Dual financial systems and Inequalities in Economic Development

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Introduction

- This paper analyses the emergence and evolution of a modern banking system, in a developing economy where banks coexist with informal credit institutions.
- Banks have a superior ability in mobilizing savings but cannot observe the behaviour of borrowers.
- Informal lenders enjoy superior information on borrowers but are restricted in the amount of savings they can collect.

Introduction contd.

The paper derives the following patterns:

- For a given productivity, small firms lacking collateral assets seek finance in the local credit market whereas banks provide capital to large firms.
- The current distribution of assets, the resulting demand and supply of capital determine the size of the informal and the banking sectors. Thus, financial institutions evolve endogenously as the economy develops.
- The whole development path of the economy is characterised by initial distribution of assets and aggregate wealth.

Empirical Evidence

- *Presence of informal credit*: Informal credit exists and plays a significant role in financing activity in many countries as can be seen from Table 1.
- *Link between scale of banking activites and distribution of assets*: The average per capita income of households borrowing in formal sector is larger than that of agents borrowing in the informal sector (Nabi, 1988; Siamwala et al 1990 etc).
- *Role of informal credit*: In England, local banks used to be very active during the first Industrial revolution, whereas national banks started to develop much later in second half on 19th century, and eventually dominated the banking network, with the appearance of large scale industries (Cameron et al, 1967).

Empirical Evidence

Table 1. Share of informal credit, rural and urban in selected countries.

Country	Share[a]	Remarks
Bangladesh Rural	33–67	Share of total volume of rural borrowing, 1980s
China Rural	33–67	Share of borrowing, mid-1980s
India Rural	38	Share of outstanding household debt owed to informal sector, 1982
Urban	40	Share of outstanding household debt owed to informal sector, 1982
Korea Rural	51	Share of average outstanding liabilities held by farm households, 1982
Malaysia Rural	75	Share of borrowing, 1980
Nepal Rural	76	Proportion of farm families borrowing from Informal sector, 1976–77
Pakistan Rural	69	Share of borrowing, 1985
Phillippines Rural	70	Share of borrowing, 1987
Urban	45	Share of borrowing, 1987
Sri Lanka Rural	45	Share of borrowing among paddy farmers, 1975–76
Thailand	66	Share of debt outstanding, 1987

Note: [a]Share of informal credit in total credit allocation (in percent).
Source: Montiel et al. (1993).

Story

- Local institutions have an important role to play in the early stages of indutrialization because of their ability to exploit local information.
- When the average size of firms increase, modern banks that collect savings on a large scale emerge and progressively dominate the financial sector.
- Moreover, the early stages of economic development are successful if the evolution of financial structure from local form of financial intermediation to modern commerical banks does take place.

Model - Economy

- Consider a closed economy with an infinite, discrete time horizon, $t = 0, 1, 2, ...$
- It is populated by a continuum of family lineages of measure one.
- At each date t, an agent's endowment consists of a bequest b_t, inherited from his parent.
  - In the 1st sub-period of date t, agent invests or saves his endowment.
  - In the 2nd sub-period of date t, agent consumes c_t of the resulting income and the remainder is the bequest b_{t+1}, to the agents unique offspring.

Model - Agents

- Agents are risk-neutral and have warm-glow preferences:

$$u(c_t, b_{t+1}) = c_t^{1-S} b_{t+1}^S$$

  where $0 < S < 1$ corresponds to a constant saving rate.
- So, each agent maximises the indirect utility function $V(w) = (1-S)^{1-S} S^S w = \phi w$ where w is the end of life income.
- The agents also differ in their personal talent a_t, drawn from a time-invariant uniform distribution $F(a)$ with support $[0, \bar{a}]$.
- The talent is publicly observable and not correlated with inheritance.

Model - Project

- At the beginning of each period t, all agents have access to projects requiring a fixed start-up cost of I units of capital.
- Good project gives the following observable returns:

$$Y = \begin{cases} \frac{a}{p}I, & \text{with probability } p \\ 0, & \text{with probability } 1-p. \end{cases}$$

- Bad project gives the following observable returns plus non-verifiable private benefits σI

$$Y = \begin{cases} \frac{a}{p}I, & \text{with probability } q \\ 0, & \text{with probability } 1-q. \end{cases}$$

Model - Investing

- Given his type (b_t, a_t), each agent may choose to
  - Start a project
  - Invest in a traditional activity yielding a gross return of $1 + \underline{r}$
  - Save in a financial institution
- **Assumption 1:** $\frac{qa}{p} + \sigma < 1 + \underline{r}$: Bad project has a lower return than the traditional activity.
- **Assumption 2:** $S(1 + \underline{r}) < 1$: Family lineages become poorer if inheriances are invested in the traditional activity only.

Financial Institutions

- Agents can borrow from banks or local intermediaries to finance their investment if $b_t < I$.
- Both institutions rely on specific mechanisms to ensure agents choose the good project.
- Local intermediaries, because of their proximity can observe the project choice and impose a large social sanction ex post if the project is bad.
- Banks rely on collateral requirements to solve the moral hazard problem.

Model - Economy

- Assume that agents are distributed on a line of infinite length, in an infinite number of villages (See Figure 1).
- Village i is located at distance x_i from the origin and has infinitely small number of agents given by density function $\lambda(x_i)$. Also, $x_{i+1} = x_i + t \; \forall i$.
- All villages are identical in terms of average wealth and wealth distribution.
- Hence, we can restrict our analysis to aggregate wealth distribution given by cumulative function $G_t(b)$ and average wealth given by $W_t = \int_0^\infty b \, dG_t(b)$.
- Also, define $x_t = \frac{b_t}{W_t}$, the individual bequest relative to average wealth.

Model - Economy

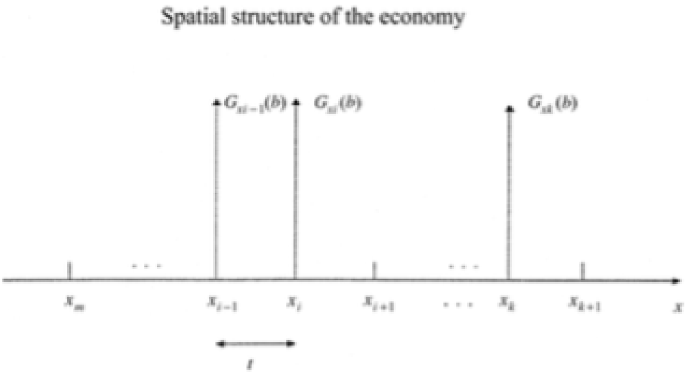


Figure 1. Spatial structure of the economy.

Model - Local intermediaries

- Any agent can become a local intermediary by incurring a fixed cost c. Assume that $c \to 0$ but $\frac{c}{\lambda(x_i)} = C_i > 0$.
- Local intermediaries have to incur an additional cost $z\gamma(l - b)$ for a loan of size $l - b$ in order to obtain perfect information about a project located at a distance z from the intermediary.
- Finally, each intermediary faces a capital constraint: he cannot intermediate more than $\kappa\lambda(x_i)$ units of capital.
- The profit of a local intermediary located in village i and covering only the local market is given by

$$\lambda(x_i)(\kappa m - C_i)$$

  where m is the interest margin on loans.

Local intermediaries

- Assume that intermediaries compete in prices on borrower's side and are perfectly competitive on deposit side and take the interest rate r on deposits as given.
- In this framework, there is only one intermediary per village since price competition between 2 local intermediaries will bring m to 0.
- This implies that individual capacity constraints translate into aggregate capacity constraints $\int_{-\infty}^{\infty} \kappa\lambda(x)\, dx = \kappa$.
- Finally, local intermediary in village i chooses R_l^i, the gross expected return on a loan, to maximise his profit by capturing the whole demand in his village, subject to the constraint that $R_l^i \leq min\{R_l^{i+1} + t\gamma, R_l^{i-1} + t\gamma\}$.

Model - Commercial Banks

- The banking sector is perfectly competitive.
- Its cost function is given by $C(L) = c_B L$ where L is the volume of savings intermediated.
- Also, a bank has to pay $\lambda(x_i)F$ to start its activity in a new village i.
- Hence, the cost of covering the whole economy is equal to F and must be incurred in order to have a fully functioning banking system.

Occupational Choices

- Let $R_I - 1$, $R_B - 1$ and r denote the expected net returns on local loans, bank loans and deposits respectively. (will be endogenised later)
- Also assume $R_I > R_B$ i.e. cost of borrowing in informal sector is higher than in formal sector.
- In the first best economy, an agent of talent a will invest iff $a \geq 1 + r$.

Bank loans

- **Participation constraint**: An agent is willing to undertake a good project iff:

$$aI - R_B(I - b) \geq (1 + r)b$$

- Rearranging gives the condition $b \geq \tilde{b_B}(a) = \dfrac{I(R_B - a)}{R_B - (1 + r)}$.
- **Incentive Compatibility Condition**: The IC condition for bank loans is given by

$$aI - R_B(I - b) \geq \frac{q}{p}(aI - R_B(I - b)) + \sigma I$$

- Rearranging gives the condition $b \geq b_1(a) = \dfrac{I(R_B + \triangle - a)}{R_B}$ where $\triangle = \dfrac{\sigma}{1 - \frac{q}{p}}$ measures the incentive cost.

Local credit

- **Participation constaint**: Given perfect information in the local credit market, it is the only relevant constraint

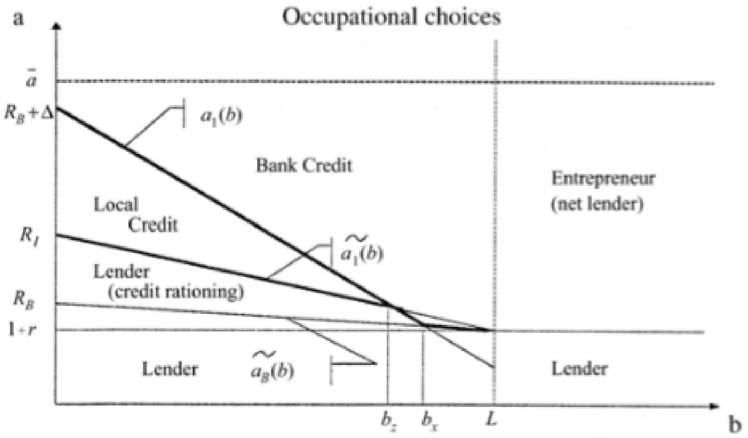
$$aI - R_I(I - b) \geq (1 + r)b$$

- Rearranging gives the condition $b \geq \tilde{b}_I(a) = \dfrac{I(R_I - a)}{R_I - (1 + r)}$.
- Define the functions :
  - $\tilde{a_B}(b) = R_B - \dfrac{b(R_B - (1 + r))}{I}$
  - $a_1(b) = R_B + \triangle - \dfrac{b(R_B)}{I}$
  - $\tilde{a}_I(b) = R_I - \dfrac{b(R_I - (1 + r))}{I}$

Summary

- The existence of a local credit market reduces the proportion of agents who are credit rationed and hence is likely to be welfare improving relative to the situation where only banks exist.
- Holding wealth fixed, increasing productivity leads from credit rationing to local credit and from local credit to bank loans.
- Holding productivity fixed, increase in wealth leads from rationing to local credit and from local credit to bank loans. (See Figure)

Summary



Occupational choices
a
$\bar{a}$
$R_B+\Delta$
$a_1(b)$
Bank Credit
Entrepreneur
(net lender)
Local
Credit
R_I
$\tilde{a}_1(b)$
Lender
(credit rationing)
R_B
$1+r$
Lender
$\tilde{a}_B(b)$
Lender
b_z
b_x
L
b

Local intermediary

- Let $D_I(R_I, R_B)$ denote the demand for informal credit, then

$$D_I(R_I, R_B) = \int_0^{b_z(R_I,R_B)} \int_{\tilde{a}_I(b)}^{a_1(b)} (I - b)\, dF(a)\, dG(b)$$

  where b_z is defined by $a_1(b_z) = \tilde{a}_I(b_z)$
- In each village, the demand for informal credit is: $d_I(R_I^i, R_B) = \lambda(x_i) D_I(R_I^i, R_B)$
- The interest rate charged by the local lender in village i maximises his profit subject to the capacity constraint, potential competition from other local lenders and indirect competition from banking system.

Local intermediary's problem

- Formally, the gross interest rate R_I^i in the informal market is chosen so as to

$$max_{R_I^i}[(R_I^i - r)d_I(R_I^i, R_B)]$$

subject to

$$\begin{cases} (1)\ d_I(R_I^i, R_B) \leq \kappa\lambda(x_i), \\ (2)\ R_I^i \leq 1 + r + t\gamma, \\ (3)\ R_I^i \leq \triangle + R_B, \end{cases} \quad .$$

Local Intermediary's solution

- **Proposition 1** For a given aggregate wealth:
  - The capacity constraint is more likely to be binding when (a) the set-up cost I is large, (b) more agents are poor.
  - One of the two price constraints is more likely to be binding when (a) informational niches are limited ($t\gamma$ small), (b) the banking system is well developed, or agency costs are small, or (c) more agents are poor.
- Simple algebra gives $D_I(R_I, R_B) = \frac{\Omega I}{\bar{a}} \int_0^{b_z} (1 - \frac{b}{I})(\frac{b_z - b}{I})\, dG(b)$ where $\Omega = R_B - R_I + (1 + r)$ and $b_z = \frac{I(\triangle + R_B - R_I)}{\Omega} < I$.

Banking sector development

- Assume that the fixed cost F has already been paid.
- The aggregate demand for bank loans is :

$$D_B(R_B) = \int_0^I \int_{a_B(b)}^{\bar{a}} (I - b)\, dF(a)\, dG(b)$$

where $R_B = c_B + (1 + r)$, b_x is defined by $a_1(b_x) = \tilde{a_B}(b_x)$ and

$$a_B(b) = \begin{cases} a_1(b) \text{ if } b \leq b_x, \\ \tilde{a_B}(b) \text{ if } b \geq b_x \end{cases} .$$

Banking sector development

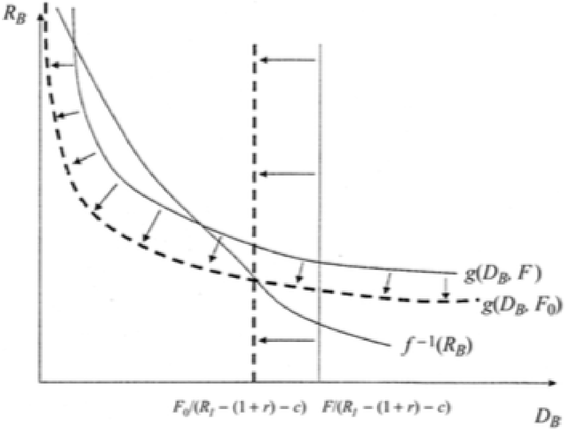
- Multiple equilibria are possible if the fixed cost not been incurred.
- The unit cost of loans depends on the expected aggregate demand D_B^e : $R_B = c_B + (1+r) + \frac{F}{D_B^e}$
- The banking sector develops iff

$$c_B + (1+r) + \frac{F}{D_B^e} \leq R_I$$

Banking sector development

- **Proposition 2:** For any aggregate wealth and distribution of wealth, there exists a unique threshold fixed cost $\underline{F}$ such that if $F \leq \underline{F}$, then, there exists one equilibrium interest rate R_B and corresponding demand for bank credit $D_B(R_B, F)$ (See Figure)
- The equilibrium interest rate $R_B^* = min\{R_B | R_B = g(D_B, F)$ and $D_B = f(R_B)\}$ where $g(D_B, F) = c_B + (1 + r) + \frac{F}{D_B}$ is the pricing function and $D_B = f(R_B)$ the demand function.

Formal credit



Banking sector development

- **Proposition 3:**
  - When interest rates are high (when most projects are rationed), the demand for bank credit decreases with an increase in inequalities.
  - When, interest rates are low (when few projects are rationed), the demand for bank credit increases with an increase in inequalities.
- $D_B(R_B) = \int_0^I (I - b)(1 - \frac{a_B(b)}{\bar{a}})\, dG(b)$

Static equilibrium

- The interest rate r on deposits that equates the aggregate supply and aggregate demand of capital is given by

$$D(r) = D_B(R_B(r)) + D_I(R_I(r, R_B(r))) = S(r)$$

- $D(r) = \int_0^I \int_{a_D}^{\bar{a}} (I - b)\, dF(a)\, dG(b)$ where

$$a_D(b) = \begin{cases} \tilde{a}_1(b) \text{ if } b \leq b_z, \\ a_B(b) \text{ if } b \geq b_z \end{cases}.$$

- $S(r) = \int_0^I \int_0^{a_D} b\, dF(a)\, dG(b) + \int_I^\infty \int_{1+r}^{\bar{a}} (b - I)\, dF(a)\, dG(b) + \int_I^\infty \int_0^{1+r} b\, dF(a)\, dG(b)$

Static equilibrium

- **Proposition 4:**
  - For a given economy $(W, G(b))$, there exists a unique equilibrium interest rate $\hat{r}$.
  - The second best interest rate $\hat{r}$ is lower than the first best interest rate r^*.
- The equilibrium on the capital markets is given by

$$\frac{W}{I} = \int_I^{\infty} \int_{1+r}^{\bar{a}} dF(a)\, dG(b) + \int_0^I \int_{a_D}^{\bar{a}} dF(a)\, dG(b) = \mu(r)$$

- Solving gives

$$\frac{W}{I} = \left[\frac{\bar{a} - (1+r)}{\bar{a}}\right] - \int_0^I \frac{a_D(b) - (1+r)}{\bar{a}}\, dG(b)$$

Dynamics of the Economy

- We characterise the stochastic dynastic transition functions that give b_{t+1} as a function of b_t.
- The dynamics of aggregate wealth, interest rate, wealth distribution are obtained by aggregating individual transition functions.
- Since the individual transition functions do not depend on location of agents, in the long run, all villages reach a similar distribution of wealth.
- This is guaranteed by equality of interest rate r across villages.

Dynamics of the Economy

- The following assumption introduces the possibility of endogenous growth.
- **Assumption 3:** The size of the project is (linearly) increasing with the average wealth: $I_t = LW_t$ and $L > 1$.
- Also assume that all agents bear the risk associated to a project.
- Let (a_t^i, b_t^i) denote the type of an agent of dynasty i at time t. The individual transition functions are as shown in figure.

Individual Transition functions

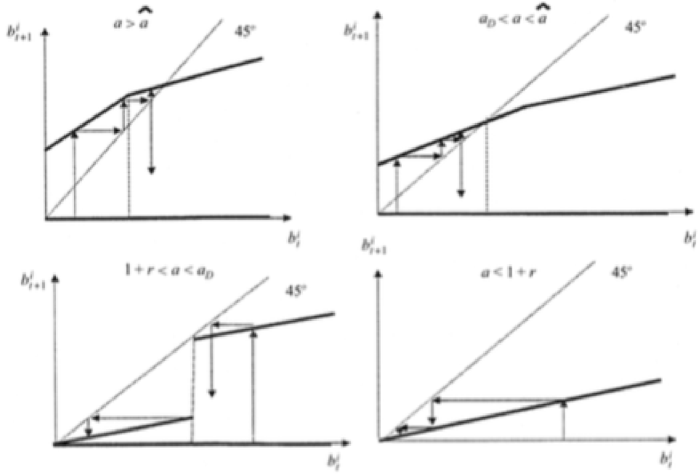


Figure 3. Individual transition functions, by project return.

Individual Transition functions

- The agent borrows from a bank if $a_t^i \geq a_B(b_t^i)$:

$$\frac{b_{t+1}^i}{S} = \begin{cases} \frac{a_t^i I_t - R_{B_t}(I_t - b_t^i)}{p}, & \text{with probability } p \\ 0, & \text{with probability } 1-p. \end{cases}$$

- The agent borrows from local market if $\tilde{a}_l(b_t^i) \leq a_t^i \leq a_1(b_t^i)$:

$$\frac{b_{t+1}^i}{S} = \begin{cases} \frac{a_t^i I_t - R_{l_t}(I_t - b_t^i)}{p}, & \text{with probability } p \\ 0, & \text{with probability } 1-p. \end{cases}$$

- The agent self finances if $a_t^i \geq 1 + r_t$ and $b_t^i > I_t$:

$$\frac{b_{t+1}^i}{S} = \begin{cases} \frac{a_t^i I_t + (1+r_t)(b_t^i - I_t)}{p}, & \text{with probability } p \\ 0, & \text{with probability } 1-p. \end{cases}$$

- The agent saves in all other cases:

$$\frac{b_{t+1}^i}{S} = \begin{cases} \frac{(1+r_t)b_t^i}{p}, & \text{with probability } p \\ 0, & \text{with probability } 1-p. \end{cases}$$

Dynamics of the Economy

- Since the individual transition functions are not stationary when rate of growth is different from 0, standard theorems of existence of long-run ergodic wealth distribution will not apply.
- So, G_t cannot converge to long run ergodic distribution G_∞ if economy grows at positive rate in the long run.
- However, the individual transition functions defined in terms of the relative wealth of dynasty, $x_t = \frac{b_t}{W_t}$, are stationary.
- Therefore the long run steady state is characterised by stationary ergodic distribution of relative wealth $H_\infty(x)$ and wealth distribution characterised by $G_t(b) = H_\infty(\frac{b}{W_t})$.

First Best Economy

- All productive projects ($a > 1 + r$) are realized.
- So, the evolution of the economy does not depend on the wealth distribution.
- The first best interest rate r^* is given by $1 + r^* = \bar{a}(\frac{L-1}{L})$.
- The aggregate dynamics is given by $\frac{W_{t+1}}{S} = \int_0^\infty \int_0^{1+r} (1+r) b \, dF(a) \, dG(b) + \int_0^\infty \int_{1+r}^{\bar{a}} a l_t + (1 + r)(b - l_t) \, dF(a) \, dG(b)$

First best economy

- **Proposition 5:** If $S > S_0 = [\bar{a}(\frac{2L-1}{2L})]^{-1}$, the first best economy grows at a constant positive rate of growth g_∞, and reaches a unique long-run distribution of x_t characterised by H_∞.
- The aggregate dynamics of the first best economy is given by

$$\frac{W_{t+1}}{S} = \left[\bar{a}\left(\frac{2L-1}{2L}\right)\right] W_t$$

Dynamics without Financial Development

- Consider the dynamics of an economy in which banks are assumed not to emerge.
- Since the financial system is fragmented, it does not perform its role of pooling funds on a large scale.
- In this economy, the process of development may stop, regardless of the initial speed of capital accumulation and distribution of wealth.

Stagnation equilibrium

- **Theorem 1: Stagnation Equilibrium** Assume that $S > S_0$. The economy with only local intermediaries converges to a unique long-run steady state, characterised by the aggregate wealth $\tilde{W}_\infty$ and the distribution of wealth $G_\infty(b)$
- **Intuition** The capacity constraint, together with market power, explains why a positive rate of growth is not sustainable with local intermediation because entry does not occur even when savings are idle.

Stagnation Equilibrium

- **Lemma A:**: For all initial conditions W_0, G_0 there exist $\bar{W} = \frac{2\kappa}{L\rho \min_t G_t(0)}$; ($\rho = \frac{\bar{a} - \hat{a}_I(0)}{\bar{a}}$) and $\underline{W}_0 = \frac{\kappa}{L}$ such that $W_t > \bar{W}_0 \Rightarrow D_{I_t} > \kappa$ and $W_t < \underline{W}_0 \Rightarrow D_{I_t} < \kappa$
- Suppose a positive growth rate is sustainable.
- By lemma A, $R_I \to \bar{a}$ as $W \to \infty$.
- The probability of escaping poverty trap (b=0) converges to 0.
- At each period, a proportion of (1-p) agents fall in bottom of distribution.
- So, asymptotically $G_t(0) \to 1$ and the proportion of projects undertaken goes to 0.
- This is clearly not consistent with the assumption of sustainable growth.

Dynamics with Financial Development

- Consider an economy where where the banking system successfully develops.
- We will see that successful financial development is sufficient to reach sustained growth rate in the long run.
- Also, the initial aggregate wealth, as well as the wealth distribution, determine the dynamics of the economy and the long run steady state.

Development Equilibrium

- **Theorem 2: Development Equilibrium** Assume that the modern banking system has been successfully developed. There exists $\tilde{c_B}$, $\tilde{\triangle}$ and $S_1(\tilde{c_B}, \tilde{\triangle}) > S_0$, such that $S > S_1$, $c_B < \tilde{c_B}$ and $\triangle < \tilde{\triangle} \Rightarrow$ the economy reaches a steady state characterised by a rate of growth $\hat{g} < g_\infty$ and a unique distribution of relative wealth $\hat{H}$. The distribution of wealth evolves according to: $G_t(b) = \hat{H}_\infty(\frac{b}{W_t})$
- **Intuition** Even if capacity constraint of local lenders is binding, all savings are invested in a high yield project rather than traditional activity. So, if the cost of bank intermediation c_B is low enough, the economy will go on growing, provided that the saving rate is high enough.

Development equilibrium

- The dynamics of the aggregate wealth is given by $\frac{W_{t+1}}{S} = \int_0^{\infty} \int_{1+r}^{\bar{a}} a l_t \, dF \, dG_t - \int_0^{l_t} \int_{1+r}^{\hat{a}_D} a l_t \, dF \, dG_t - \triangle R_I D_I(R_I) - c_B D_B(R_B)$ where $\triangle R_I = R_I - (1+r)$
- **Lemma B** There exist $\bar{W}` = \frac{2\kappa}{L\sigma \min_t G_t(0)}$ such that $W > \bar{W}` \Rightarrow D_I = \kappa$ where $\sigma = \frac{\hat{a}_I(b_z/2) - \hat{a}_I(b_z)}{2\bar{a}} > 0$
- So, the capacity constraint of local intermediaries is binding, hence local intermediaries market power is a fixed cost once the economy is rich enough
- The sum of 1st two parts is proportional to l_t, and leads to a positive growth for high enough saving rate.

Conditions

Theorem 3:

- There exists a non-empty subset of parameters such that, given initial conditions (W_0, G_0), the economy converges to a unique long-run steady state.
- If $W_0 < \tilde{W}$, the economy may converge to the "stagnation" or to the "development" equilibrium, depending on the initial distribution of wealth.
- If $W_0 > \tilde{W} + \psi$, the economy converges to the "development" equilibrium.

Conditions

- The above theorem is a consequence of Theorem 1 and 2.
- it is crucial to generate a sufficiently large demand for bank loans at some stage of development at which the transition to a banking system becomes feasible.
- However, as shown in Proposition 3, the impact of inequalities on demand for bank loans is ambiguous.
- There exists an intermediate degree of inequalities that maximises the demand for bank loans.

Conclusion

- The paper analysed the emergence of a modern banking sector in a developing economy, in particular, the transition from local financial institutions to modern banks.
- Local intermediaries, due to the their informational advantage, have an essential role in early stages of development when most firms are small and without collateral.
- Despite their imperfect monitoring technology, banks are necessary for development because of their ability to collect funds on a large scale.
- The paper argues that the transition from local financial institutions to modern banks is crucial for long run growth.