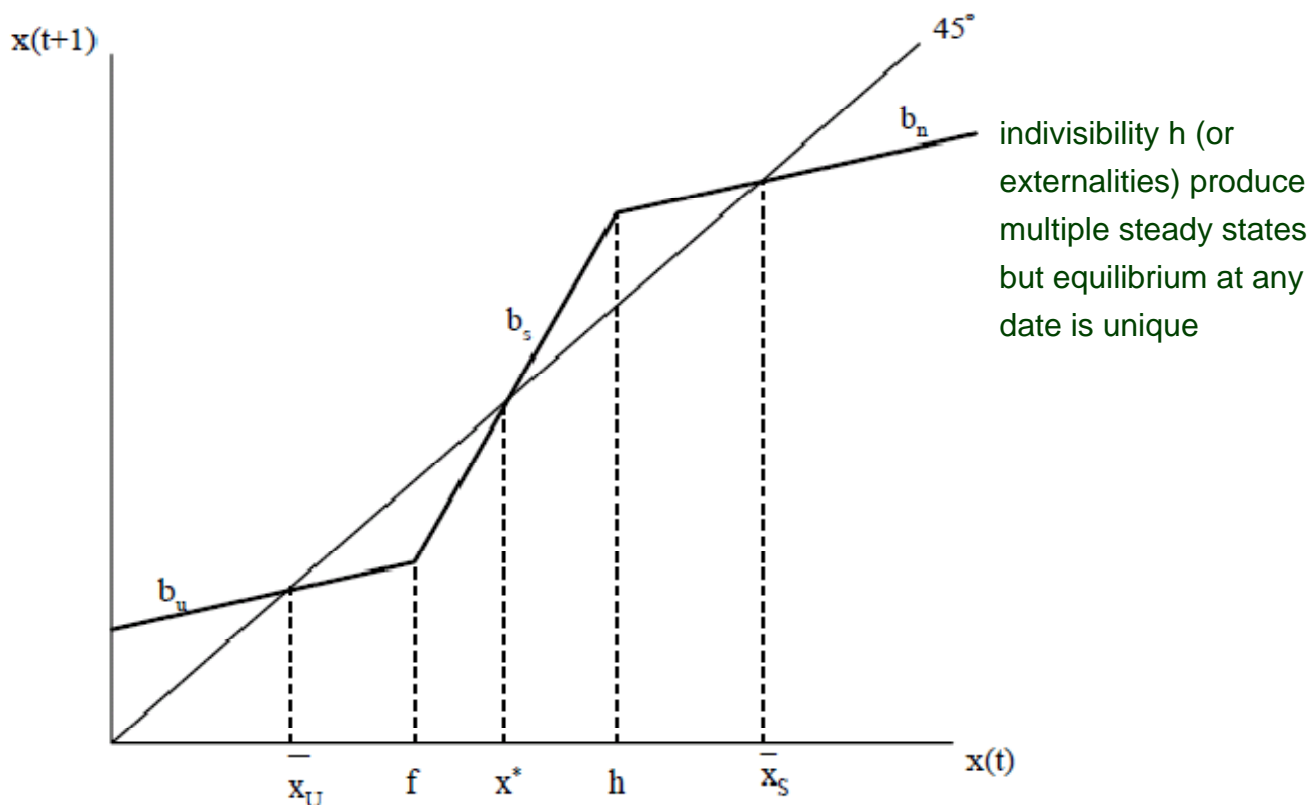


FIGURE 21.9. Multiple steady-state equilibria in the Galor and Zeira model.

Critical initial wealth x^*

- $x(t) < x^* \rightarrow x(t) \text{ converges to } X_U$
- $x(t) > x^* \rightarrow x(t) \text{ converges to } X_S$

Inequality and growth in the Galor-Zeira model:

Greater inequality → 'aggregate' growth if economy is very poor :

Suppose:

- all individuals in the economy start in initial condition

$$x(t) < x^* \rightarrow x(t) \text{ converges to } X_U \text{ and remains there}$$

- **inequality-increasing wealth transfer** in favor of a minority of young R-individuals, from the other young individuals (the P-individuals), and such that: $x_R(t) > x^*$, while $x_P(t) < x^*$ still holds.
- $x_P(t)$ converges to X_U as before
- $x_R(t)$ converges to X_S
- **After convergence, aggregate wealth is higher, and nobody is poorer**

This is not a general argument in favor of wealth inequality.

- After convergence has taken place, if the number of skilled workers is large enough, and/or if $X_S - x^* > x^* - X_U$, there is an inequality reducing wealth transfer, which triggers a wealth dynamics such that the economy is eventually richer, in the aggregate.
- Based on examples of this sort, some authors argue that wealth inequality is growth promoting when economies are very poor, and is growth reducing at a later stage of development.

the short run effect of the inequality reducing transfer is: some 'poors' have wealth $x > x^*$, while no 'rich' has wealth $x < x^*$. In the long run: all formerly rich recover wealth X_S , some formerly poor attain wealth X_S .

In the long run everybody is richer, and nobody is more poor.

Implications for relation between inequality and growth

- In countries with very low wealth per capita, greater inequality in wealth distribution may cause greater investment in education.
- *Positive relation between inequality and growth* in countries with very low wealth per capita
- If wealth per capita is higher, the nature of the relation may change. Greater inequality in wealth distribution may exclude a larger fraction of population from education. *Greater inequality causes lower growth.*

Poverty Traps through multiple equilibria

The example of aggregate demand externalities:

P. Rosenstein-Rodan (Economic Journal, 1943)

K. Murphy, A. Shleifer, R. Vishny (Quarterly Journal of Economics, 1989)

Economy with traditional and modern sector

In the economy a unit mass of agents choose to work either in a traditional, rural sector or a modern sector. Labor is the only input to production, and each agent supplies one unit in every period. All markets are competitive. In the traditional sector returns to scale are constant, and output per worker is normalized to zero. The modern sector, however, is knowledge-intensive, and aggregate output exhibits increasing returns due perhaps to spillovers from various types technological externalities, or from sunk costs

modern sector

Strategic complementarities between agents' choices arise as a result of:

- **increasing returns**
- **income and demand externalities**

increasing returns in modern sector arise from

technological externalities:

The productivity of a single individual working in the modern sector is increasing with the number of individuals adopting the modern technology and working in the same sector .

from a sunk cost:

to adopt modern techniques, workers must bear a non divisible learning cost

income and demand externalities

- *A continuum $[0, 1]$ of workers and products*
 - *Each worker is self employed and produces a specialized consumer good.*
 - *Each worker distributes her expenditure uniformly across all varieties of products.*
-
- *each worker demands and consumes only a small fraction of her output*
 - *In equilibrium, each worker's output is dependent upon the demand coming from other workers*
 - *For each worker, it is rewarding producing a large output **only if** most other workers are doing the same, earn a high income and exert a high demand on all type of products.*
 - **The process at work is reminiscent of Keynesian effective demand externalities**

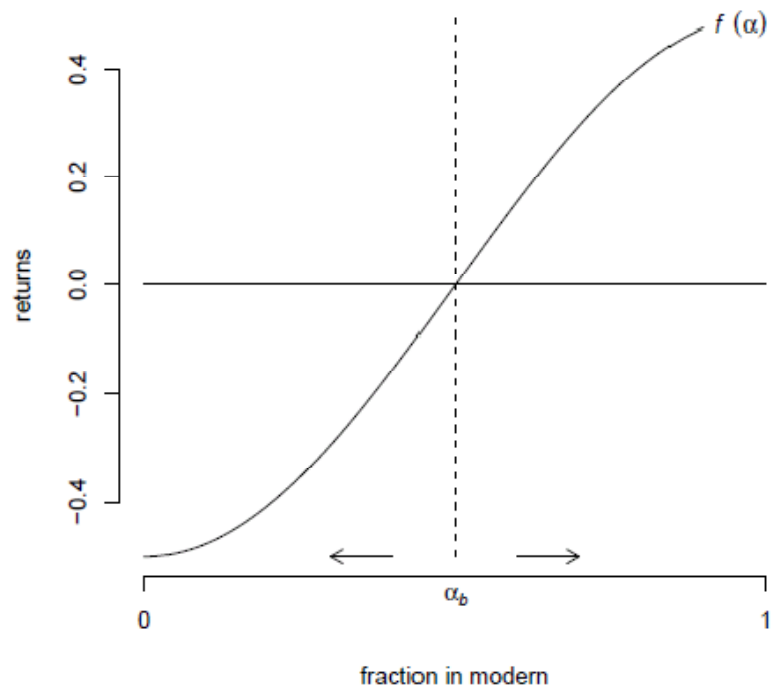
Workers are self-employed (no capital)

α = fraction of workers in modern sector

$f(\alpha)$ = net pay-off per worker in modern sector at α

0 = net pay-off per worker in traditional sector (normalization)

$$\frac{\partial f}{\partial \alpha} > 0$$



indivisibilities and/or externalities produce a multiplicity of equilibrium paths at any date

Fig. 13. Returns in traditional and modern sectors

- at $\alpha = \alpha_b$ returns in the two sectors are equal $f(\alpha_b) = 0$
- two equilibria: $\alpha = 0$ and $\alpha = 1$

coordination- failure theory of poverty traps

- Exit from status quo requires coordination of expectations
 - Take-off may be delayed or blocked by:
 1. adjustment costs
 2. irreversible investment
 3. risk aversion
- (P. Krugman, *QJE*, 1991, 651-667).

Counter-argument 1

development trap is caused by demand-externalities

- if country is small there is a demand source available: exports
- export led growth is the solution!!

With exports available, aggregate demand externalities are not sufficient to explain poverty persistence.

Counter-argument 2

- Another solution to coordination failure does not rely upon foreign trade
- announcement of a government subsidy $s_G = 0.5$ to the *workers* *incurring losses as a result of modern technology adoption*
- sufficient to coordinate technology adoption on the Pareto superior equilibrium, but requires:
 - high trust in government action
 - simple coordination problem

A Reply to counter-arguments

A. Rodriguez-Clare, *Journal of Development Economics*, 1996:

‘The division of labour and economic development’

- Coordination failure does not have an easy solution in the open economy with international capital flows and world trade

Conclusion: *A small open economy trading in final goods may face a poverty trap through coordination failure*

The line of argument 1

1. The wealth of nations is partly explained by division of labour: use of techniques relying intensively on wide variety of intermediate specialized inputs and services (A. Smith 1776, A. Young 1928).
2. Some inputs are essentially *non-tradable*: it is important that the supplier be near the final producer (using such inputs). Such inputs cannot be imported from abroad-

An example of non-tradable inputs are *maintenance and assistance services*, which are very important when modern technologies are adopted

3. specialized non-tradable intermediates are produced with decreasing average cost (as a result of a fixed capital cost $K = 1$, and constant marginal cost)
indivisibility (fixed capital cost) causes increasing returns and positive short-run profit

The line of argument 2

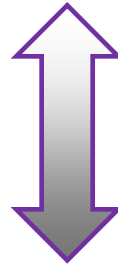
4. Fixed supply of primary inputs L (labour) and K (capital)
5. Two final-good industries y and z *perfectly competitive*
6. continuum $[0, n]$ of intermediate-good varieties
7. $z = \textit{traditional good}$
 $y = \textit{modern good}$
 z and y produced with capital K, labour, and a number n of intermediates
8. International prices P_y and P_z are fixed (small country) in some international standard

returns to variety of intermediates are higher in y than in z production

9. Complementarities

final good producer:

higher variety of intermediates lowers the cost of producing y relative to cost of producing z
choice between y and z



intermediate-good producer:

choice between entry, non-entry

an intermediate will sell at a higher price, if y is produced, rather than z

10. each variety j produced by a local monopolist (*monopolistic competition* in intermediates sectors)

To produce quantity $x(j)$:

1 fixed unit of K
variable labour requirement $x(j)$, all j
(1 unit of labor for 1 unit of $x(j)$)



decreasing average cost



Uniform Monopolistic output x_s all j , in state s

state $s = z$

only traditional final good z is produced

state $s = y$

only modern final good y is produced

state $s = z + y$

both traditional and modern final goods are produced

profit maximizing price: p_s^ uniform, all j , in state s*

other things equal, p^ higher in state y than in state z*

y and z produced by fixed capital, labour and intermediates

The line of argument 3

11. division of labour is measured by the **number of specialized intermediates used** in production of the two final goods z (traditional) and y (modern).

Relative comparative advantage:

$$\frac{\text{Price}}{\text{unit cost}}: \frac{P_y}{C_y} \text{ versus } \frac{P_z}{C_z} \quad \text{or equivalently } \frac{P_y}{P_z} \text{ versus } \frac{C_y}{C_z}$$

P_y, P_z fixed by international trade

Persistent switch from z to y production takes place if:

at w and r ruling when **final output is z** we have $\frac{P_y}{P_z} > \frac{C_y}{C_z}$

at w and r ruling when **final output is y** we have $\frac{P_y}{P_z} > \frac{C_y}{C_z}$

In a wide range of n, larger intermediate-variety n lowers $\frac{C_y}{C_z}$
and favours the adoption of modern output y

Short-run equilibrium: n given

there are at most n_{Max} intermediates, but less may be produced

short run equilibrium: n exogenous and $n_z = n_y = n$

three possible equilibria: *only z is produced*

only y is produced

y + z are produced

Long-run equilibrium: n^* endogenous through entry in X sector

n^* is determined by zero-profit condition for producers of intermediates

multiple long-run equilibria arise if $\phi(y)$ suff. larger than $\phi(z)$
returns to variety sufficiently larger in y industry than in z industry

- **equilibrium with 'shallow' division of labour (z equilibrium):**
low n_z^* and producers specialized in final output z

because n_z^* is 'low' → specialization in z is a best option
because z is produced → lower entry in X sector (n_z^* is 'low')

- **equilibrium with 'deep' division of labour (y equilibrium):**
high n_y^* and producers specialized in modern final output y

because n_y^* is 'high' → specialization in y is a best option
because y is produced → higher entry in X sector (n_y^* is 'high')

coordination problem is 'complex':

- it does not have 'easy' market solution through international trade
- With trade in final goods and no international factor mobility
If returns to variety (division of labour) are sufficiently high

$$w(y) > w(z)$$

$$r(y) > r(z)$$



- Returns to both capital and labour are lower in the z economy, because shallow division of labour makes factors less productive

- Factor mobility does not solve this development trap, because there is no market incentive for capital to flow into the economy with shallow division of labour.
- This provides also a reply to the question posed by R. Lucas (1990): 'Why doesn't capital flow from rich to poor countries?'

Solution of coordination failure from appropriate government intervention:
D. Rodrik, *NBER* (1994), *Economic Policy* (1995)

Multiple steady states versus multiple equilibria explanation of poverty persistence:

Acemoglu:

- coordination failure cannot last indefinitely
 - Eventually, decentralized agents would spontaneously coordinate on a Pareto superior allocation, if one exists.
- multiple steady state theory is 'better'

Counter-arguments

1. Agents coordination may be very difficult to realize in practice
2. There is no reason to discard the possibility that different types of 'poverty traps' be simultaneously at work in a backward economy
"fractal poverty traps": are located at every scale of the economy

Micro level: example is the low human-capital investment trap

Meso level : example are complementarities and network externalities within large organizations, and specific markets.

Macro level: example are macroeconomic demand externalities

Conclusions

- Government action designed to overcome poverty traps and coordination problems is not easy to implement
- the East Asia Tigers experiments show that such government action may be feasible
- these experiments were made possible by special institutional and structural circumstances
- the 'East Asia model' is not easy to export to a different institutional and structural context.