Intertemporal Trade, Asset Trade, and Credit Market

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Very Preliminary: (Permanently) Work in Progress
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Overview:

- **International Capital Flows (Lending & Borrowing or Intertemporal Trade) and Dynamics of the Current and Trade Accounts**
- **Credit Markets and Patterns of International Capital Flows (Intertemporal Trade)**
- **Credit Markets and Patterns of International Trade**
- **Risk, Diversification and Asset Trade; Complete Market**
- **Risk, Diversification and Asset Trade; Incomplete Market**

International Capital Flows (Lending &Borrowing or Intertemporal Trade) and Dynamics of the Current and Trade Accounts *(Unfinished)*

Modeling Credit Market Frictions; *A Single Agent's Problem:*

Two Periods: 0 and 1

A Single Agent (an Entrepreneur or a Firm):

- is endowed with $\omega < 1$ units of the input at Period 0.
- consumes only at Period 1.

Two Means to Convert the Input into Consumption:

- Run a **non-divisible project**, which converts one unit of the input in period 0 into ***R*** units in **Consumption** in period 1, by **borrowing** $1-\omega$ at the market rate of return equal to ***r*.**
- **Lend** $x \leq \omega$ units of the input in period 0 to receive rx units of consumption in period 1. (Or, **Storage** with the rate of return equal to r.)

Agent's Utility = Objective Function = Consumption in Period 1:

$U = R - r(1-\omega) = R - r + r\omega$, if borrow and run the project,

$U = r\omega$ if lend (or put in storage).

Profitability Constraint**:** The agent *is willing to* borrow and invest iff

(PC) $R \geq r$

***Borrowing Constraint*:** To borrow from the market, the agent must generate the market rate of return, ***r*,** per unit to the lenders, yet, *for a variety of reasons*, no more than a fraction, λ, of the project output can be used for this purpose. Thus, the agent *can* borrow and invest iff

(BC) $\lambda R \geq r(1-\omega)$.

If **$\lambda/(1-\omega) < r/R \leq 1$,** (PC) holds but not (BC).

- The profitable project fails to be financed, due to the borrowing constraint.
- *Necessary Condition*: **$\lambda + \omega < 1$**
- A higher ω (as well as a higher λ) can alleviate the problem

Broad Interpretations of the Parameters:

λ: agency problems affecting credit transactions (may vary across projects or industries), institutional quality or the state of financial development (may vary across countries)

ω; entrepreneur's net worth, the firm's balance sheet, the borrower's credit-worthiness (may vary across agents).

Justifying $\lambda < 1$.

- Strategic Defaults
- Renegotiation
- Moral Hazard (Hidden Action)
- Pure Private Benefit (not necessarily hidden)
- Costly State Verification, etc, etc.

Here, we will *not* ask which of these mechanisms are the most plausible *microeconomic causes* of credit market frictions. Instead, we will simply treat them as a fact of life, and proceed to investigate their *aggregate consequences*.

Why? Three Reasons

- The major causes of credit market frictions, even if we could identify them in certain specific cases, are likely to vary across investment types, industries, countries and times.
- At least qualitatively speaking, much of the aggregate implications of credit market frictions do not depend on the specific nature of the agency problems behind them.
- This reduced form approach saves the space, time, and the effort.

Partial Equilibrium (Endogenizing the project return, R)

Two Departures:

- **A Continuum of Homogeneous Agents with Unit Mass**
- A Project produces R units of **Capital**, used in the production of the Consumption Good, $f(k) = F(k, \zeta)$, where $F(k, \zeta)$ is CRS but $f(k)$ is subject to **Diminishing Returns.** ζ is the hidden factors in fixed supply, owned by those who do not have access to the investment technologies.
- $k = Rn$ is Aggregate Supply of Capital; n is the number of agents running the project.

***Profitability Constraint* (PC):** $Rf'(k) \geq r$
***Borrowing Constraint* (BC):** $\lambda Rf'(k) \geq r(1-\omega)$.

Equilibrium Condition: $\mathbf{Rf'(k)/r = Max\{(1-\omega)/\lambda, 1\}}$

If $\boldsymbol{\lambda + \omega < 1}$, $\boldsymbol{Rf'(k) = r(1-\omega)/\lambda} > r$; **Under-Investment;**
Net Worth Effect; $\omega \uparrow \rightarrow k \uparrow$

If $\boldsymbol{\lambda + \omega > 1}$, $\boldsymbol{Rf'(k) = r} > r(1-\omega)/\lambda$; **Optimal Investment;**
No Net Worth Effect.

General Equilibrium with Endogenous Saving:

Add some "savers", with no access to the investment technology, who choose to maximize $U^o = V(C^o_0) + C^o_1$ subject to $C^o_1 = r(\omega^o - C^o_0)$. → Saving by the Savers: $V'(\omega^o - S^o(r)) \equiv r$ → $S^o(r) \equiv \omega^o - (V')^{-1}(r)$.

Resource Constraint (RC): $k = R[\omega + S^o(r)] = R[\omega + \omega^o - (V')^{-1}(r)]$.

→ $k/R = S(r) \equiv \omega + \omega^o - (V')^{-1}(r)$.

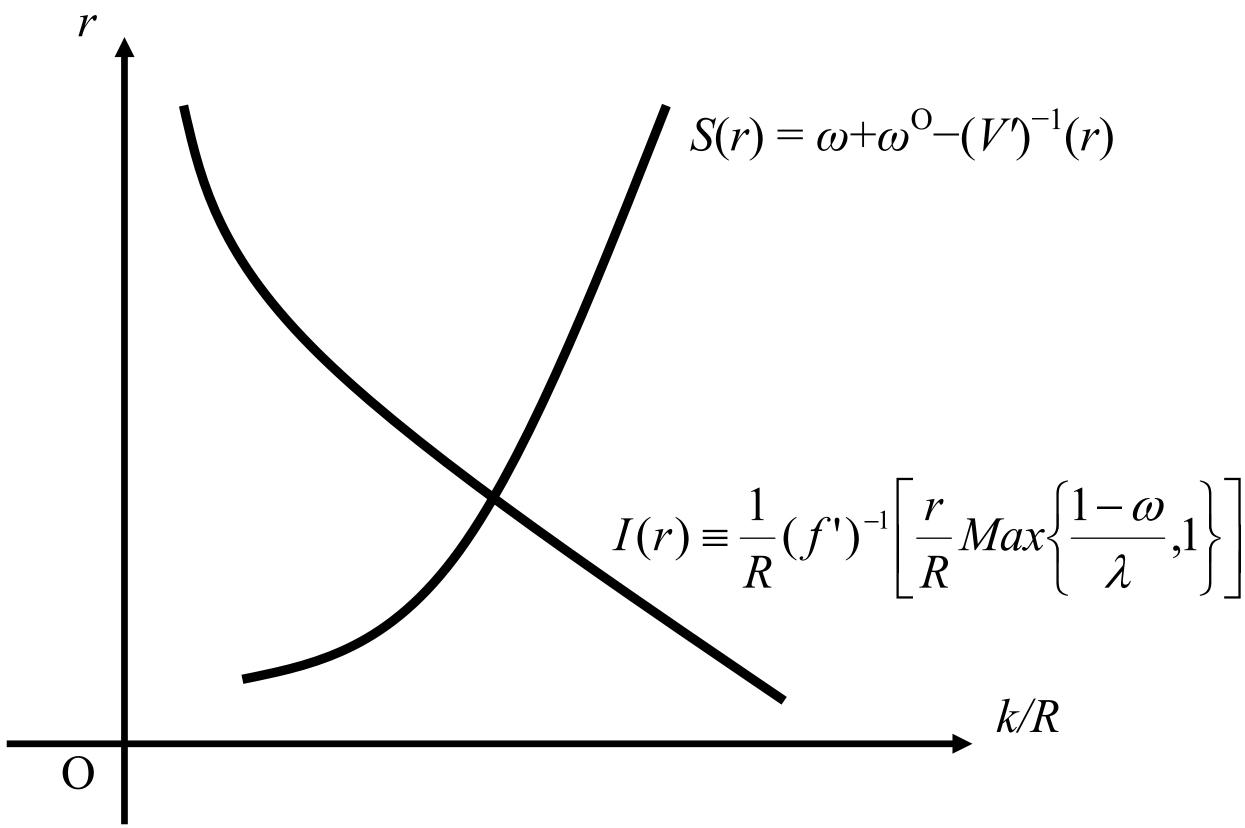
Profitability Constraint (PC) plus Borrowing Constraint (BC):

$$Rf'(k) = Max\{1, (1-\omega)/\lambda\}r.$$

→ $$k/R = I(r) \equiv \frac{1}{R}(f')^{-1}\left(Max\left\{1, \frac{1-\omega}{\lambda}\right\}\frac{r}{R}\right).$$

which jointly determines k and r.

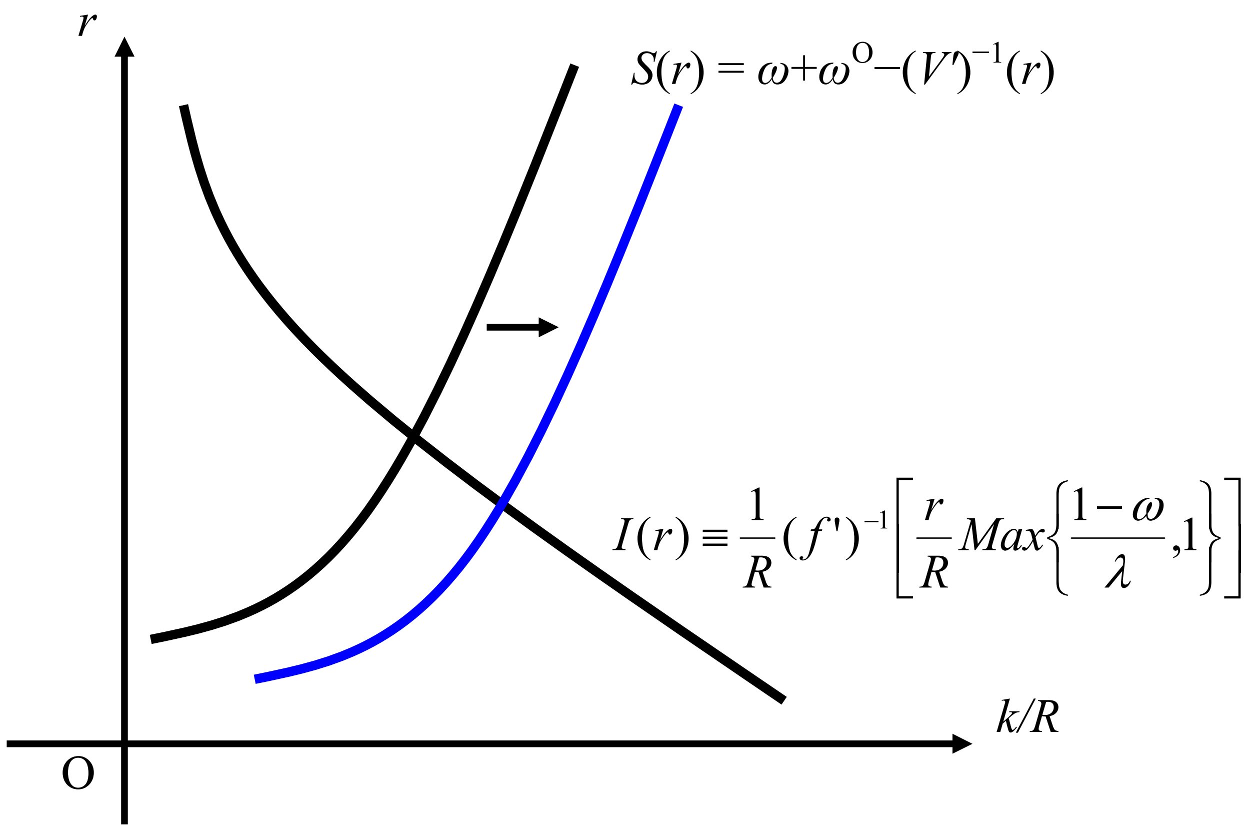
Aggregate Saving = Aggregate Investment: A Graphical Illustration



Note: $S(r)$ depends on $\omega + \omega^{o}$, while $I(r)$ depends only on ω.

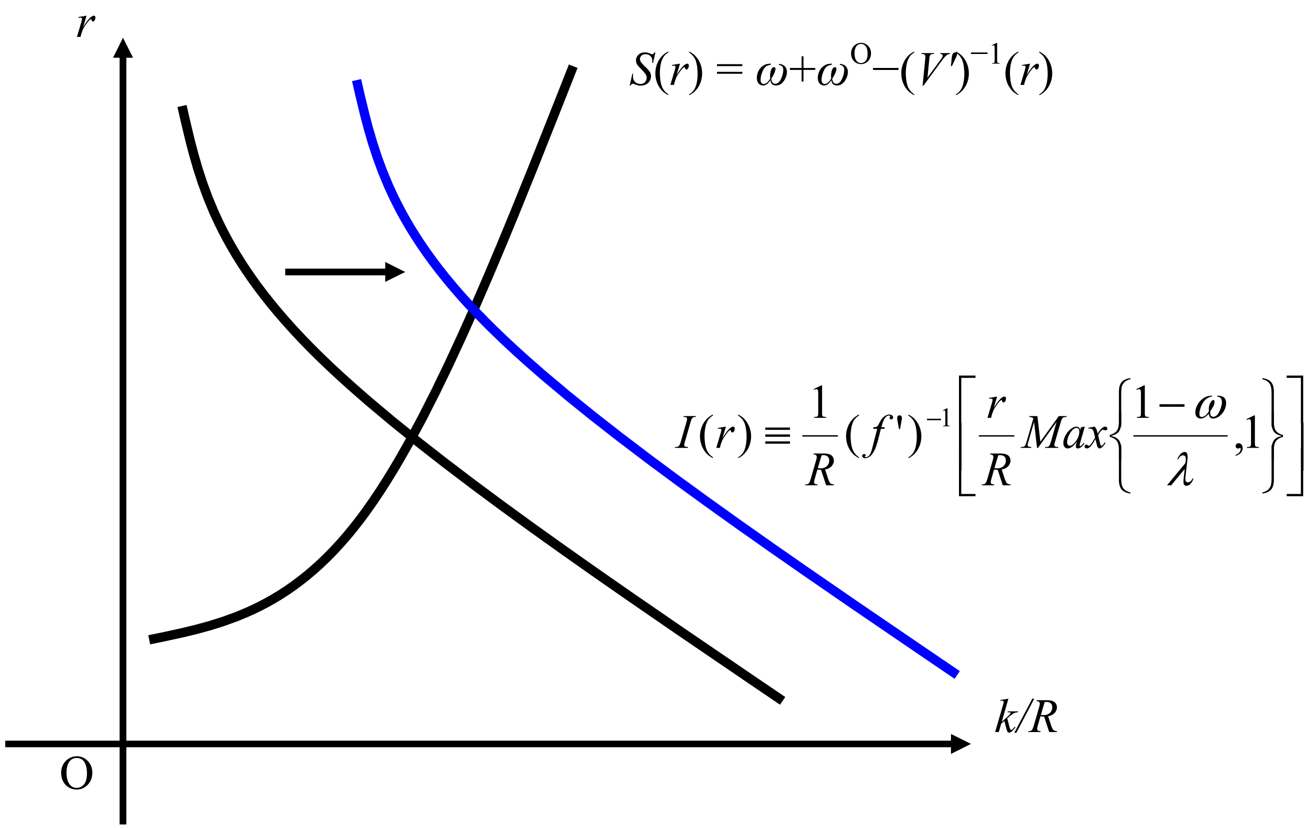
Some Comparative Statics:

A higher wealth of the savers, $\Delta\omega^0 > 0$, leads to more capital formation and a lower rate of return. **(Capital Deepening Effect**)

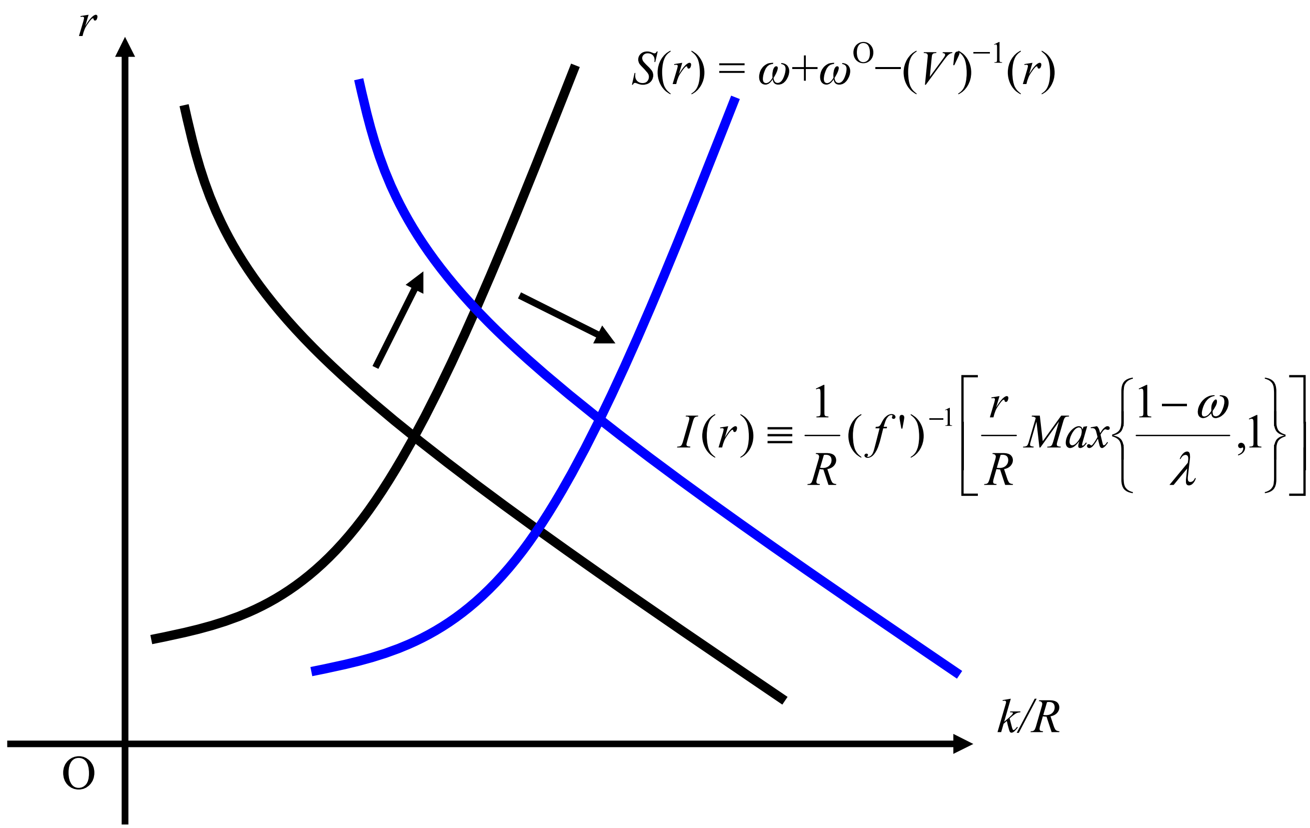


When $\lambda + \omega < 1$,

- Redistributing Wealth from "Savers" to "Investors," $\Delta\omega = -\Delta\omega^0 > 0$, leads to more k and a higher rate of return. **(Net Worth Effect)**
- A credit market improvement, $\Delta\lambda > 0$, has the same effect.



When $\lambda + \omega < 1$, a higher endowment of "Investors," $\Delta\omega > 0$, leads to more capital formation and *may* lead to a higher rate of return, as the **Net Worth Effect** may dominate the **Capital Deepening Effect**.



Credit Markets and Patterns of International Capital Flows

Two Countries: North & South of the kind described above. They have the identical f(k) and R, but may differ in λ, ω, and ω^o.

Further Assumptions:

- The Input and the Consumption Good are *tradeable*. → This allows the agents to lend and borrow across the borders.
- Physical Capital and the hidden inputs are *nontradeable*.
- Only the agents in North (South) can produce Physical Capital in North (South). Alternatively, the agent's productivity, R, is substantially lower when operating abroad. → This effectively rules out Foreign Direct Investment.

Experiment:

Suppose the agents in North can pledge $\varphi\lambda_N$ to the lenders in the South, and the agents in South can pledge $\varphi\lambda_S$ to the lenders in the North. Let φ change from $\varphi = 0$ (Autarky) to $\varphi = 1$ (Full Integration).

Autarky Equilibrium for j = N or S:

(RC): $k_j = R[\omega_j + S^o(r_j)] = R[\omega_j + \omega^o{}_j - (V')^{-1}(r_j)]$.

(PC) + (BC): $Rf'(k_j) = \text{Max}\{1, (1-\omega_j)/\lambda_j\}r_j$.

World Equilibrium (with Full Financial Integration):

World Resource Constraint (WRC):

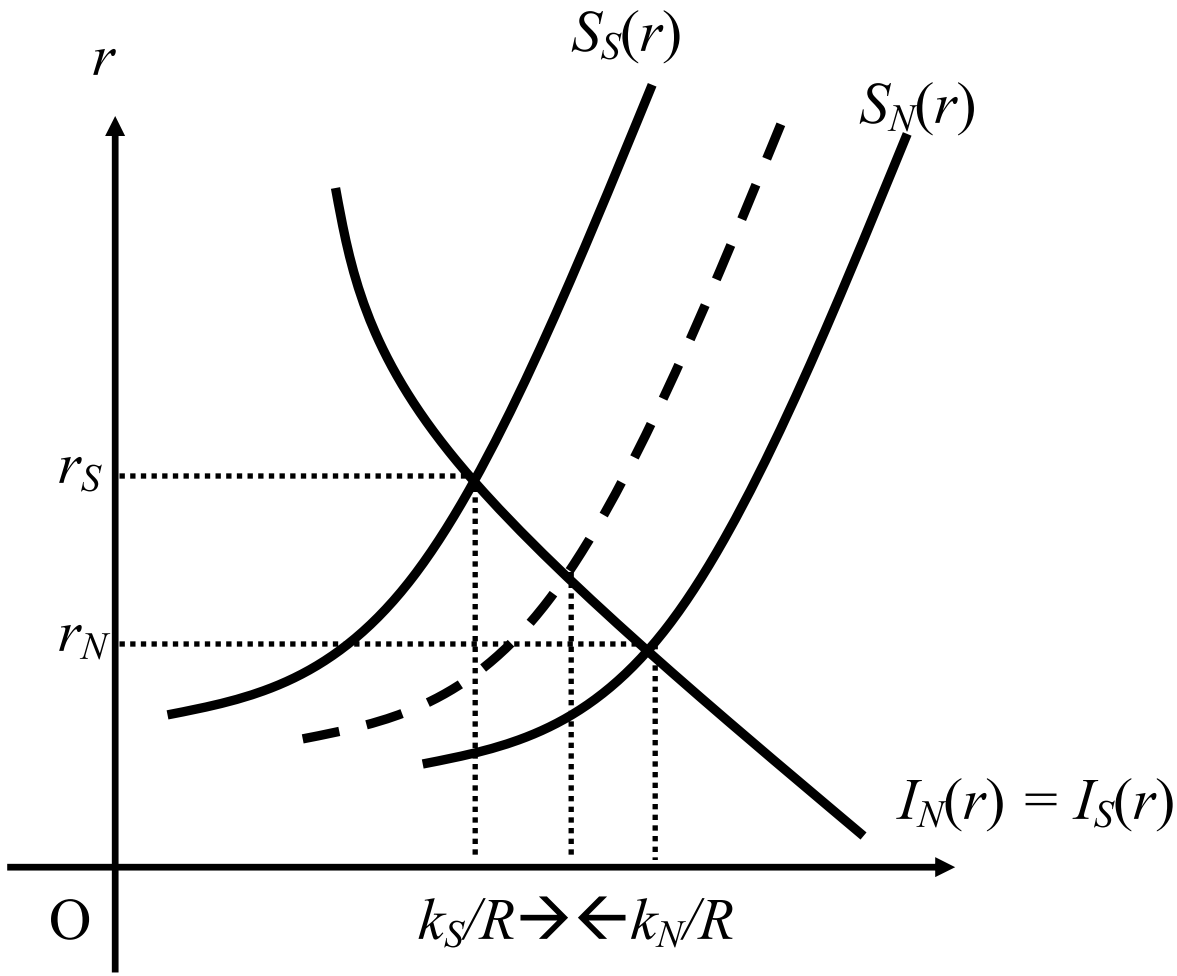
$$k_N + k_S = R[\omega_N + \omega^o{}_N + \omega_S + \omega^o{}_S - (V')^{-1}(r)].$$

Rate of Return Equalization (RRE):

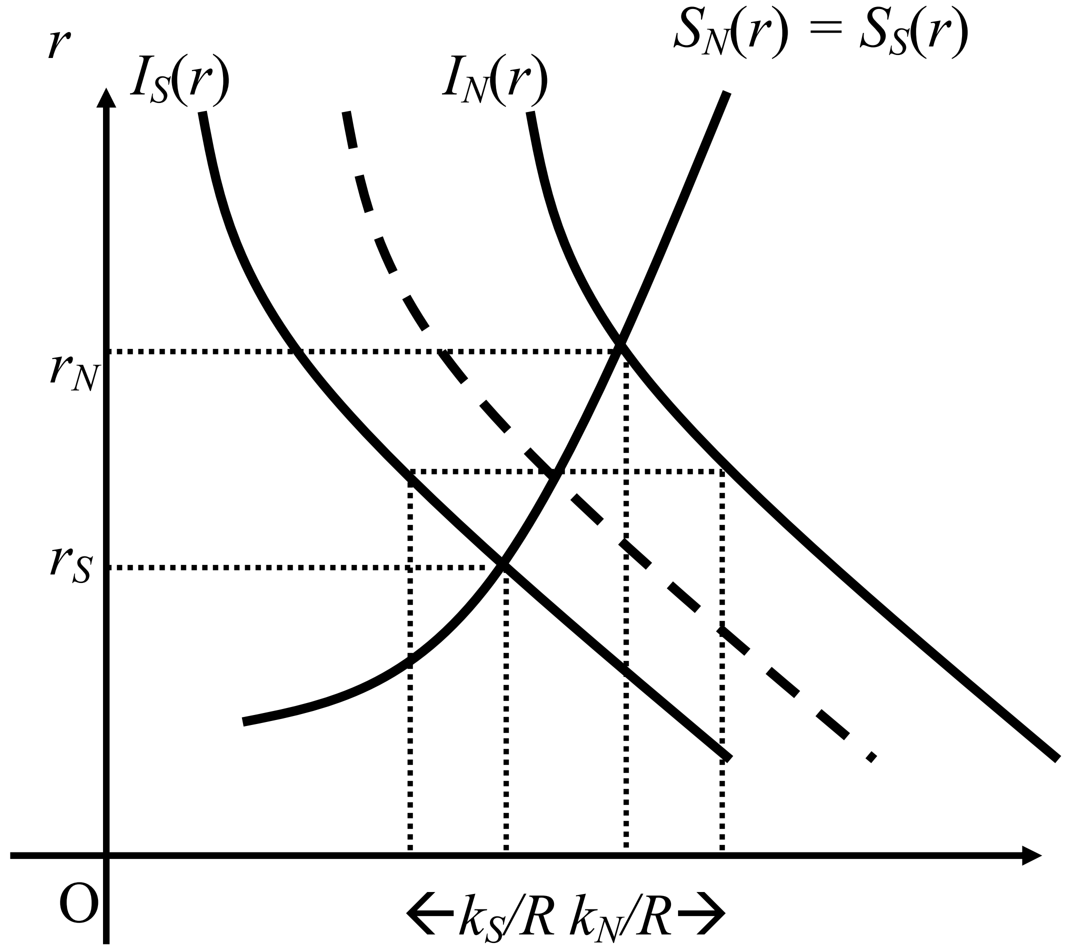
$$\text{Min}\{1, \lambda_N/(1-\omega_N)\}Rf'(k_N) = r = \text{Min}\{1, \lambda_S/(1-\omega_S)\}Rf'(k_S)$$

(WRC) + (RRE) → $S_N(r) + S_S(r) = I_N(r) + I_S(r)$.

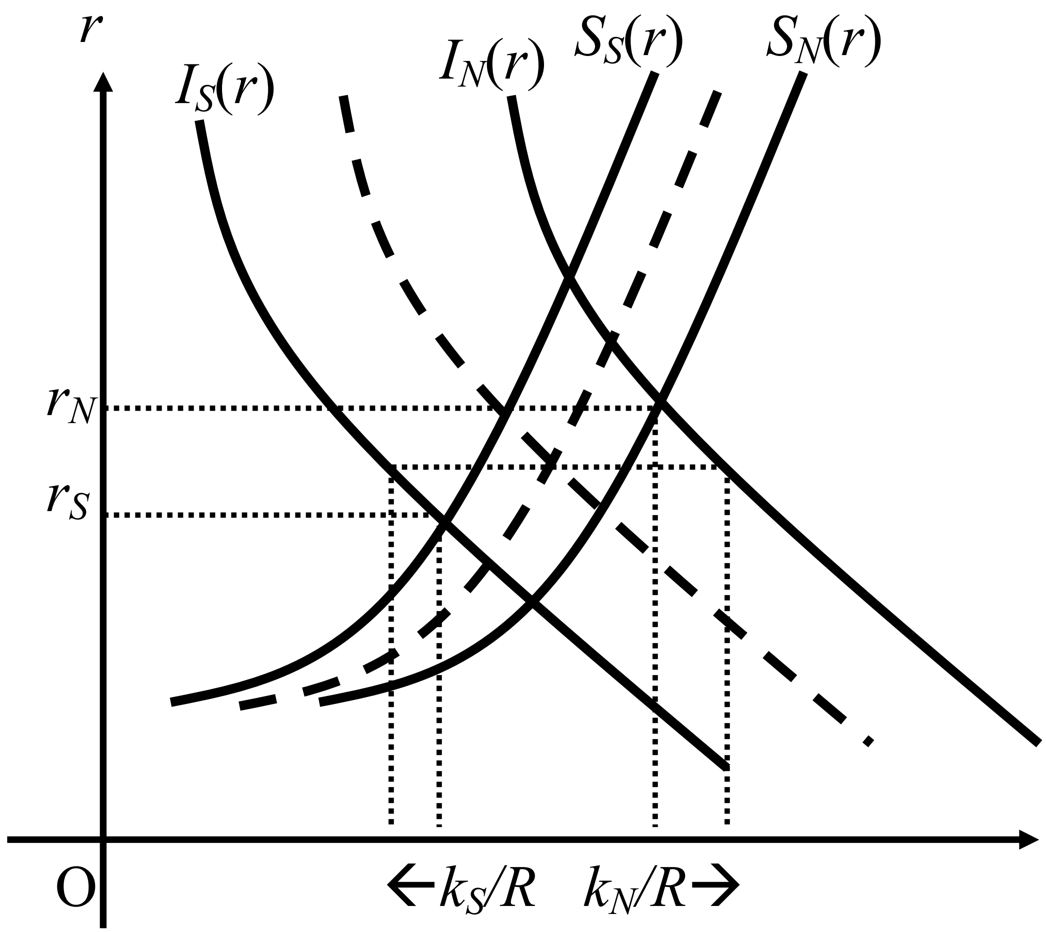
Neoclassical View: North's saving helps to finance South's development. ($\lambda_N = \lambda_S$, $\omega_N = \omega_S$, $\omega^o_N > \omega^o_S$)



Reverse Capital Flows (I): South's saving leaves for North, and South's capital formation declines, if $\lambda_N > \lambda_S$, $\omega_N = \omega_S$, $\omega^o{}_N = \omega^o{}_S$ (South has poorer financial institutions), or if $\lambda_N = \lambda_S$, $\omega_N - \omega_S = \omega^o{}_S - \omega^o{}_N$ (The savers account for a larger share of the wealth in the South than in the North).



Reverse Capital Flows (II): South's saving leaves for North, and South's capital formation declines, because North's entrepreneurs are more credit-worthy (and if the net worth effect dominates the capital deepening effect): $\lambda_N = \lambda_S$, $\omega_N > \omega_S$ $\omega^o{}_N = \omega^o{}_S$.



In the above analysis, the distribution of borrower net worth across countries, (ω_N, ω_S), *affect the distribution of capital* (k_N, k_S). *What would be dynamic implications if we allow for some feedback from* (k_N, k_S) *to* (ω_N, ω_S)?

Inequality of Nations and International Capital Flows: Based on Matsuyama (2004)

Time: Discrete ($t = 0, 1, 2,\ldots$)

Two Countries: Country 1 & Country 2

Demography: 2-period lived OG agents

- L^j units of agents in Country j in each cohort.
- Each Country j agent is endowed with and supplies inelastically one unit of nontradeable labor in the first period (when they are young)
- Each agent consumes only in the second (when they are old). They save all the wage income when young.

Final Good: Each country produces the final good, $Y_t^j = F^j(K_t^j, L^j) = f^j(k_t^j)L^j$, where K_t^j is nontradable **country-j capital,** and $k_t^j = K_t^j/L^j$ is **the country-j capital-labor ratio**.

Competitive Factor Prices: $\rho_t^j \equiv f^{j\prime}(k_t^j)$; $w_t^j = f^j(k_t^j) - k_t^j f^{j\prime}(k_t^j) \equiv W^j(k_t^j)$.

Investment Technologies:

Only the young Country-j agents can produce country-j by running a **non-divisible project**, which converts m^j units of the input in period t into ***R*** units of in **Capital** in period t+1, by **borrowing** $m^j - W^j(k_t^j)$ at the market rate of return equal to $\boldsymbol{r_{t+1}}$**.**

Agent's Utility = Objective Function = Consumption in Period t+1:

$$U = m^j R^j \rho^j(k_{t+1}^j) - r_{t+1}^j[m^j - W^j(k_t^j)] \quad \text{by borrowing and running the project}$$

$$= m^j[R^j \rho^j(k_{t+1}^j) - r_{t+1}^j] + r_{t+1}^j W^j(k_t^j);$$

$$U = r_{t+1}^j W^j(k_t^j) \quad \text{by lending.}$$

Profitability Constraint **(PC):** $R^j f^{j}{}'(k_{t+1}^j) \ge r_{t+1}^j$

Borrowing Constraint **(BC):** $\lambda^j m^j R^j f^{j}{}'(k_{t+1}^j) \ge r_{t+1}^j(m^j - W^j(k_t^j))$

(PC)+(BC):

$$\frac{R^j f^{j}{}'(k_{t+1}^j)}{Max\left\{\dfrac{1 - W^j(k_t^j)/m^j}{\lambda^j}, 1\right\}} = r_{t+1}^j$$

Autarky Equilibrium Dynamics in Country-j:

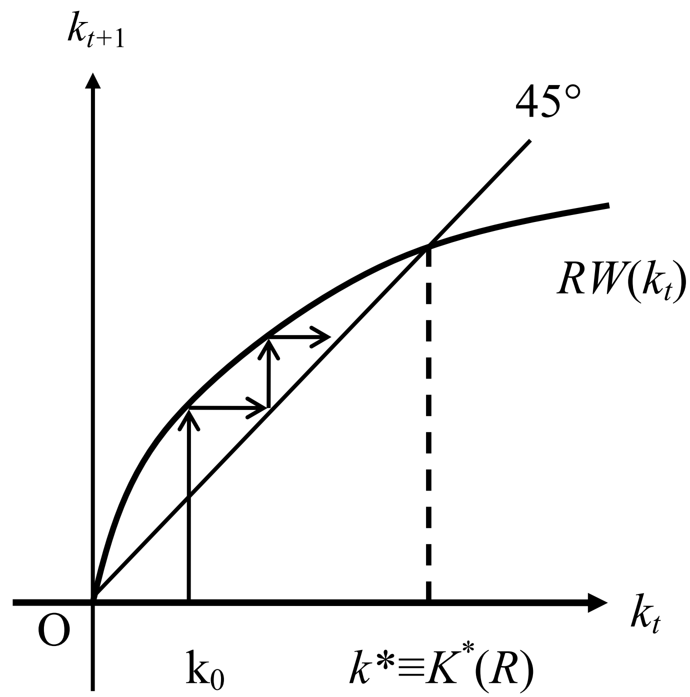
S = I condition: $W^j(k_t^j)L^j = S_t = I_t = m^jX_t^j L^j$.

Capital Stock Adjustment: $k^j_{t+1} = m^jX_t^j R^j$

These two can be combined as

(RC-j) $k^j_{t+1} = R^jW^j(k_t^j)$,

which determines the dynamics in autarky.



Notes:

- Figure assumes W(k)/k is monotonically decreasing to ensure the unique steady state, $k^* = K^*(R)$. (Superscript j is dropped in the Figure.)
- The dynamics is independent of m and λ.

Equilibrium Dynamics under Financial Integration:

S = I condition: $\sum_j W^j(k_t^j)L^j = S_t = I_t = \sum_j m^j X_t^j L^j$.

Capital Stock Adjustment: $k^j_{t+1} = m^j X_t^j R^j$ (j = 1, 2)

These two can be combined as

(WRC) $\sum_j W^j(k_t^j)L^j = \sum_j k^j_{t+1}(L^j/R^j)$

(PC)+(BC) + (Inada Condition) for each →

(RRE)

$$\frac{R^1 f^{1\prime}(k^1_{t+1})}{Max\left\{\dfrac{1-W^1(k^1_t)/m^1}{\lambda^1},1\right\}} = r_{t+1} = \frac{R^2 f^{2\prime}(k^2_{t+1})}{Max\left\{\dfrac{1-W^2(k^2_t)/m^2}{\lambda^2},1\right\}}.$$

Symmetric Case: $m^j = m$; $L^j = 1$; $\lambda^j = \lambda$; $R^j = R$; $f^j(\bullet) = f(\bullet)$ for j = 1 and 2.

(WRC): $R\{W(k_t^1) + W(k_t^2)\} = k^1_{t+1} + k^2_{t+1}$

(RRE): $$\frac{Rf'(k^1_{t+1})}{Max\left\{\frac{1-W(k^1_t)/m}{\lambda},1\right\}} = r_{t+1} = \frac{Rf'(k^2_{t+1})}{Max\left\{\frac{1-W(k^2_t)/m}{\lambda},1\right\}}$$

If $m(1-\lambda) = 0$, $r_{t+1} = Rf'(k^j_{t+1}) = Rf'(k_{t+1})$ where $k_{t+1} = (R/2)\sum_j W(k_t^j)$.

→ Convergence Across Countries Complete After One Period!

After One Period,

→ $k_{t+1} = RW(k_t)$ for j = 1 and 2.

What if $m(1-\lambda) > 0$?

Suppose that $W(k_t^1), W(k_t^2) < m(1-\lambda)$.

***Caution**: This assumption is problematic, since it is made on endogenous variables.*

(WRC): $R\{W(k_t^1) + W(k_t^2)\} = k^1_{t+1} + k^2_{t+1}$

(RRE): $$\frac{f'(k^1_{t+1})}{m-W(k_t^1)} = \frac{f'(k^2_{t+1})}{m-W(k_t^2)}$$

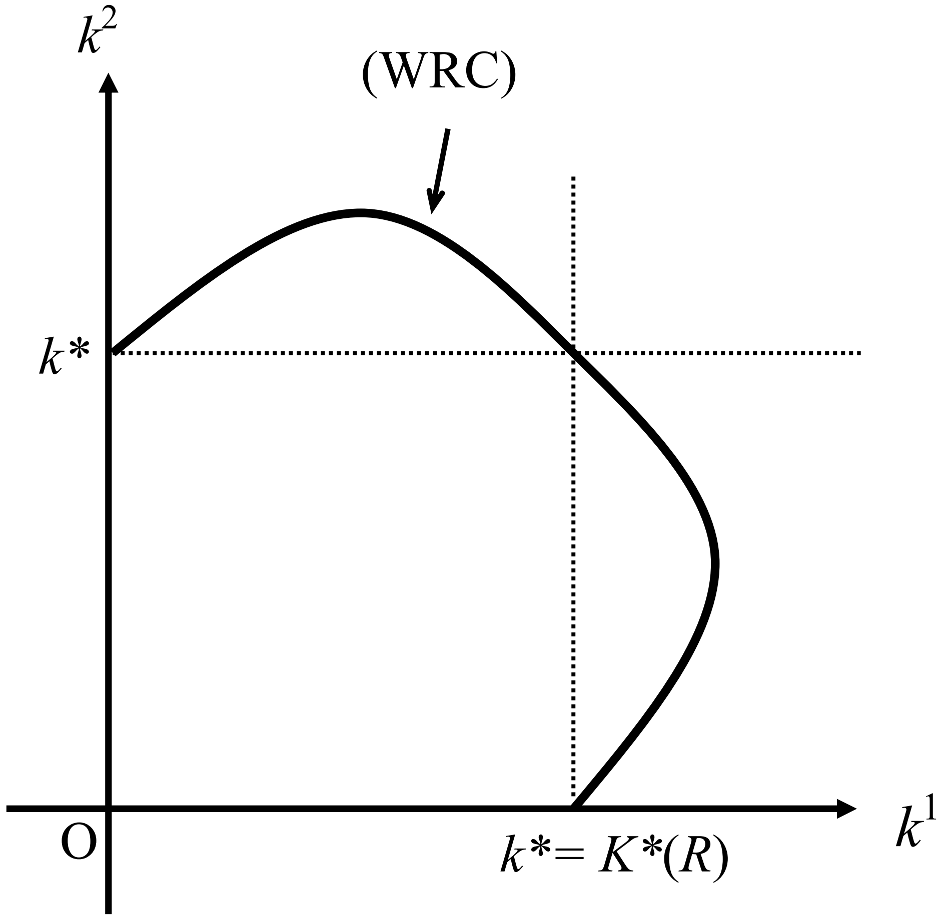
Steady State Conditions:

(WRC): $R\{W(k^1) + W(k^2)\} = k^1 + k^2$

(RRE): $$\frac{f'(k^1)}{m-W(k^1)} = \frac{f'(k^2)}{m-W(k^2)}.$$

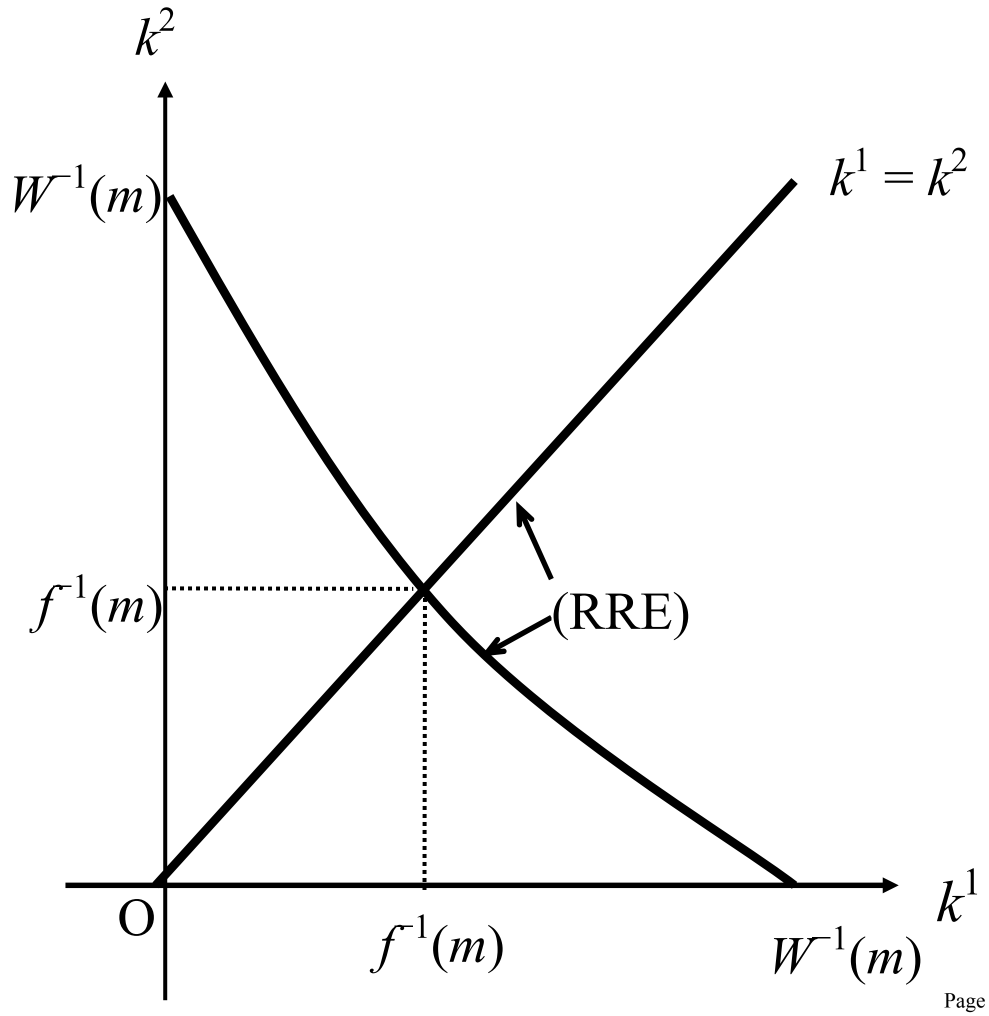
A Graphic Illustration of (WRC): $R\{W(k^1) + W(k^2)\} = k^1 + k^2$

Exercise:
Prove that (WRC) has the properties shown in this figure.

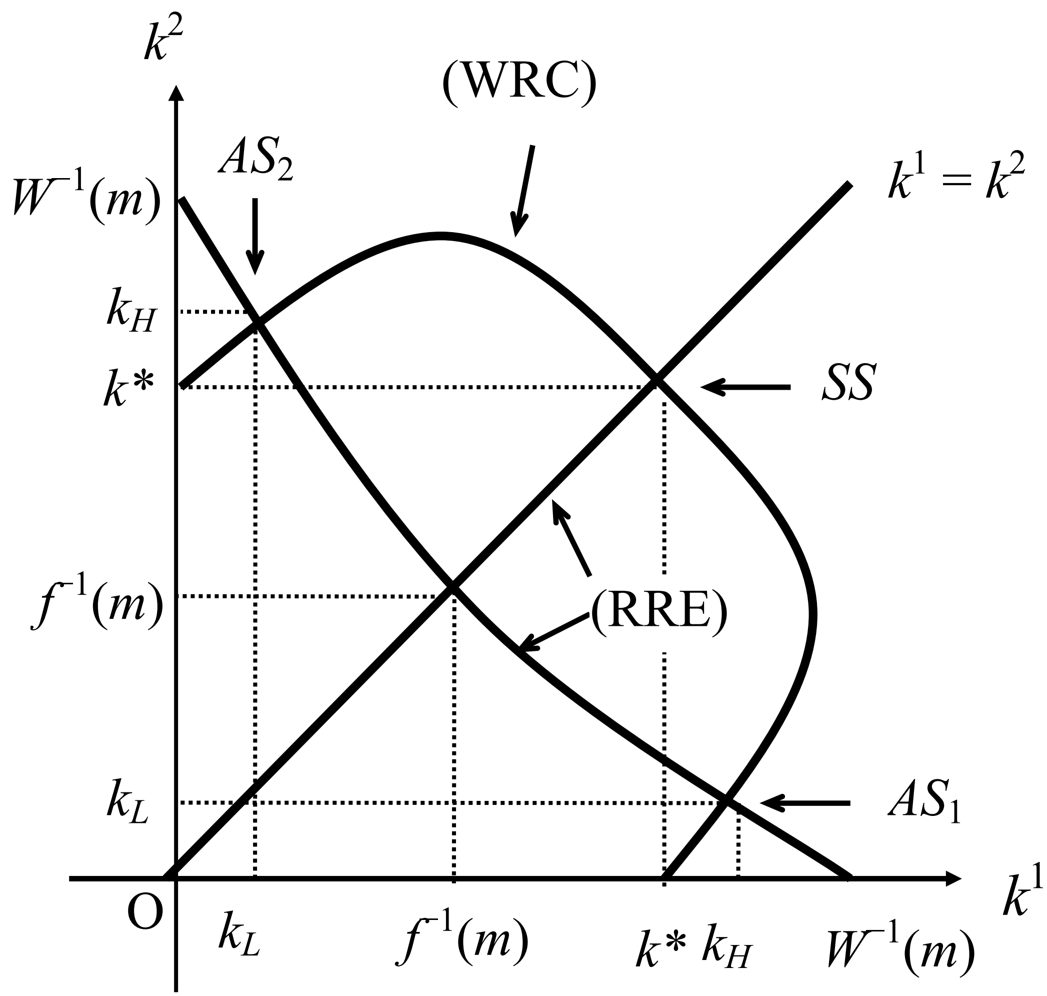


A Graphic Illustration of (RRE): $\dfrac{f'(k^1)}{m - W(k^1)} = \dfrac{f'(k^2)}{m - W(k^2)}$

Exercise:
Prove that (RRE) has the properties shown in this figure.



For an Intermediate Value of R, there are multiple steady states.



When multiple steady states exist,

- A Unique Symmetric Steady State, (SS) = (k*, k*), is *unstable.*
- A Symmetric Pair of Asymmetric Steady States; $(AS_1) = (k_H, k_L)$, $(AS_2) = (k_L, k_H)$. *Are they stable?* Numerical simulations suggest that they seem stable.

Exercise: Prove analytically that (SS) = (k*, k*), is *unstable.*

While suggestive, the above analysis has some flaws:

- Hard to examine the stability of Asymmetric Steady States analytically.
- Hard to verify the assumption, $W(k_t^1)$, $W(k_t^2) < m(1-\lambda)$.
- Hard to characterize the steady states for the entire parameter spaces. → We cannot examine the effects of changing the parameter values.

Let us modify the model in order to get the analytical results.

A Continuum of Countries; j ∈ [0,1] so that each country is small.

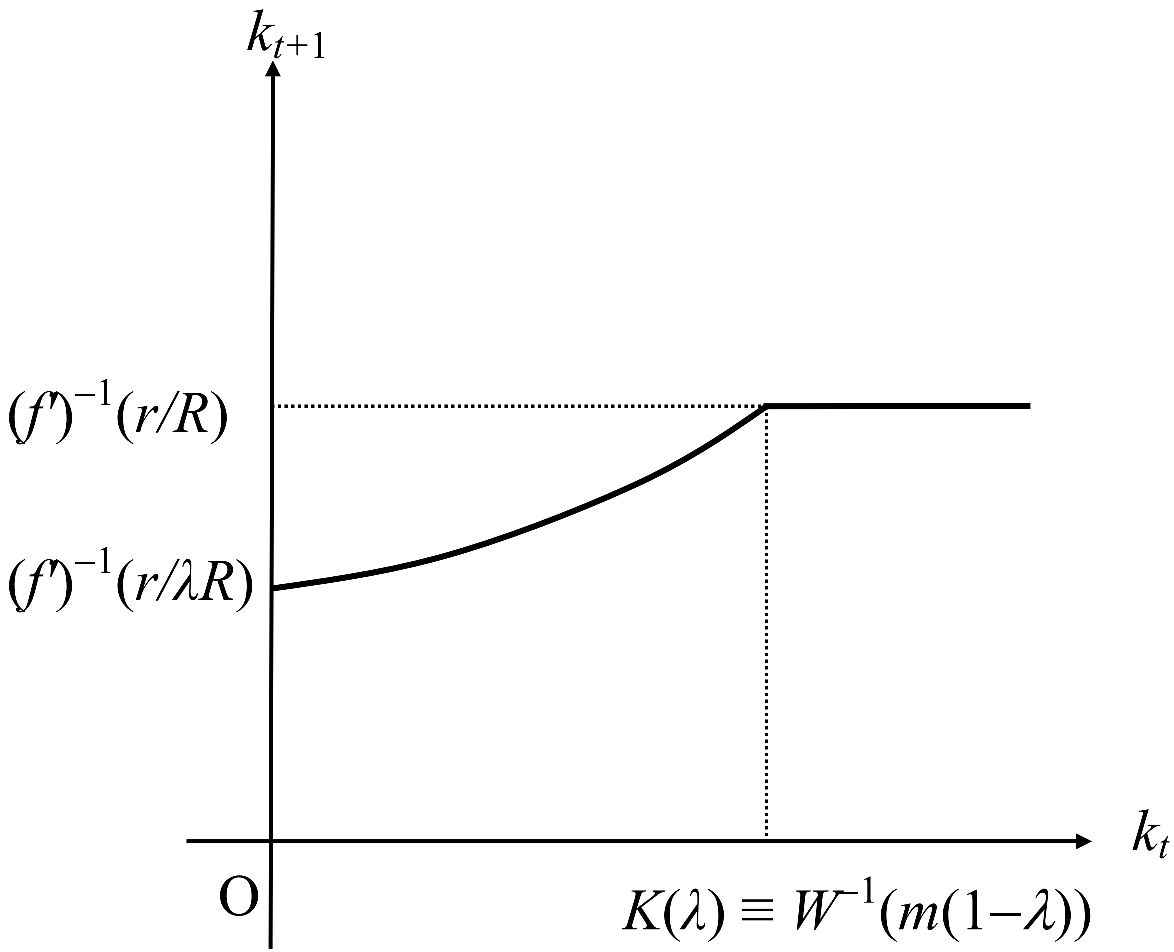
(WRC): $$R\int_0^1 W(k_t(j))dj = \int_0^1 k_{t+1}(j)dj$$

(RRE): $$r_{t+1} = \frac{\lambda R f'(k_{t+1}(j))}{Max\{1 - W(k_t(j))/m, \lambda\}}$$

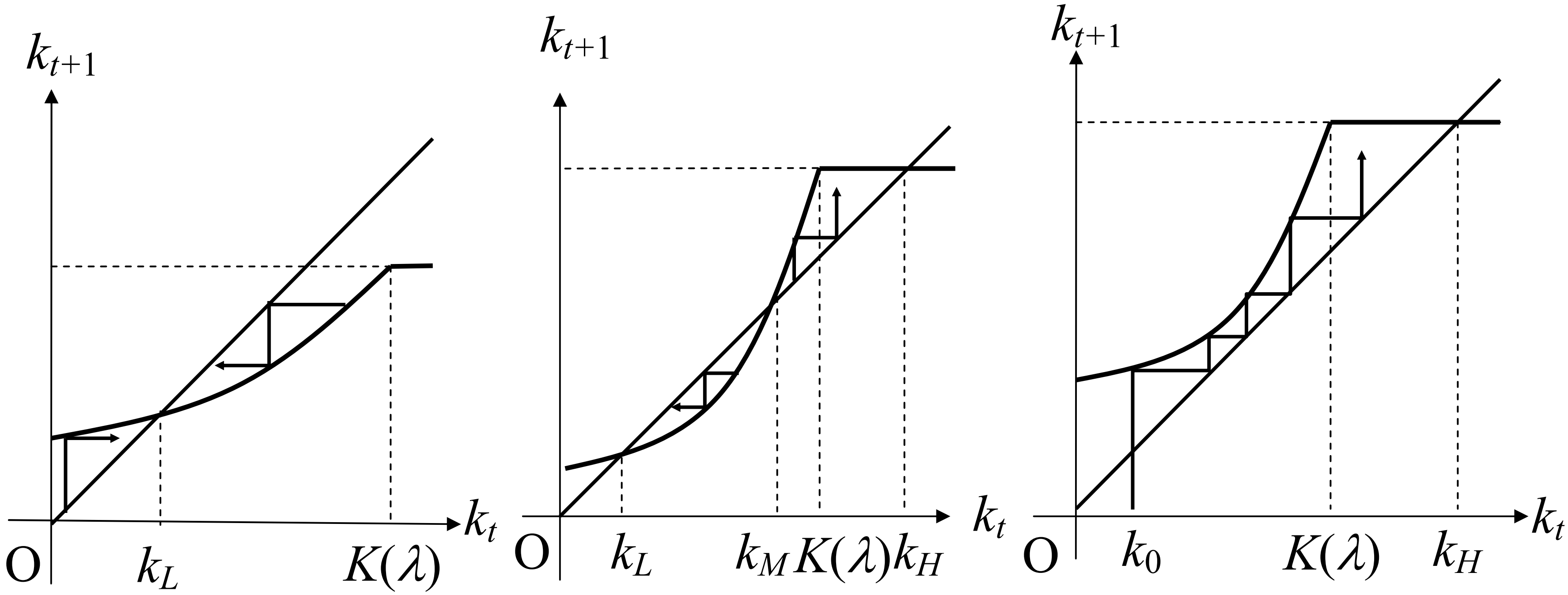
Dynamics of a (Small) Country: When the world as the whole is in steady state, r is constant over time:

(WRC): $$R\int_0^1 W(k^*(j))dj = \int_0^1 k^*(j)dj$$

(RRE): $$r = \frac{\lambda R f'(k_{t+1}(j))}{Max\{1 - W(k_t(j))/m, \lambda\}}$$


k_{t+1}
$(f')^{-1}(r/R)$
$(f')^{-1}(r/\lambda R)$
k_t
O
$K(\lambda) \equiv W^{-1}(m(1-\lambda))$

Three generic ways in which the graph intersects with the 45º line.



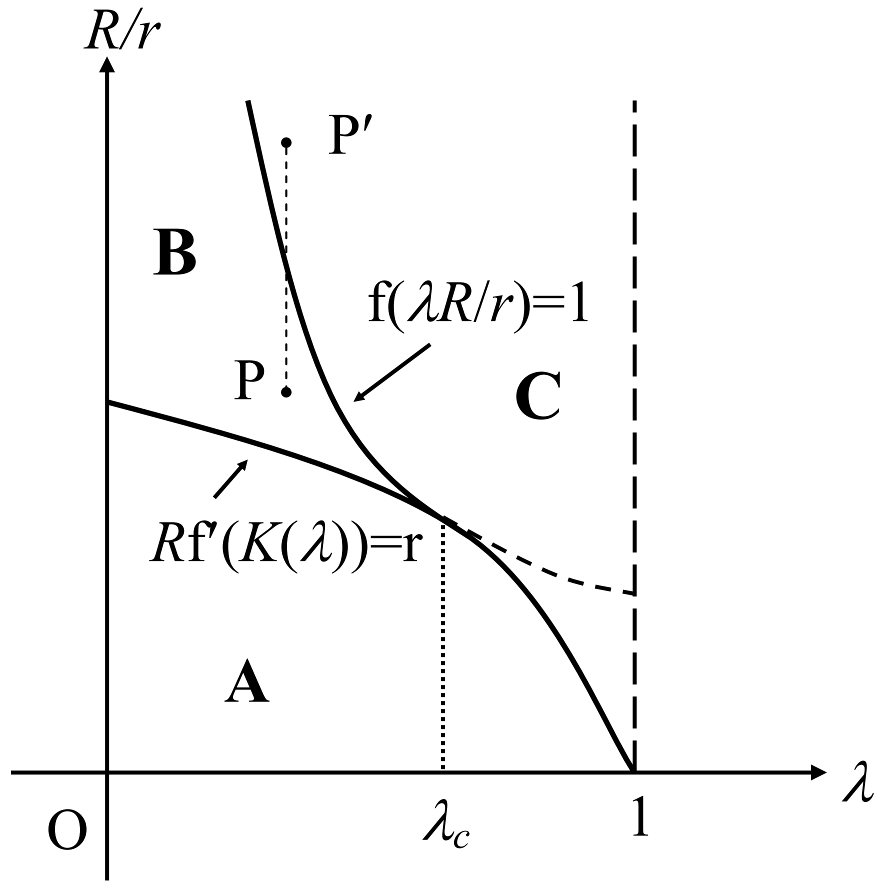
A B C

Parameter Configurations (Note: r is taken as a parameter, here.)

When interpreted as a small open economy model with the exogenous r,

- Even a small exogenous decline in r, illustrated by a move from P to P', could help the small economy trapped at the lower steady state, escape from it.

- Even a small exogenous rise in r could dislocate the small open economy from the higher steady state, causing a downward spiral.



Stable Steady States in the World Economy (with a Continuum of Small Countries):

The three generic cases above imply that, in any *stable* steady state of the world economy consisting of a continuum of small countries, the steady state value of each country, k*(j), could take at most two different values.

If k*(j) = k* for all j, then the steady state is symmetric and

(WRC): $k^* = RW(k^*) \rightarrow k^* = K^*(R)$.

(RRE): $r = \dfrac{\lambda R f'(k^*)}{Max\{1 - W(k^*)/m, \lambda\}} = \dfrac{\lambda R f'(K^*(R))}{Max\{1 - W(K^*(R))/m, \lambda\}}$

In this symmetric steady state,

- (PC) is binding, if $K^*(R) \geq K(\lambda)$.
- (BC) is binding, if $K^*(R) \leq K(\lambda)$.

This steady state is identical with the steady state for the autarky case.

Or, the steady state may be characterized by a two-point distribution, where, for a fraction X of countries, $k^*(j) = k_H$, or for a fraction, 1–X, $k_t{}^*(j) = k_L$.

(WRC): $X[k_H - RW(k_H)] = (1-X)[RW(k_L) - k_L] > 0$

(RRE): $Rf'(k_H) = r = \dfrac{\lambda Rf'(k_L)}{1-W(k_L)}$

where 0 < X < 1 is also endogenous.

Notes:

- (WRC) implies $k_H > K^*(R) > k_L$.
- (RRE) implies $k_H > K(\lambda) > k_L$.
- Endogenous Polarization of the World Economy into the Rich & the Poor.
- Investment Distortion among the Poor is endogenous.
- The Rich's investment is financed by the Poor's saving.

Thus, there are only two possible types of stable steady states, which may or may not co-exist, depending on the parameter values:

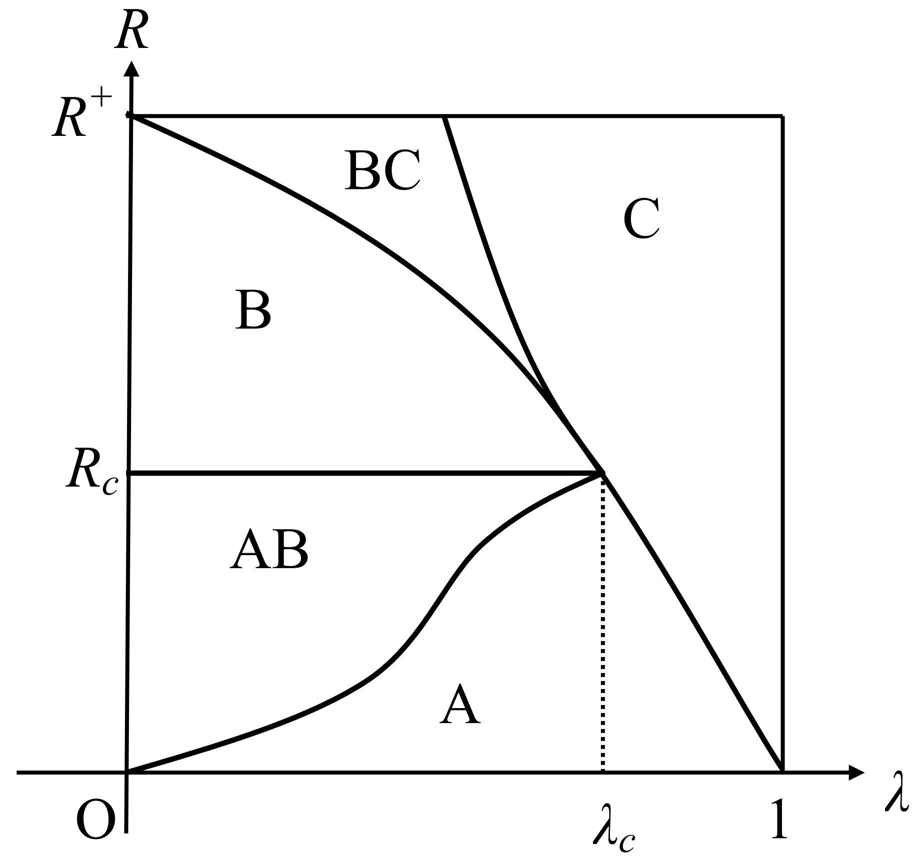
I. *Symmetric Steady State (SS)*, where $k^*(j) = K^*(R)$ for all j.
II. *Asymmetric Steady States (AS),* where some countries have k_H and others have k_L, where $k_H > K^*(R)$, $K(\lambda) > k_L$.

Parameter Configuration:

- In A+AB, (SS) exists, with (BC) binding.
- In AB+B+BC, (AS) exist.
- In BC+C, (SS) exists, with (PC) binding.

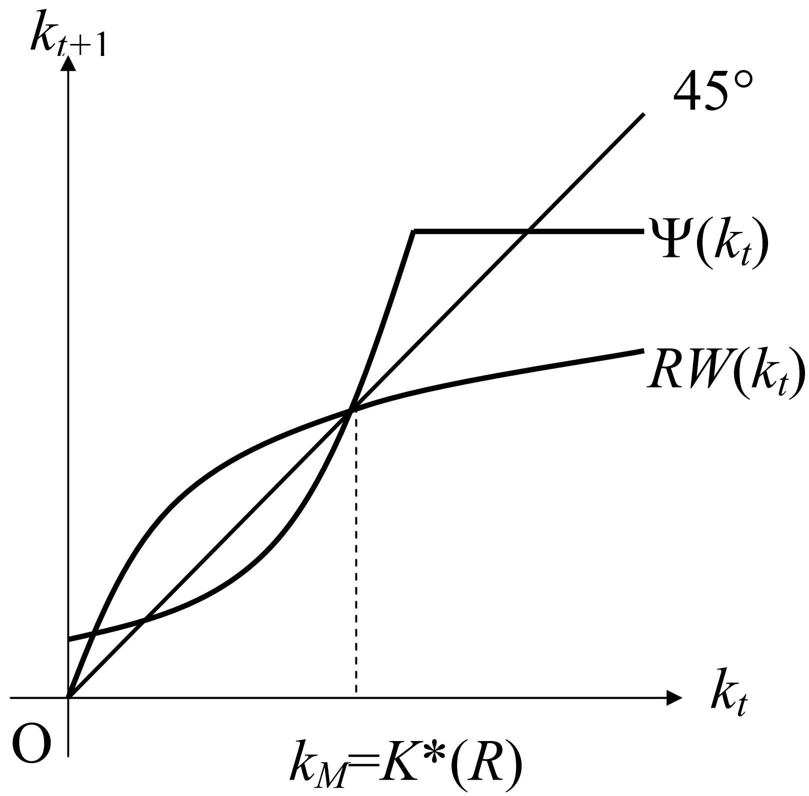
In Region B,

- Only Asymmetric Steady States are stable.
- Symmetric Steady State is unstable.
  → Symmetry-Breaking!!



Understanding Symmetry-Breaking when $K^*(R_c) < K^*(R) < K(\lambda)$.

Suppose that all the countries were initially located in the autarky steady state, K*(R). What would happen if financial markets are fully integrated?



Intuitions:

Why Symmetry-Breaking caused by Global Financial Integration?

- WITHOUT the international financial market, the domestic market rate adjusts to equate S = I, which offsets any country-specific shock, restoring the symmetry.
- WITH the international financial market, the domestic market rates are all linked. Without offsetting changes in the domestic market rate, positive (negative) country-specific shocks start virtuous (vicious) circles of high (low) wealth/high (low) investment.

Why Asymmetric Stable Steady States?

Diminishing Returns eventually put a break on the spiral process

The model captures the two contrasting views on global financial markets

1. Neoclassical View: *An Equalizing Force*

- Facilitate the Efficient Allocation of the World Saving
- Help the poor countries to grow faster and catch up with the rich

2. Structualist View: *An Unequalizing Force*

- The poor cannot compete with the rich in the global capital market
- Magnifying the gap between the rich and the poor
- Creating the International Economic Order of the Rich and the Poor

Efficiency Implication:

Because of the convexity of technologies (Aggregate Diminishing returns at the country level), the world output is smaller in (stable) asymmetric steady states than in the (unstable) symmetric steady state.

Proof: Maximizing the steady state world output means;

$$\text{Max} \int_0^1 f(k(j))dj \qquad \text{s.t.} \int_0^1 k(j)dj \leq R\int_0^1 W(k(j))dj$$

Since the feasibility set is convex, the objective is symmetric and strictly-quasi concave, the solution is k(j) = k* = K*(R) for all j $\in$ [0,1].

Note: This feature is in contrast to models of endogenous inequality and symmetry-breaking based on IRS and/or Agglomeration Economies.

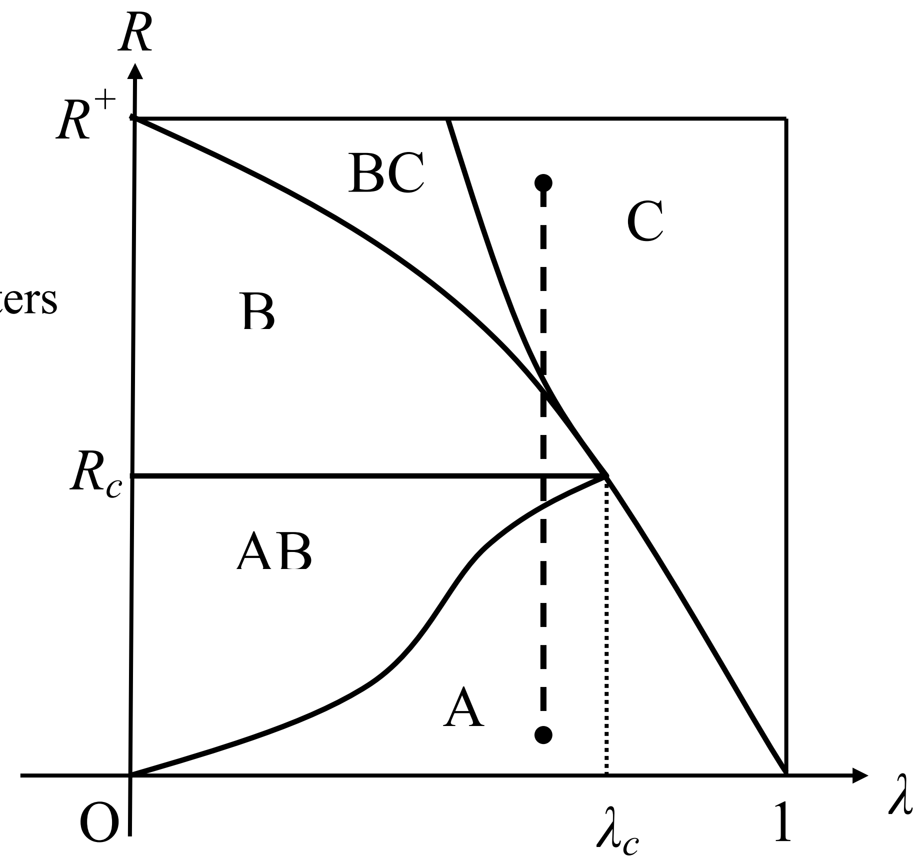
Application: Technical Progress and Inverted U-Curve Patterns of Inequality

Suppose $\lambda < \lambda_c$, and R was initially so small that the World Economy was in Region A applies. Countries are equally poor. Then, gradually, technology starts improving.

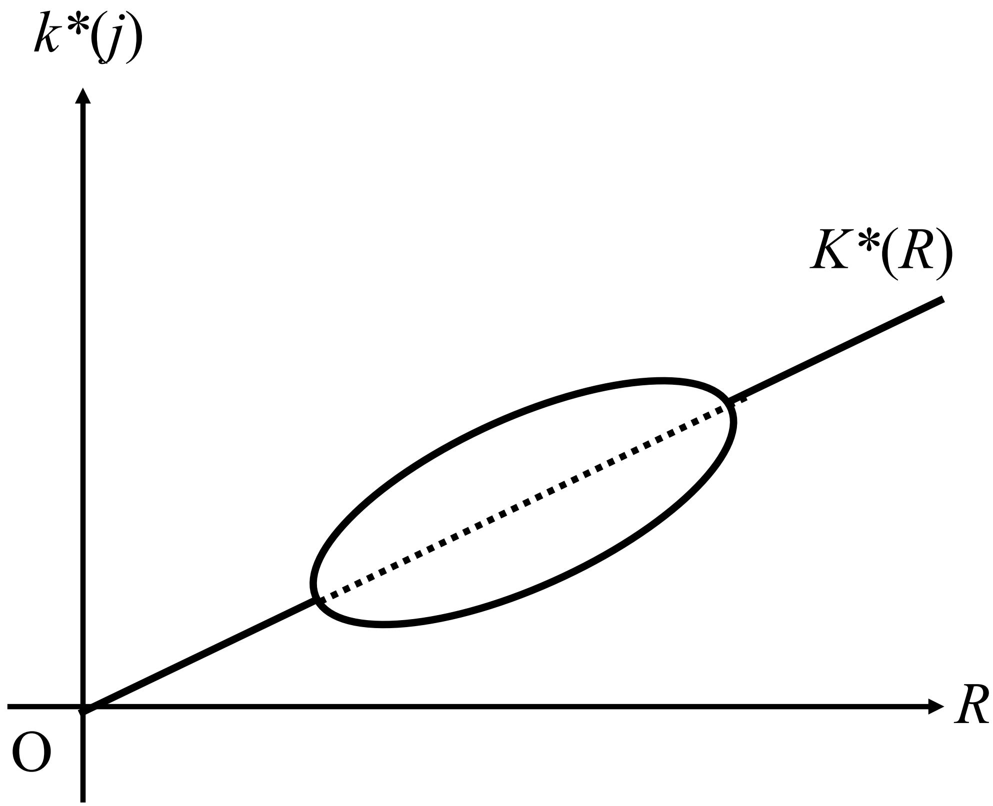
As R becomes greater than R_c, the world economy enters Region B.
Symmetric Steady State becomes unstable.

As R becomes even greater, the world economy enters Region C.
Stable Asymmetric Steady States disappear.

Over Region B, the world economy experiences:
First, divergence; then convergence.



Schematically,



Some Additional Remarks:

The model suggests:

- a greater financial integration may polarize the world economy into the rich and the poor.
- inequality among nations might go up initially, and then go down as technology improves.

The model does not say:

- The world economy has become increasingly unequal.
- The inequality of nations should be blamed for the international financial market.

More generally,

Symmetry-Breaking does not mean divergence

- Symmetry-Breaking means endogenous inequality.
- Symmetry-Breaking can be consistent with convergence.
- Symmetry-Breaking means, however, that there is a limit to convergence.

Endogenous Inequality does not mean that exogenous heterogeneity is not important. It suggests that

- a small amount of exogenous heterogeneity can be magnified to generate a huge inequality
- possible endogeneity of observed heterogeneities that are treated as exogenous in the growth accounting, growth calibration literature (e.g., there may be the two-way causality between Per Capita Income $\leftrightarrow$ the Investment distortions)

Some Open Questions and Possible Extensions:

- Convergence Speed; even if the steady state continues to be unique, symmetric and stable under globalization, financial integration might affect the speed of convergence. We know that, when $\lambda = 1$, convergence is faster under globalization than under autarky. But, with a smaller λ, convergence might be slower under globalization than under autarky.
- Allow the agents to produce capital abroad (with reduced productivity), which could lead to Two-Way Flow of Financial Capital and FDI.
  - ➢Savers in the Poor South lends to firms in the Rich North, which invest in the Poor South.
  - ➢FDI can be used to bypass the external capital market in the Poor South.
- Introducing Trade in Inputs, subject to some trade costs, which could lead to positive spillovers in neighboring countries;
  - ➢Regional contagions (East Asian booms and Latin American stagnations)
- Endogenizing Investment Technology
  - ➢Two-way causality between Productivity Difference vs. Institutional difference
  - ➢Capital may flow into countries with inefficient investment technologies.
- The above analysis treats λ as exogenously fixed. However,
  - ➢Economic development might change λ endogenously.
  - ➢Globalization might affect λ.
- Interactions Between Inequality Within and Across Countries

Credit Market Frictions and Patterns of International Trade: Matsuyama (2005)

Two Countries: **North and South (j = N or S)**

A Continuum of Tradeable Consumption Goods, $z \in [0,1]$

Symmetric Cobb-Douglas preferences.

Homogeneous Agents with Unit Mass, each endowed with $\omega < 1$ units of **Labor**

Tradeable Consumption Goods produced by the projects run by agents

- Each agent can run at most one project.
- Each project in sector z converts one unit of labor to R units of good z.

→ To run the project, one must hire $1-\omega$ units of labor at the market wage rate, w, from those who don't run the project.

Agent's Income:

$I = p(z)R - w(1-\omega)$ by running the project in sector z.

$I = w\omega$ by not running any project and working for others

Profitability Constraint**:** The agent *is willing to* run the project in sector z iff

(PC-z) $p(z)R \geq w$

Borrowing Constraint**:** The agent is unable to pledge to the lenders/workers more than a fraction, $\lambda\Lambda(z)$, of the project revenue for the wage repayment. Thus, the agent *can* borrow and start the project in sector z iff

(BC-z) $\lambda\Lambda(z)p(z)R \geq w(1-\omega)$,

$0 \leq \lambda \leq 1$: country-specific factors
$0 \leq \Lambda(z) \leq 1$: sector-specific factors, continuous and increasing in z.

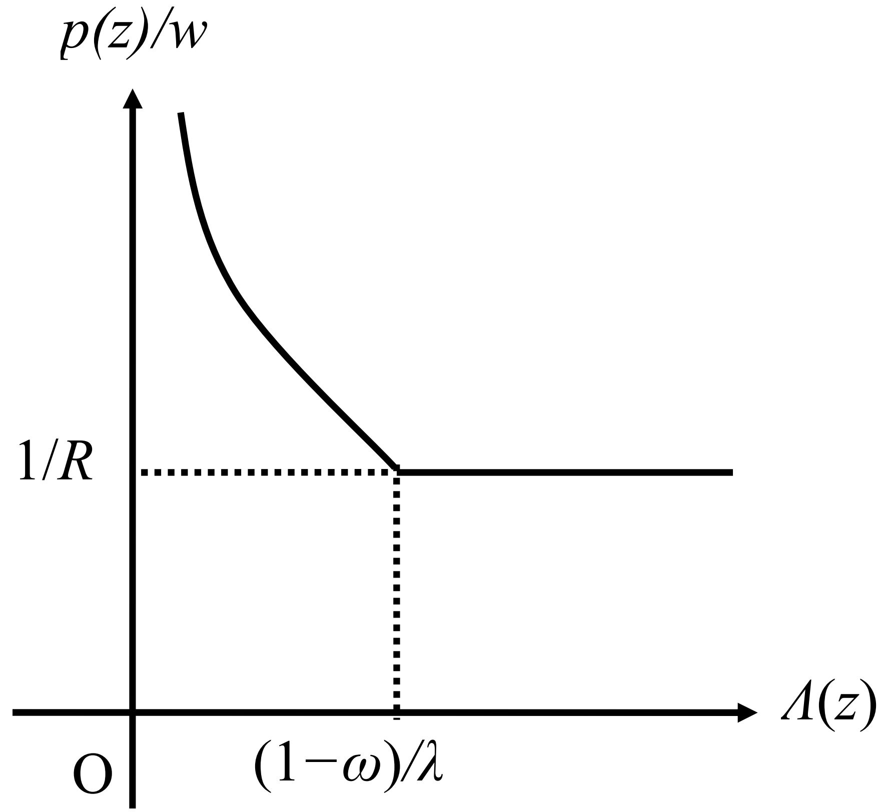
The Closed Economy Case:

- Both (PC-z) and (BC-z) hold, because the economy produces all the goods.
- One of them is binding in each z, because there would be no workers otherwise.

$$p(z)/w = \max\{1, (1-\omega)/\lambda\Lambda(z)\}/R$$

- (PC-z) is binding in $\Lambda(z) > (1-\omega)/\lambda$
- (BC-z) is binding in $\Lambda(z) < (1-\omega)/\lambda$.

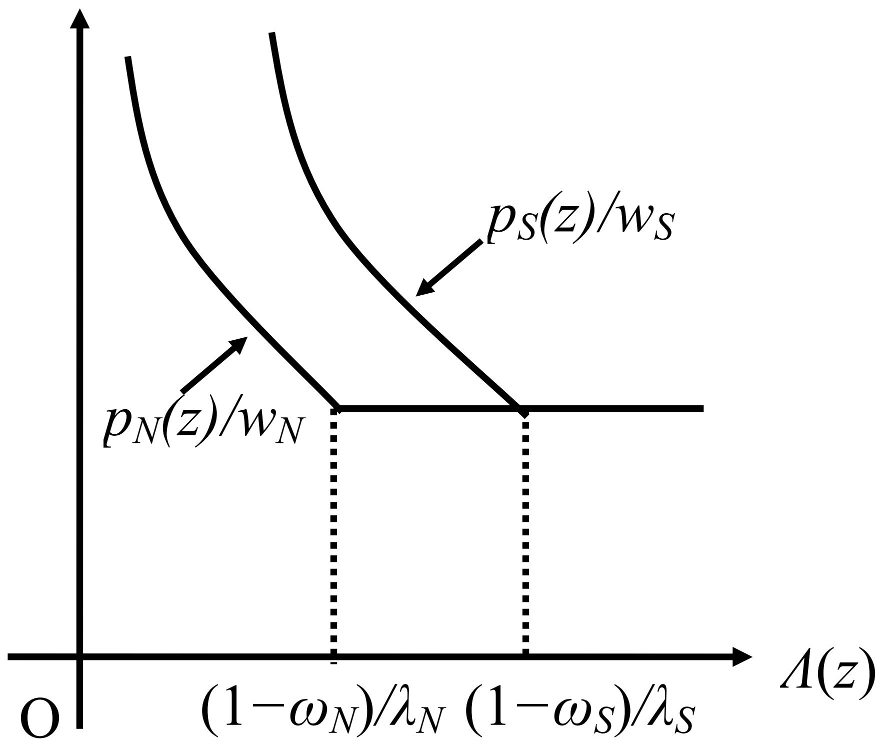
The credit market imperfection restricts entry to the lower-indexed sectors, and the rent created by the limited entry makes the lenders happy to finance the firms in these sectors.



World Economy with North and South: ($\omega_N > \omega_S$, $\lambda_N \geq \lambda_S$).

In Autarky: $p_j(z)/w_j = \max\{1, (1 - \omega_j)/\lambda_j\Lambda(z)\}/R$ $(j = N, S)$

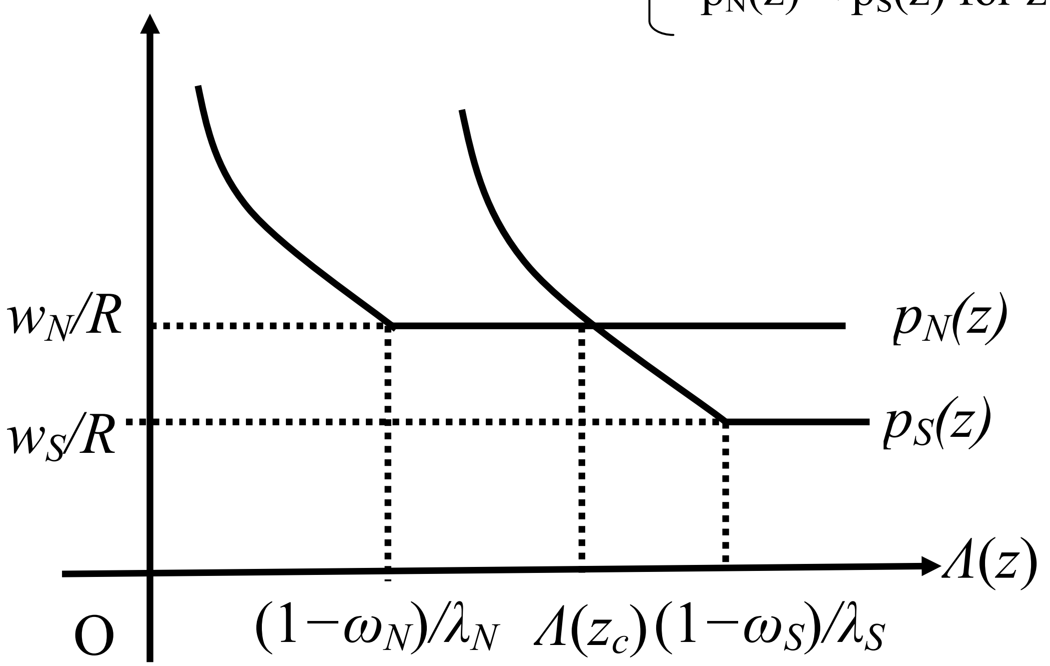
North (South) has *absolute* advantage (disadvantage) in low-indexed goods.



In World Trade Equilibrium:

North's *absolute* advantage translates into a higher wage in North, which implies North's (South's) *comparative* advantage in low (high)-indexed sectors.

$$w_N > w_S \leftrightarrow \begin{cases} p_N(z) > p_S(z) \text{ for } z < z_c. \\ p_N(z) < p_S(z) \text{ for } z > z_c. \end{cases}$$



Risk, Diversification and Asset Trade; Complete Market *(Unfinished)*

Risk, Diversification and Asset Trade; Incomplete Market *(Unfinished)*

Bibliography: *(Unfinished)*