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Dual Financial Systems and Inequalities in Economic Development

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This paper analyzes the emergence and the 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 while informal lenders enjoy a superior information on borrowers. More specifically, banks cannot observe perfectly the behavior of borrowers; therefore the latter need to provide collateral assets in order to obtain bank loans. Physical collateral is not needed to borrow in the informal credit market: informal lenders can rely on social networks to obtain information on borrowers' behavior and invoke social sanctions to enforce repayment.

The sustained growth path is associated with the successful development of the banking system that gathers savings on a large scale. However, informal lenders and other traditional credit institutions are necessary in the first stage of development when collateral is scarce. In this economy, the development of modern financial intermediaries is closely associated with the accumulation of collateral assets by entrepreneurs. This implies that the initial level of development as well as the initial distribution of wealth will determine the joint evolution of the real side of the economy and the financial system. Under certain conditions, two long-run steady-state equilibria exist: in the first one the economy stops growing and the banking system never successfully develops; in the second one the economy reaches a sustained growth rate and the informal sector asymptotically vanishes. The impact of the following policies is discussed: financial repression, micro-credit institutions and redistribution of assets.

Keywords: economic development, financial deepening, financial repression, informal credit

JEL classification: O11, O17, O16, G21

1. Introduction

> The beginning of a process of expansion (...) might also occur because of financial improvements, diminishing the size of our ''gap'' [between the rate of return on real investment and the return received by holders of idle balances](...) It is not savings only that are required, but a channel of communications between savings and potential real investment.
>
> J. R. Hicks, *Capital and Growth*, Oxford, 1965.

> The financial structure accelerates economic growth and improves economic performance to the extent that it facilitates the migration of funds to the best user.
>
> R. W. Goldsmith, *Financial Structure and Development*, 1969.

Fragmentation is an essential feature of financial systems in developing countries where informal sources of finance are widespread and the lack of penetration of organized bank lending prevents an efficient macroeconomic allocation of resources. The concept of

fragmentation[1] was introduced by Mac Kinnon (1973) who argued that ''financial repression''[2] (or banking restraint) is the main distortion that explains the reliance on informal credit markets in developing economies. According to him, financial liberalization would allow a unification of credit markets in developing countries and a better penetration of poor and rural areas by modern banks. Montiel et al. (1993) present some facts for Korea that are consistent with this hypothesis. However, it is widely recognized that informal credit markets are still thriving in many developing countries, even when financial systems have been deregulated. This observation led international organizations to carefully study these traditional financial institutions[3]. Moreover, new theories of informal credit institutions have built on the idea that their importance in developing countries is the result of an informational advantage[4] (see Besley, 1995). In parallel, a new approach to poverty alleviation, namely microfinance, has expanded by combining the advantage of a standard bank with mechanisms long used in traditional credit markets (see Morduch, 1999).

Against this background, our model addresses the following questions. What is the macroeconomic role of informal credit markets? What determines whether or not modern banks succeed in expanding their activities in low income countries? What are the respective roles of banks and traditional credit institutions in the development process? The paper takes a first step in the direction of analyzing those issues in a dynamic macroeconomic model, where the evolution of financial institutions is the result of agents' financing decisions, and in turn affects the rate of growth. Moreover, our macroeconomic approach provides the opportunity to discuss the ''financial repression'' and the ''informational superiority'' theories of dual financial systems in a unique framework.

The structure of the model is the following. Consider a population of potential entrepreneurs looking for outside finance. Agents differ in wealth and talent. They can either borrow in the local (or informal) credit market, or from a modern bank. Alternatively, they can become savers or invest in a traditional activity. An Intermediary in the local credit market can acquire complete information about borrowers and rely on social sanctions to enforce loan repayments, but is restricted in the amount of savings he can collect. On the contrary, banks rely on collateral to provide incentives, and their organization in network allow them to gather funds on a large scale and channel the latter to the best users in the economy. We derive the following pattern. For a given productivity, small firms lacking collateral assets seek finance in the local capital market whereas banks provide capital to large firms:[5] the current distribution of assets, the resulting demand of capital and the aggregate 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 characterized by the initial distribution of assets and aggregate wealth. A necessary condition for long run growth is that a banking system develops: the banking technology is necessary in order to gather savings on a large scale and channel them to the best projects in the economy. On the contrary, traditional credit institutions are inadequate for reducing the fragmentation of the capital market: development is prevented because a significant share of resources are invested in low-yield projects. We concentrate on situations in which the economy can reach one of two possible steady states, depending on the initial conditions: (1) the banking sector eventually vanishes and the economy reaches a stable aggregate wealth level; (2) the

banking sector progressively develops and eventually dominates the financial system; in this case, the economy grows at a constant and positive rate in the long run.

The model emphasizes a demand-side effect boosting financial development. It is the outcome of the accumulation of collateral assets by entrepreneurs. In that sense, it is related to the literature that studies the long run effects of the wealth distribution when credit markets are imperfect (Banerjee and Newman, 1993; Galor and Zeira, 1993; Aghion and Bolton, 1997; Piketty, 1997; Lloyd-Ellis and Bernhardt, 2000, among others). However, while we are mainly interested in the evolution of financial institutions over the process of development, the abovementioned authors underline the link between the rate of growth of the economy, the distribution of wealth and occupational choices when credit markets are imperfect. In particular, financial institutions are not clearly modeled in these papers. Hence, the link between the level of development and the credit market goes solely through the equilibrium interest rate: financial institutions do not adapt actively to the economic environment. On the contrary, we concentrate on the endogenous evolution of financial institutions (from traditional credit institutions to modern banks), and underline their respective roles. We believe that a more precise understanding of financial institutions is indeed crucial in order to design policy recommendations based on this class of macroeconomic models. The implementation and the impact of redistribution is likely to differ markedly in developing and developed economies, since such policies often involve financial institutions, especially in developing countries. In addition, we discuss the short-run and long-run adverse effects of financial repression.

The model is also related to the papers that analyze the effect of the financial structure on the rate of growth (see Pagano, 1993, for a survey). Two main arguments can be identified in this literature. Financial institutions (banks or stock markets) stimulate economic growth because (1) they provide the opportunity for risk diversification (Bencinvenga and Smith, 1993; Saint Paul, 1992) and (2) financial intermediaries are more efficient than individual investors in gathering information (Diamond, 1984; Greenwood and Jovanovic, 1990; King and Levine, 1993b; Berthelemy and Varoudakis, 1994; Sussman and Zeira, 1995; Acemoglu and Zilibotti 1999).

Our approach departs from these models in two ways.[6]

First, they concentrate on savers-investors who are willing to diversify risk or to acquire information on the potential investment opportunities. They do not investigate the consequences of asymmetric information caused by the separation between lenders and borrowers, which instead is crucial to our model[7] in which it introduces a demand-side effect. More specifically, our model emphasizes a ''big push'' process leading to financial development in developing countries: modern banks develop successfully only if a sufficiently large demand for bank loans materializes. We believe that such demand-side factors are crucial to understand financial underdevelopment in low income countries.

Second, this literature usually assumes that the only alternative to modern financial institutions is financial autarky. However, as argued in this paper and illustrated in Section 2, it is recognized that local credit institutions appear prior to banks, are widespread in low income countries, and their informational advantages are now widely acknowledged. It is therefore necessary to take these institutions into account in order to explain the emergence of a modern banking system in the context of a developing economy, or in poor regions of emerging economies.[8]

Thus, a growing microeconomic literature, also related to the discussion on microfinance institutions (Morduch, 1999), assesses the mechanisms (group lending, dynamic incentives, etc.) that underline the informational advantages of traditional credit institutions: see, for instance, Banerjee et al. (1994) for credit cooperatives, McMillan and Woodruff (1999) for trade credit in Vietnam, and also Ghatakad and Guinnane (1999), Ghatak (2000), Armendariz de Aghion (1999) and Laffont and N'Guessan (1999) among others.

However, the macroeconomic effects of informal credit institutions have not been analyzed theoretically, although, as we discuss in Section 2, existing evidence suggests that they play a significant role in financing activity in low income countries. Moreover, their precise role in the development process is still unclear. Our model shows that they complement the banking system in the first stages of development when collateral is scarce, even though the success of a development strategy depends on the gradual substitution of these institutions by modern banks.

Section 2 provides evidence on the importance of informal credit institutions in developing countries. The main building blocks of the model, in particular the two types of financial institutions, are described in Section 3. Section 4 characterizes occupational decisions. Section 5 analyzes the static equilibrium while Section 6 is devoted to the dynamics and the long-run steady states of the economy. Section 7 discusses the short-term and long-term effects of financial repression and redistributive policies. We conclude in Section 8.

2. Empirical Evidence

2.1. Informal Credit in Developing Countries

It is a common observation that informal credit exists on a widespread basis in most low income countries. Detailed information of a quantitative nature on the size and transactions that take place in these markets does not exist on a systematic basis. However, the existing evidence, usually based on occasional surveys and anecdotal information, suggests that they play a significant role in financing activity in many countries.

For instance, Biggs (quoted by Fry, 1995, p. 350) remarks that ''the emergence of a large and thriving curb market has been enormously important to Taiwan's industrial development (...). The curb market complemented the formal credit market by providing information-intensive, efficient credit facilities (...), helped to mobilize domestic savings by offering high returns (although riskier) on investable funds.'' Lee and Tsai (1988) (also quoted by Fry, 1995, p. 350) argue that ''in Taiwan, curb markets provided 48 percent of loans to private businesses in 1964. Although this ratio fell to 27 percent in 1973, it was back at 48 percent in 1986.''

More recently, in a study on Taiwanese rotating saving and credit associations in urban and rural areas, Besley and Levenson (1996) claim that on average 20 percent of households participate to such an association every year. In addition, Kan (2000) shows that informal financial channels were heavily relied upon by small businesses in Taiwan

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).

during the period 1977–1992. According to him, ''In 1977, the informal sector [such as ROSCAs, underground financial companies and private lending] accounted for 34.82 percent of total lending to private enterprises.''

In the case of Korea, the informal credit market was also of considerable importance (Cole and Park, 1983).

As summarized in Table 1 (from Montiel et al. 1993), existing studies suggest that their size is large in many developing countries.

2.2. Distribution of Assets, Scale of Activity and Modern Banks

Evidence of the link between the distribution of assets and the scale of banking activities is scarce. However, several observations suggest that it is relevant for developing countries. First, the average per capita income of households or entrepreneurs borrowing in the formal sector seems to be larger than that of agents borrowing in the informal sector (Nabi, 1988; Siamwalla et al., 1990; Paulson and Townsend, 2001) and small firms borrow more from the informal sector (Kan, 2000). Second, Siamwalla et al. (1990), focusing on one region of Thailand, show that ''the sphere of operation of commercial banks and cooperatives (...) has been almost exclusively in villages where land titles have been issued,'' which is consistent with our story underlying the importance of collateral, and the importance of land reforms that increase the number of collateral assets.

In their historical study of the French society, Braudel and Labrousse (1976)[9] claim that the reorganization of the banking system (which did not happen until 1840) was not essential to the first wave of industrialization at the beginning of the nineteenth century. They suggest that supplier credit and informal loans were sufficient to cover the needs of external finance in young industries, the main banking activities being located in Paris. Until approximately 1840, the French banking system was therefore characterized by a

few large private banks located in the capital; outside Paris, ''informal'' loans used to be underwritten by local notaries.

Similarly, in their historical description of financial systems in the early stages of development, Cameron et al. (1967) show for instance that in the case of England, the banking structure notably changed between the mid-eighteenth century and the mid-nineteenth century: local banks (called ''country banks'') used to be very active during the first industrial revolution, whereas joint-stock regional and national banks started to develop much later in the second half of the nineteenth century, and eventually dominated the banking network, with the appearance of large scale industries.

This is broadly consistent with our story. Local institutions have an important role to play in the early stages of industrialization because of their ability to exploit local-informal-information; when the average size of firms increases, 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 the financial structure from local form of financial intermediation to modern commercial banks does take place.

3. The Model

We consider a closed economy with an infinite, discrete time horizon, $t = 0, 1, 2, \ldots$ 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 (or her) parent. The agent invests or saves his endowment in the first sub-period of date t. In the second sub-period, the agent consumes some of the resulting income and the remainder is the bequest, b_{t+1}, to the agent's unique offspring. As in Aghion and Bolton (1997), there is no labor market (see below).

Agents are risk-neutral and have warm-glow[10] preferences over consumption c_t and bequest $bt + 1$:

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

where $0 < S < 1$ corresponds to a constant saving rate. Thus, each agent maximizes the indirect utility function $V(w) = (1-S)^{(1-S)} \cdot S^S \cdot w = \Phi \cdot w$, where w is the end of life income.

Agents differ in two dimensions: their initial inheritances b_t and their personal talent a_t. At the beginning of the period, individual talent is drawn from a time-invariant uniform distribution $F(a)$ with support $[0, \bar{a}]$. It is publicly observable and is not correlated with inheritance.

At the beginning of each period t, the economy is characterized by the current distribution of wealth, represented by the cumulative function $G_t(b)$; the aggregate wealth is given by $W_t = \int_0^{+\infty} b dG_t(b)$. For reasons that will become clear in Section 6, we also define $x_t = b_t/W_t$, the individual bequest relative to the average wealth.[11]

At the beginning of period t, all agents have access to a modern project requiring a fixed start-up cost of l units of capital.[12,13] The productivity of the project depends on the agent's talent a_t (see below).

Given his type (b_t, a_t), each agent chooses to start a modern project, to invest in a traditional activity yielding a gross return of $1 + \underline{r}$, or to save in a financial institution. Saving and investment decisions are made in sub-period 1, and the resulting incomes are consumed and bequeathed in sub-period 2.

The modern technology is subject to moral hazard, as in Holmstrom and Tirole (1997): the outcome of the project is perfectly observable,[14] however, an entrepreneur of talent a can choose at date 1 between two possible projects: a good project with expected productivity a, and a bad project with a lower return. Success or failure of the project can be observed at no cost.[15] However, the bad project provides non-verifiable private benefits to the borrower.

Good project:

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

Bad project:

$$Y = \begin{cases} \frac{a}{p} \cdot l & \text{with probability } q, \text{ plus private benefit } \sigma \cdot l, \\ 0 & \text{with probability } 1 - q. \end{cases}$$

Assumption 1 $q(a/p + \sigma) < 1 + \underline{r}$.

Assumption 2 $S(1 + \underline{r}) < 1$.

Assumption 1 states that the bad project has a lower return than the traditional activity. Assumption 2 implies that family lineages become poorer if inheritances are invested in the traditional activity only.

Entrepreneurs can borrow to finance their investment. We assume that two types of financial institutions intermediate savings between borrowers and entrepreneurs: local intermediaries (informal credit institutions) and modern commercial banks. Each financial institution relies on a specific mechanism to ensure that entrepreneurs choose the good project. Local intermediaries, because of their proximity to the borrower, can observe the project choice and impose a large social sanction *ex post* if the project is bad[16] (i.e., they observe whether or not the entrepreneur enjoys private benefits and impose a large punishment in the former case).[17] On the contrary, the cost of monitoring is infinite for modern banks; thus banks rely on collateral requirements to solve the moral hazard problem.

3.1. Financial Institutions

3.1.1. Local Financial Institutions

As argued for instance by Besley (1995), an important element of the lender–borrower relationship in informal markets is proximity. We embody this characteristics of informal

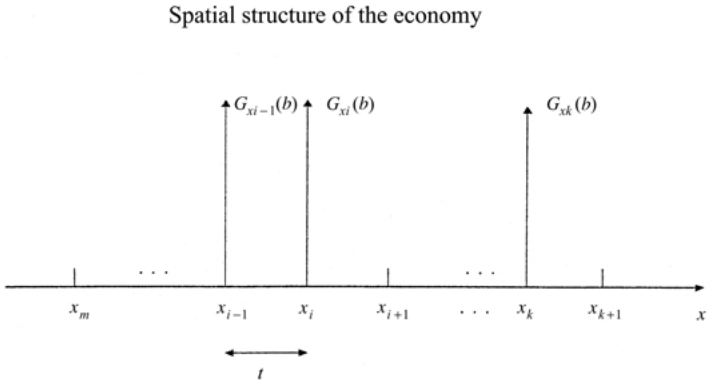

Figure 1. Spatial structure of the economy.

intermediaries in a spatial framework (Figure 1). Our model of informal lenders has two features. First, the quality of information on the project choice depends on location. Second, borrowers in the informal sector cannot escape their repayment obligations:[18] they incur large social sanctions in case of strategic default.

Assume that agents are distributed on a line of infinite length, in an infinite (but countable) number of villages. There is a fixed distance t between two villages. Each village i, located at distance x_i from the origin, has a infinitely small number of inhabitants, given by the density function $\lambda(x_i)$ (villages are ordered such that $x_{i+1} = x_i + t$). For the sake of simplicity, all villages are identical (i.e., average wealth and wealth distribution). Hence, the analysis can be restricted to the aggregate wealth distribution and average wealth.[19]

Any agent can become a local intermediary. Each local intermediary must incur a fixed cost c that can be interpreted as the time spent to obtain perfect information about potential borrowers. We assume that this fixed cost is negligible at the macroeconomic level ($c \to 0$), but that it is not negligible from the point of view of the local intermediary: more specifically, we assume that, for any village i, $c/\lambda(x_i) = C_i > 0$. In addition to the fixed cost c, local intermediaries have to incur a 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 of the intermediary. These assumptions are relatively standard in the oligopolistic model of Salop applied to financial intermediation.[20]

Finally, we assume that each local intermediary faces a capacity constraint: he cannot intermediate more than $\kappa\lambda(x_i)$ units of capital.[21,22]

The intuition is that local intermediaries are individuals (or small groups of individuals) who have a limited time capacity and therefore cannot raise more than a certain amount of funds. Thus informal credit, despite its informational advantages, is not adapted to gathering large amount of capital.[23]

The profit of a local intermediary located in village i and covering only the local market is given by:

$$\Pi = \lambda(x_i) \cdot [\kappa m - C_i],$$

where m is the interest margin on loans (which we need not specify for the moment).

Assume that intermediaries compete in prices on the borrower's side and that they are perfectly competitive on the deposit side and take the interest rate r on deposits as given.

In this framework, there is only one local intermediary per village. The reason is the following. Price competition between two intermediaries located in the same village will indeed bring the interest margin to zero. This implies that individual capacity constraints translate into an aggregate capacity constraint $\int_{-\infty}^{+\infty} \kappa\lambda(x)\, dx = \kappa$. This is consistent with the views of Goldsmith (1969) and MacKinnon (1973) who claim that modern banks are necessary to gather savings on a large scale and to reduce the fragmentation of capital markets in developing countries.[24] As we see in Section 6, this feature of local intermediation has important macroeconomic implications as it prevents unification of capital market to occur in an economy in which banks do not develop.

To sum up, the local intermediary located in village i competes in prices with his two closest competitors located in villages $i-1$ and $i+1$. More specifically, this intermediary chooses R_I^i, the gross expected return on a loan, to maximize his profit by capturing the whole demand in his village, subject to the constraint that $R_I^i \leq \min[R_I^{i+1} + t\gamma, R_I^{i-1} + t\gamma]$. Were this constraint to be violated, one of the two closest intermediaries would capture the market in village i.

3.1.2. Commercial Banks

An entrepreneur may also borrow from a bank. Banks have imperfect information on the project choice. Moreover, they cannot rely on social collateral to induce proper behavior. Therefore, the size of the loan is limited by the availability of collateral assets, e.g., the initial wealth b_t.

The banking sector is assumed to be perfectly competitive. The banking technology exhibits constant returns to scale and the cost function is given by $C(L) = c_B \cdot L(c_B \ll 1)$, where L is the volume of savings intermediated. Hence, the banking system can intermediate arbitrarily large amounts of savings. In addition, a bank has to pay a once-for-all fixed cost $\lambda(x_i) \cdot F$ to start its activity in a new village i. It can be interpreted as the cost of setting up the local branch and acquiring ''hard'' information on potential borrowers. 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. Fixed costs of starting modern financial institutions are fairly standard in this literature and are aimed at capturing informational frictions leading to increasing returns. For instance, Saint Paul (1994) assumes that a fixed cost must be incurred by the whole economy, at each period, in order to have a functioning capital market. Greenwood and Jovanovic (1990), on the other hand, assume that each dynasty has to bear a once-for-all fixed cost in order to join the mutual fund. In their model, this fixed cost can be interpreted either as cost borne by each family or by the entire economy.[25] Our model differs from Greenwood and Jovanovic's framework insofar as the evolution of financial institutions is itself determined by the characteristics of the economy (e.g., wealth distribution and aggregate wealth).

4. Occupational Choices

In this section we derive an agent's decision first between becoming either an entrepreneur or a saver, and second to borrow from a bank or a local lender. The decision will depend on the interest rates $R_l - 1$, $R_B - 1$ and r[26] (which are respectively the expected net returns on local loans, bank loans and deposits, to be endogenized in Section 5). Let us assume for the moment that $R_l > R_B$ (it is the case if $C_B \ll 1$), that is the cost of borrowing in the informal sector is higher than in the formal sector (we will discuss the conditions under which this holds in Section 5).

First, let us recall that in the first best economy, an agent of talent a will invest if and only if the return on the project is greater or equal to the cost of capital: $a \geq 1 + r$.

4.1. Bank Loans

4.1.1. Participation Constraint

An agent is willing to undertake the good project if and only if:

$$al - R_B(l - b) \geq (1 + r)b.$$

When $a \geq R_B$, the agent obviously prefers to start a project rather than lend his endowment because the return is greater than the cost of capital. He also undertakes the project when the return a is lower than the gross interest rate R_B on the loan, but greater than $1 + r$, e.g., whenever

$$b \geq \widetilde{b_B} = l \cdot \frac{R_B - a}{R_B - (1 + r)}.$$

Define $\widetilde{a_B} = (\widetilde{b_B})^{-1}$.

4.1.2. Incentive Compatibility Condition

The incentive compatibility condition for bank loans[27] is given by:

$$al - R_B(l - b) \geq q\frac{a}{p}l - q\frac{R_B}{p}(l - b) + \sigma l.$$

Therefore, an agent can borrow from a bank if and only if $b \geq b_1(R_B, a) = l\left(1 - a - \Delta/R_B\right)$ where $\Delta = \sigma/((1 - q)/p)$ measures the incentive cost. Define $a_1(b) = b_1^{-1}$. It is standard that credit rationing is a decreasing function of productivity (or talent a) and increasing function of the interest rate.

4.2. *Local Credit*

Given perfect information in the local credit market, the only relevant constraint is the participation constraint, e.g., (1) $a \geq R_I$, or (2) $1 + r < a \leq R_I$ and

$$b \geq \tilde{b}_I = l \cdot \frac{R_I - a}{R_I - (1 + r)}.$$

Define $\tilde{a}_I = \left(\tilde{b}_I\right)^{-1}$.

4.3. *Summary*

The resulting segmentation of credit markets is summarized in the following figure (see the appendix for a definition of the threshold functions). Interestingly, the existence of a local credit market reduces the proportion of agents who are credit rationed. Hence, the existence of a local credit market is likely to be welfare improving relative to the situation where only banks exist. However, because of higher interest rates in the local credit market, some agents who are willing but unable to borrow from a bank, choose not to borrow from a local lender (''credit rationing'' area in Figure 2).

4.4. *Claim*

The model predicts the following transition out of credit rationing (Figure 2):

1. Holding wealth fixed, increasing the productivity of the project (higher talent a) leads from credit rationing to informal credit, and from informal credit to bank loans (or directly from rationing to bank loans for intermediate levels of wealth).

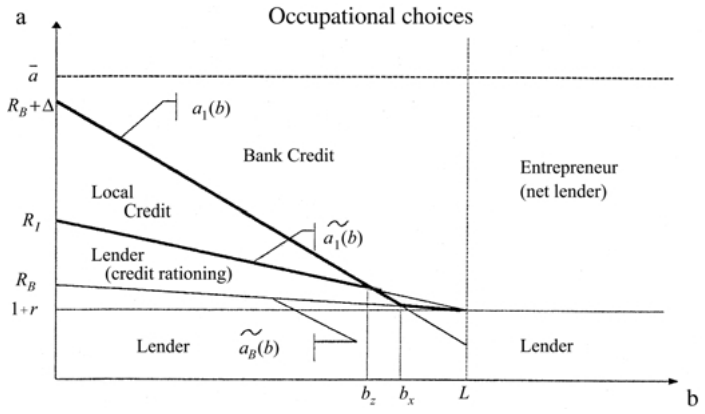

Figure 2. Occupational choices.

2. Holding the productivity of the project fixed, an increase in wealth b leads from rationing to local credit, and from local credit to bank loans (or directly from credit rationing to bank loans for lower productivity projects).

Similar predictions on the link between credit rationing and individual wealth and talent can be derived from existing models[28] (see Paulson and Townsend, 2001). However, given that they allow only for bank finance, one can make the point that it may be difficult to test the underlying financial market imperfection given the importance of informal lending in developing countries, as described in Section 2. Omitting this important source of finance may lead to substantial bias when testing a model.

5. Static Equilibrium

Interest rates (r, R_I, and R_B) are determined by the market clearing conditions on the formal and informal credit markets. We begin by characterizing the demand for capital in each segment. We also show that the existence of a non-convexity in the banking sector implies the possibility of multiple equilibria. The intuition is the following. If banks expect to face a large demand for bank loans, the fixed cost will be spread among more borrowers, hence the unit cost of borrowing will be low, and the demand for bank loans will indeed be large. Alternatively, if banks expect to face a low demand for bank loans, the fixed cost will be spread among few borrowers who will face a high unit cost of borrowing, and the demand for bank loans will indeed be low. The possibility of multiple equilibria in a model with fixed costs of intermediation is standard.[29] However, when analyzing the dynamics of the economy, we will assume that agents always coordinate on the good equilibrium (e.g., high demand for bank loans).

5.1. The Local Credit Market

In each village, the demand for informal credit is:

$$d_I(R_I^i, R_B) = \lambda(x_i) \cdot D_I(R_I^i, R_B),$$

where (see Figure 2):

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

The interest rate charged by the local lender in village i maximizes his profit subject to (1) the capacity constraint $\lambda(x_i)k$, (2) potential competition from lenders in villages $i-1$ and $i+1$.[30] Moreover, indirect competition from the banking system also restricts the market power of local lenders. Indeed, local lenders cannot charge more than $\Delta + R_B$ (see Figure 2) in order to attract borrowers who do not have access to bank loans. Hence the gross interest rate on the informal market maximizes:

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

subject to:

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

Proposition 1 *For a given aggregate wealth*:

1. *The capacity constraint is more likely to be binding when (a) the set-up cost l is large, (b) more agents are poor.*

2. *One of the two price constraints is more likely to be binding when (a) informational niches are limited (tγ small), (b) the banking system is well developed, or agency costs are small, or (c) more agents are poor.*

Proof. See the Appendix. The intuition for these results is the following. (1) The first result is self-explanatory: the demand for external finance, and in particular informal loans, increases with the required size of the investment. Second, consider two distributions G_1 and G_2 such that $G_1(b) > G_2(b)$ for low levels of wealth (see the appendix for the precise statement). The demand for informal loans will be larger in the former case simply because agents borrowing from the informal sector have less personal resources to invest in the project. (2) The first two statements state that price constraints are more stringent when the banking system is more developed (c_B lower) or the agency cost is low (Δ low). The last result comes from the fact that the elasticity of demand is lower when more agents are poor, which implies that the unconstrained monopoly price would be higher. ■

The policy implications of these results are discussed in Section 7.

5.2. Banking Sector Development

Assume that the once-for-all fixed cost F has already been paid. As long as R_B is lower than R_I,[31] all agents with wealth b and project a that verify $a \geq a_B(b)$ choose to borrow from a bank (see Figure 2). Other agents choose not to, either because they are credit constrained ($a < a_1(b)$), or because their project is not productive enough ($a < \tilde{a}_B(b)$) (see Figure 2).

Thus the aggregate demand for bank loans is:

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

where $R_B = c_B + (1 + r)$.

Multiple equilibria are possible when the once-for-all fixed cost has to be incurred.

The reason is standard: if (potential) bankers anticipate that the demand will be low, they will charge high interest rates to compensate for the fixed cost, leading to a low demand for bank loans. Conversely, if they anticipate a high demand for bank loans, they will charge a lower interest rate on individual loans. More specifically, the unit cost of loans depends on the expected aggregate demand D_B^e: $R_B = c_B + (1+r) + F/D_B^e$. Entrepreneurs are willing to borrow in the formal sector if and only if the interest rate R_B is lower or equal to R_I. Hence, there may be two equilibria, one in which entrepreneurs anticipate that bank lending rates are high and therefore borrow only in the informal sector, and one in which they anticipate low interest rates and choose to borrow from a bank when they have enough collateral. The banking sector develops if an only if:

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

We are, however, not interested in this multiplicity of equilibria in the static model. To focus on the dynamics of the economy, we assume that agents always coordinate on the ''good'' equilibrium. Its existence and characteristics are established in Propositions 2 and 3.

Proposition 2 *For any aggregate wealth and distribution of wealth, there exists a unique threshold fixed cost* $\underline{F}$ *such that* $F \leq \underline{F} \Rightarrow$ *there exists one equilibrium interest rate* R_B *and corresponding demand for bank credit* $D_B(R_B, F)$.

Proposition 3 *(1) When interest rates are high (when most projects are rationed), the demand for bank credit decreases with an increase in inequalities. (2) When, interest rates are low (when few projects are rationed), the demand for bank credit increases with an increase in inequalities.*

Proof. See the Appendix. The impact of the wealth distribution on the demand for bank loans is driven by two opposite effects. First, the demand increases when less agents are credit rationed (first effect); second, when a sufficiently large proportion of entrepreneurs have access to bank loans, decreasing inequalities simply reduce the gap $l - b$, hence the need for external finance. The implications of this result are discussed in Section 7.

5.3. Static Equilibrium

The interest rate r on deposits that equates the aggregate supply and aggregate demand of capital is given by:[32]

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

Proposition 4 *(1) For a given economy* $(W, G(b))$, *there exists a unique equilibrium interest rate* $\hat{r}$. *(2) The second best interest rate* $\hat{r}$ *is lower than the first best interest rate* r^*.

Proof. See the Appendix. The first best interest rate r^* corresponds to the economy with perfect information and no intermediation costs. The gap between $\hat{r}$ and r^* increases with (1) intermediation costs, and (2) credit rationing. Indeed, credit rationing limits the demand for capital, hence reduces the equilibrium interest rate.

6. Dynamics of the Economy

The equilibrium interest rate determines the stochastic end-of-period income of each dynasty as a function of the beginning-of-period income. First, one can characterize the stochastic dynastic transition functions that give the bequest as a function of the beginning-of-period income. Second, the (deterministic) dynamics of the aggregate wealth, the interest rate and the wealth distribution (for each village x, and for the global economy) are obtained by aggregating individual transition functions. As the interest rate is time-dependent, each macroeconomic variable follows a non-stationary Markov process.

Note, however, that the long run distribution of wealth in each village is determined by long run individual transition functions, which do not depend on the location of agents. Therefore, in the long run, all villages reach a similar distribution of wealth. This is guaranteed by the equality of the interest rate r across villages. Hence, it is sufficient to track down the dynamics of the aggregate wealth and wealth distribution in order to characterize the evolution of the economy.

The model does not allow for long-run growth so far.[33] We introduce the possibility of endogenous growth by making the following assumption.

Assumption 3 *The size of projects is (linearly) increasing with the average wealth*: $l_t = L \cdot W_t$, *and* $L > 1$.

Here we have in mind the standard model of endogenous growth *a la* Romer in which total factor productivity depends on the average stock of capital. In the standard model, the optimal size of projects is increasing with the productivity parameter. The production function that we choose is simply an extreme version with a fixed size production function. This is a simplifying assumption that does not affect the main results of the paper. $L > 1$ guarantees that $r > 0$.

6.1. Individual Dynamics

Consider a dynasty i at date t. Let b_t^i be the initial wealth of the individual of the dynasty at date t, b_{t+1}^i the initial wealth of the dynasty at date $t+1$ and a_t^i the productivity of the (good) project available to the dynasty at date t. As in Piketty (1997), we assume that all agents bear the risk associated to a project.[34] This assumption, which does not affect the static economy,[35] simplifies the analysis of the dynamics without substantially affecting

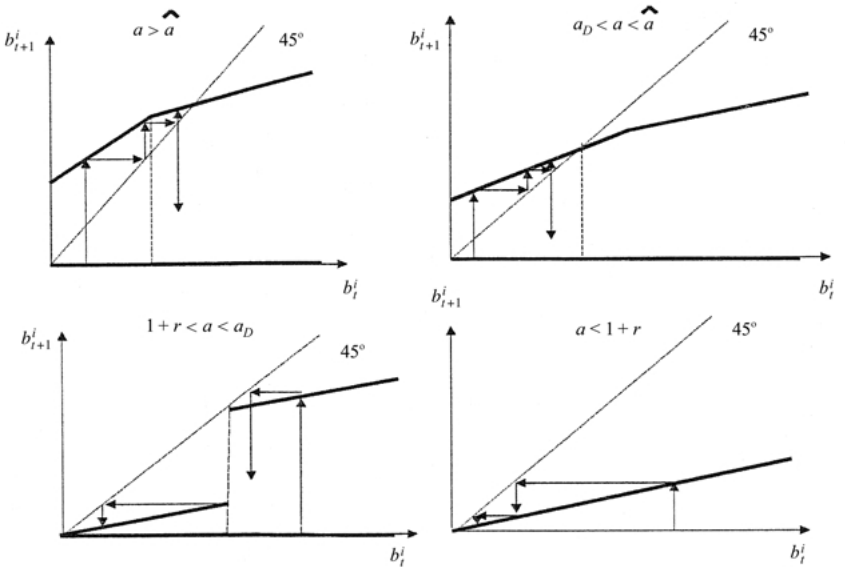

Figure 3. Individual transition functions, by project return.

the argument. To keep the exposition clear, individual transition functions are detailed in the Appendix.

Remark Note that individual transition functions are not stationary when the rate of growth is different from zero, even with exogenous interest rates because Assumption 3 introduces an additional time-dependance. Hence, standard theorems of existence of a long-run ergodic wealth distribution will not apply in this economy:[36] it is clear that the distribution G_t cannot converge to a long-run (ergodic) distribution G_∞ if the economy grows at a positive rate in the long run. However, one can show that long-run stationarity is maintained for $x_t = b_t/W_t$, the wealth of a dynasty relative to the average wealth. This is straightforward to see by checking that individual transition functions, with exogenous interest rates, are indeed stationary when defined in terms of relative wealth x_t. Therefore, if a long-run steady state with a positive rate of growth does exist, it is characterized by a stationary (ergodic) distribution of relative wealth $H_\infty(x)$ and a wealth distribution characterized by the cumulative function $G_t(b) = H_\infty(b/W_t)$. Theorems of existence of long-run steady states are proved in the next section.

6.2. Aggregate Dynamics

6.2.1. First-Best Economy

The dynamics of the first-best economy can be easily computed. All productive projects $(a > 1 + r)$ are realized. Hence the evolution of the economy does not depend on the

wealth distribution. Given the first-best interest rate $1 + r^* = \bar{a}(1 - 1/L)$,[37] the aggregate dynamics is given by

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

Proposition 5 *If $S > S_0 = [\bar{a}(1 - 1/2L)]^{-1}$, the first-best economy grows at a constant positive rate of growth g_∞, and reaches a unique long-run distribution of individual wealth (relative to the average wealth) characterized by the cumulative function H_∞.*

Proof and Comment. Existence, uniqueness and ergodicity of the distribution function H_∞ follow directly from the shape of individual transition functions, and from Theorem 2 in Hopenhayn and Prescott (1992). The ergodicity of the distribution function H implies that, in the long run, all dynasties visit all neighborhoods of the support of the distribution with a common and positive probability. In the long run, the distribution of wealth, relative to the average, is stationary. In contrast, the distribution of wealth itself is not stationary; inequalities, measured for instance by the ratio of the average wealth of the x percent richest relative to the x percent poorest, may increase steadily[38] over the development process.

6.2.2. *Dynamics of an Economy without Financial Development*

In this section, we analyze the dynamics of an economy in which financial development (e.g., emergence and development of modern banks) does not take place.

Aghion and Bolton (1997) and Piketty (1997) showed that the process of ''trickle-down development'' may succeed under certain conditions, and that the economy will fully develop even in presence of capital market imperfections. More specifically, the economy will reach the ''high'' equilibrium if the initial conditions (the distribution of wealth and aggregate wealth) imply a fast decrease of credit rationing, even though there is an irreductible core of capital market imperfections (as in Aghion and Bolton) because of unobservable efforts.[39] In these models, however, the capital market imperfection does not depend on financial development. Even if credit rationing decreases as the economy develops, it is driven solely by a price effect: the interest rate falls because capital is more abundant. However, the process through which the financial system evolves to respond to the modifications of the economy is unexplained. Our point is that on the contrary it is particularly important to understand why financial development takes place or not. Indeed in these countries, the financial system is fragmented, it does not perform its role of pooling funds on a large scale, and therefore the ''trickle-down'' process may not take place.

In order to understand the joint evolution of the financial system and the economy, we start by characterizing the dynamics of an economy in which banks are assumed not to emerge. We show that the process of development may stop, regardless of the (initial) speed of capital accumulation and distribution of wealth, if the economy does not develop institutions capable to gather savings on a large scale.

Theorem 1 (Stagnation Equilibrium) *Assume that* $S > S_0$. *The economy with only local intermediaries converges to a unique long-run steady state, characterized by the aggregate wealth* $\tilde{W}_\infty$ *and the distribution of wealth* $G_\infty(b) = \tilde{W}_\infty(b/W_\infty)$.

Proof. See the Appendix. Existence and uniqueness of a steady state is based on Remark 1 of Theorem 2 of Hopenhayn and Prescott (1992). The intuition why a positive rate of growth is not sustainable is the following. First, the capacity constraint of local intermediaries must be binding over a level of aggregate wealth, irrespective of the distribution of wealth: indeed, as the economy starts growing, the size of projects, hence the demand for capital, increases. Assume that growth is sustained. In a growing economy, a declining proportion of entrepreneurs has access to intermediated funds because local intermediaries have a limited capacity to intermediate capital and new entry is impeded.[40] Asymptotically, with sustained growth, the proportion of entrepreneurs who get an informal loan becomes negligible: the probability for an entrepreneur with wealth b below l to be able to borrow converges to zero. Therefore, such an economy will stop growing. Indeed, all rich agents fall back to the bottom of the distribution with a probability $1 - p$, and then have a negligible chance to escape poverty because they can invest mainly in the traditional activity. Assumption 1 implies that those dynasties will stop accumulating wealth. If growth is sustained, asymptotically all dynasties will eventually invest in the low-yield traditional activity. Assumption 1 states that this is inconsistent with a positive rate of growth. ■

Comment. The development path followed by this economy can be summarized in the following way. Initially, none of the constraints on local intermediaries is binding. The capacity constraint is not binding because the demand for capital is low (l small). The price-competition constraint is not binding because the demand for capital is relatively elastic (poor agents will become lenders or will invest in the traditional activity if the interest rate on loans increases). When the economy starts growing the demand shifts up and is less elastic; hence the market power of local lenders increases. Moreover, one of the two constraints will be binding at some point. When the price constraint is binding, the market power of local lenders stops increasing as the economy grows. The capacity constraint will be binding beyond a level of aggregate wealth. From this period onward, the local market power of intermediaries will again increase as the economy grows. This market power and the capacity constraint eventually bring the development process to an end. This result holds whatever the savings rate (as long as assumptions 1, 2 and 3 hold) and the initial wealth distribution are.

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. This is consistent with the view of MacKinnon (1973, Chapter 7) who claims that ''there appears to be no economical substitute for expanding the role of organized finance in small-scale lending (...) in either rural or urban areas.'' Indeed, according to him, moneylenders and traditional institutions ''are quite inadequate'' for reducing the fragmentation of the capital market.

6.2.3. Dynamics of the Economy with Financial Development

In this section we characterize the long-run steady state of the economy when the banking system successfully develops. We show that successful financial development is sufficient to reach sustained growth rate in the long run (we showed in Section 5 that it is necessary). Next, we establish the initial conditions under which an economy converges to one of the two long-run steady states. We show that the initial aggregate wealth, as well as the wealth distribution, determine the dynamics of the economy and the long-run steady state.

Theorem 2 (Development Equilibrium) *Assume that the modern banking system has been successfully developed. There exists* $\tilde{c}_B$, $\tilde{\Delta}$ *and* $S_1(\tilde{c}_B, \tilde{\Delta}) > S_0$, *such that* $S > S_1$, $c_B < \tilde{c}_B$ *and* $\Delta < \tilde{\Delta} \Rightarrow$ *the economy reaches a steady state characterized 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*: $G_t(b) = \hat{H}(b/W_t)$.

Proof. See the Appendix. The intuition is the following. First, notice that, even if the capacity constraint of local lenders is binding, all the savings are invested in a high yield project rather than the traditional activity. Once the economy has reached an intermediate level of development, the capacity constraint on local intermediation is always binding. Thus, the aggregate cost of market power in the informal sector corresponds to a fixed cost given that the amount of funds intermediated is κ. Hence, 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 to overcome this fixed cost. Existence (and uniqueness) of the steady states is proved as in Theorem 1. ■

We now prove that the two equilibria characterized in Theorems 1 and 2 are indeed long-run steady states, and discuss the conditions under which either of these steady states prevail.

Theorem 3

1. *There exists a non-empty subset of parameters such that, given initial conditions (aggregate wealth* W_0, *and wealth distribution* G_0*), the economy converges to a unique long-run steady state (interest rate, aggregate wealth or rate of growth, and ergodic distribution of ''relative'' wealth H(x)).*

2. *If* $W_0 \leq \tilde{W}$ *the economy may converge to the ''stagnation'' or to the ''development'' equilibrium, depending on the initial distribution of wealth.*

3. *If* $W_0 > \tilde{W} + \varphi(\varphi \ll 1)$, *the economy converges to the ''development'' equilibrium.*

Proof. This theorem is the consequence of Theorems 1 and 2. However, one must show that the fixed cost F of banking development can indeed be incurred in order to reach the development path described in Theorem 2. The intuition can be summarized in the following way. First, consider a neighborhood of the ''stagnation'' equilibrium, and define

F_1, the limit fixed cost such that the demand for bank credit is asymptotically sufficient for the banking network to be set up. Next, consider an initial condition $I_0 = (G_0, W_0)$ leading to the stagnation equilibrium. Define $(F_t)_0$ the sequence of fixed costs for the given entire path leading to the stagnation equilibrium (i.e., from the initial conditions to the stagnation steady state), so that the banking system indeed never emerges along this path. One can show that there exists a non-empty set of initial conditions I_0 such that $\max(F_t)_0 > F_1$. The reason is that, at the stagnation equilibrium, one can find a redistribution of wealth such that the demand for bank loans increases at the prevailing interest rate, thus the demand for bank loans is greater than F_1.[41] The result is obtained, for instance, if $F = F_1 + \varepsilon, \varepsilon \ll 1$. ■

The initial distribution of wealth and aggregate wealth determine the long-run steady state. The impact of inequalities depends, however, on the level of development reached at the ''stagnation'' equilibrium, for a given value of F. Indeed, the distribution of wealth determines the level of development at which the transition to a modern banking system (i.e., payment of the fixed cost F) becomes feasible. The intuition is simple. It is crucial to generate a sufficiently large demand for bank loans at some stage of development in order for the banking network to be set-up. As shown in Proposition 3, however, the impact of inequalities on the demand for bank loans is ambiguous. Higher inequalities have a negative impact on the demand for bank loans whenever a majority of wealthy (relative to the average wealth) entrepreneurs are constrained on the margin. On the contrary, higher inequalities tend to increase the demand for bank loans whenever the majority of (relatively) well-off entrepreneurs already has access to the banking system: they borrow less if their wealth increases. Therefore, there exists an intermediate degree of inequalities that maximizes the demand for bank loans. This suggests a ''big push'' story of financial development, based on the accumulation of collateral by potential borrowers. The impact of inequalities depends on whether the bulk of borrowers get access to bank loans early enough. At an intermediate level of development, less inequalities may be necessary in order to generate a large enough demand for bank loans. Note that if F is relatively large, the transition to a modern banking system may not take place in poor economies, but only once the economy has started to grow. In such a situation, high initial inequalities may be harmful if they prevent the demand for bank loans to be large enough at a later stage of development.

7. Financial Development: Policy Implications

In this section, we discuss the policy implications of the model.

7.1. Enhancing Competition between Intermediaries

The model suggests several directions to limit the market power of local lenders.

First, an increase in the monitoring capacity of banks would reduce the market power of local lenders by increasing competition for the borrowers who are credit-constrained on

the margin. The other end of the distribution, i.e. extremely poor agents who cannot afford to borrow in the local credit market, is also of interest. Indeed, as these agents start accumulating some wealth, and hence borrow locally, Proposition 1 implies that the market power of local lenders will increase. This suggests that the market power of local lenders is initially likely to increase, in the first stage of development, when more and more agents are willing to borrow despite high interest rates, and subsequently to decrease as more and more agents gain access to bank loans.[42]

Second, subsidized bank loans for the poor may have an indirect impact on the cost of capital in the informal sector by increasing price competition for the borrowers who are credit rationed on the margin. Such a policy would unambiguously speed up the penetration of modern banks in poor areas if ceilings on deposits rates are not simultaneously imposed (the potentially disastrous consequences of ceilings on deposit rates are discussed in Section 7). To be sure, the government intervention discussed here is to subsidize loans for the poor—not to remove the incentive constraint on bank loans. Another possibility (which is not exclusive) is to impose that banks should lend a minimum share of their credit to small entrepreneurs. Such directed programs, with various characteristics, have been widely used in developing countries. Banerjee and Duflo (2002) use a policy change in a directed lending program in India to successfully test for credit constraints.

The impact of government intervention (subsidies on bank loans) on informal credit has been discussed by Hoff and Stiglitz (1997), Bose (1998) and Jain (1999) among others. They highlight possible adverse consequences of such policies. In Hoff and Stiglitz's models of monopolistic competition, subsidized credit induces new entry of moneylenders (who obtain credit from banks at a lower cost). This affects the borrowers' incentives to repay, thereby increasing enforcement costs in the informal credit market. The informal lending rate may increase if this effect is strong enough. Moreover, Bose (1998) shows that a ''composition effect'' may lead to a higher informal lending cost even if the number of moneylenders is fixed. Indeed, a decrease in the opportunity cost of funds allows more informed moneylenders to expand by selecting only the good type borrowers. Thus, less informed lenders face a higher proportion of low quality borrowers and therefore a higher marginal cost of lending. In addition, if strategic default is possible, the terms of credit can worsen for all moneylenders. Both models, however, assume that borrowers have no access to formal loans, thus ruling out the possibility that lower formal interest rates may also decrease the demand for informal loans. On the contrary, we focus on competition between the formal and informal sectors, which unambiguously leads to lower costs of funds in the informal sector. Our conclusion would be obviously less clear cut if κ is endogenized along the lines of these papers. Which effects dominate in practice will depend on specific conditions in the local market considered. These include the capacity to enforce repayment in the informal sector, the distribution of collateral assets and the degree of asymmetric information (Δ) which affects the degree of penetration of formal banks. We have also assumed that entrepreneurs cannot borrow simultaneously from both the formal and informal sector. Jain (1999) explores this possibility in a model in which a monopolistic bank may impose co-financing requirements with a perfectly competitive and better informed informal sector, in order to screen borrowers. Jain shows that imposing ceilings on lending rates therefore has two opposite effects, since the interest rate is an instrument for extracting surplus as well as for screening.

Encouraging the development of microfinance is another policy option to enhance credit for the poor. Microfinance institutions (MFIs) typically exploit group lending, social sanctions, and more importantly, the threat of denial of future credit to achieve high repayment rates (Morduch, 1999). Our framework suggests that they may have an indirect positive effect by reducing the market power of informal lenders even if their size is limited and they need to rely on subsidies.[43] Assume for instance that MFIs face the same capacity constraint κ and entry cost c as informal lenders, but have less information on borrowers so that they need to spend $(s+\gamma z)(l-b)$ to obtain information on a borrower located at distance z from the MFI. If these institutions receive a total subsidy $s'\kappa$ and do not make profits, they will charge $r+s-s'$ per loan in the village. If the subsidy is large enough, they will drive local lenders out of the local market and offer cheaper loans which will benefit poor borrowers and speed up the accumulation of assets relative to the situation with only local lenders. Empirical evidence on the effectiveness of microcredit programs remains limited however.

7.2. The Impact of Financial Repression and Redistributive Policies

The role of wealth redistribution in models in which capital market imperfections affect the accumulation of wealth has been discussed, for instance, by Aghion and Bolton (1997) and Piketty (1997). In their models, wealth must be redistributed from the rich to the poor in order to improve the long-run efficiency of the economy, even if, on the basis of distributive justice alone, there seems to be little reason to redistribute.[44] Aghion and Bolton make a case for a permanent redistribution of wealth because incentive problems do not vanish at the unique long-run steady state of the second-best economy. Such redistribution improves the allocative efficiency because incentive problems are more acute for the poor than for the rich. Piketty shows that a one-shot redistribution from the rich to the poor can bring the economy to the ''non-rationing'' development path.

Both models, however, are silent on the interplay between redistributive policies and the financial system. We believe that this interaction is important. First, capital market imperfections are not a ''passive'' phenomena explained solely by the scarcity of capital: financial institutions are likely to adapt themselves to informational frictions. Second, the interplay between the financial system and redistribution of wealth is crucial in developing economies. Most redistributive policies targeted to the poor involve financial institutions,[45] either directly or indirectly. Hence the macroeconomic effects of such policies are potentially far-reaching. It is also the case that many low-income countries rely on financial repression which reduces the efficiency of the formal financial system. Financial repression can take the form of directed credits and/or subsidized loans that benefits politically influential groups, ceilings on bank deposits and preemption of banks' resources by the public sector. Thus, redistribution of wealth, together with financial liberalization, has a role to play in hastening the evolution of the financial system, by modifying the relative demand for funds in each segment of the capital market.

Let us first consider a redistributive policy and, second, two situations of financial repression.

First, consider a redistribution from rich (having access to the banking system) to poor

who are credit rationed. In the best case, this redistribution will increase the demand for bank loans, hence increasing the size of the banking system. It is, however, not clear whether or not there is an efficiency gain in the local credit market. On the one hand, it may indeed reduce the cost of borrowing by relaxing the capacity constraint and therefore increasing price competition. On the other hand, it may decrease the elasticity of the local demand for funds, thus increasing the market power of intermediaries, if less agents are on the margin hesitating between being savers and entrepreneurs. In this case, borrowers in the local credit market may end up being worse-off after the redistribution.

Second, consider a ceiling r_d on bank deposits that finances a subsidy on bank loans for poor entrepreneurs. Assume that banks cannot extract rents. If the return on bank deposit rates is lower than $\underline{r}$, this will unambiguously lead to financial disintermediation. More interesting is the case in which the ceiling r_d, is larger than $\underline{r}$. In a relatively developed economy, in which the capacity of local intermediation is binding, the impact will be unambiguously positive and will enhance access to bank loans for poor entrepreneurs. In a poor economy in which this capacity constraint is not binding, the effect can be negative. On the one hand, the demand for bank loans will increase. On the other hand the supply will decrease: funds will shift out of the banking system towards the local credit market as long as the return is higher in the local credit market. If this supply effect is strong enough, the banking system will collapse. It happens if:

$$D_I(R_I(\hat{r})) = S(\hat{r}) \quad \text{and} \quad \hat{r} > r_d.$$

This is more likely to be the case in developing economies where aggregate demand for funds is relatively low and inequalities are large (i.e. few entrepreneurs would gain access to the banking system). In order to assess the impact on the rate of growth, however, we need to compare the intermediation costs with and without the imposition of the ceiling. Let us concentrate on the case in which the banking sector totally collapses and assume that the capacity constraint κ does not bind.[46] Without the ceiling we know that $R_I > R_B$. Imposing the ceiling leads to the collapse of the banking sector. Local intermediaries face less competitive pressures (no price competition from the banks on the borrower side), hence their market power does not decrease. Thus, the rate of growth will decrease.

Another form of financial repression is preferential credit policies to the sole benefit of politically powerful groups. In our framework, this can take the form of subsidized loans that are captured by the wealthiest agents, for instance (assuming that political influence is positively associated with wealth).[47] The simplest case is to consider the situation in which agents with wealth $b > l$ can obtain subsidized loans for productive activities. Let s be the subsidy per dollar borrowed. For an agent of talent a and wealth $b > l$, the expected return will be $al + r(b - l) + sl$, instead of $al + r(b - l)$ in the case in which the project is self-financed. However, assuming that banks have to break even, this implies that the cost of this subsidy will have to be passed on either poorer borrowers (by increasing the lending rate), or by decreasing the return on deposits. As already discussed, this is likely to lead to disintermediation in both cases in a low income country. Moreover, given that such policies have distributional consequences, their impact is likely to be persistent.

We have not discussed the role of state-owned banks in the process of financial development. In our model, state-owned development banks can be introduced as banks offering subsidized loans for the poorest agents. A more detailed analysis of the role of

development banks in the process of development can be found in Armendariz de Aghion (1999).

8. Final Remarks

This paper is concerned with the emergence of a modern banking sector in a developing country, in particular, the transition from local (informal) financial institutions to modern banks. As in some microeconomic studies, the duality of the financial structure is the outcome of asymmetric information between lenders and borrowers. The model concentrates on the relationship between financial institutions and development, and points out that the period of transition from local to modern financial institutions is crucial for long-run growth. Despite their imperfect monitoring technology, banks are necessary for development because they collect funds on a large scale, and therefore are able to finance large projects at a reasonable cost. On the contrary, local financial institutions have an essential role in early stages of economic development when most firms are small, without collateral, have relatively limited needs of external capital, and when informational frictions are severe. As is standard in growth models with credit rationing, the initial wealth distribution is not neutral; therefore any policy that has an impact on the distribution of wealth can have long-run consequences. The novelty of the model is to illustrate, in a stylized fashion, how distributive issues and the characteristics of the financial system are entangled in the first stages of economic development. In particular, we integrate the discussion on financial repression in this framework. Our model does not provide any informational advantage to modern banks. This could be easily analyzed, for instance, by assuming that banks can obtain better macroeconomic information whereas informal lenders do not have access to this information (this could be because banks are able to compare the return of projects located in different villages). However, this would not significantly modify the patterns of financial development that are derived in this paper, and the policy discussion would be unchanged.

Appendix

Definitions (Figure 2).

1. b_Z is defined by: $a_1(b_Z) = \widetilde{a}_I(b_Z)$.
2. b_X is defined by: $a_1(b_X) = \widetilde{a}_B(b_X)$.
3. $a_B(b) = \begin{cases} a_1(b) & \text{if } b \leq b_X, \\ \widetilde{a}_B(b) & \text{if } b \geq b_X. \end{cases}$
4. $a_D(b) = \begin{cases} \widetilde{a}_I(b) & \text{if } b \leq b_Z, \\ a_1(b) & \text{if } b_Z \leq b \leq b_X, \\ \widetilde{a}_B(b) & \text{if } b \geq b_X. \end{cases}$

Proof of Proposition 1. Simple algebra leads to:

$$D_I = \frac{\Omega}{\bar{a}} \cdot l \cdot \int_0^{b_z} \left(1 - \frac{b}{l}\right)\left(\frac{bz}{l} - \frac{b}{l}\right) dG(b),$$

where $\Omega = R_B - R_I + (1 + r)$ and $\frac{b_z}{l} = \frac{(\Delta + R_B - R_I)}{\Omega} < 1$. Part 1. First, the demand for local credit increases when l increases. Second, consider two distributions G_1 and G_2, corresponding to two economies with the same aggregate wealth W such that $G_1(b) > G_2(b)$ for all $b < b_Z(R_B^2, R_I^2)$, where R_B^2 and R_I^2 are the equilibrium interest rates associated with G_2. Clearly, $D_I^1(R_B^2, R_I^2) > D_I^2(R_B^2, R_I^2)$. Third, the quantity constraint is less likely to be binding when one of the two price constraint is binding. Part 2. (a) and (b) are also clear, (c) comes directly from monopolistic pricing:

$$\frac{R_I - (1 + r)}{(1 + r)} = \frac{-1}{1 + r} \cdot \frac{D_1}{D_I'},$$

and

$$D_I' = \frac{-l}{a} \int_0^{b_Z} \left(1 - \frac{b}{l}\right)^2 dG(b).$$

Consider distribution $G(b)$ and assume a small change in the distribution such that δ $dG(b) > 0$ for all $b < b_Z$, where b_Z is defined at the initial equilibrium. In other words, the proportion of poor agents increases. The elasticity of demand changes in the following way:

$$\delta \frac{D_I}{D_I'} = \frac{\delta D_I \cdot D_I' - D_I \cdot \delta D_I'}{D_I^2} < 0.$$

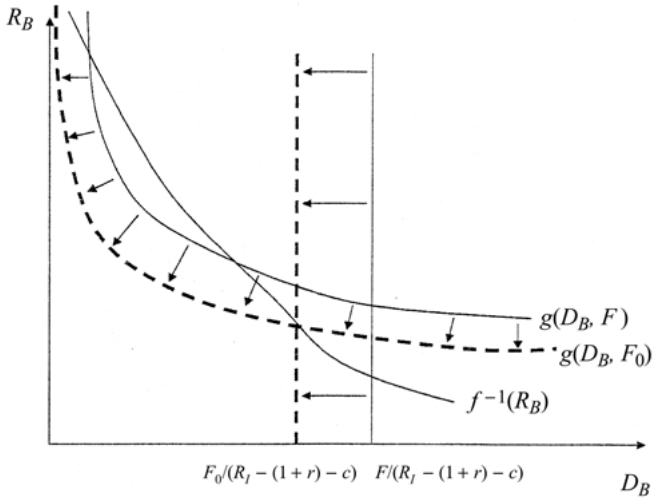

Figure 4. The formal credit market.

Hence the monopoly mark-up increases, and price constraints are more likely to be binding. ■

Proof of Proposition 2. The equilibrium interest rate R_B^* is defined by:

$$R_B^* = \min\{\tilde{R}_B | \tilde{R}_B = g(D_B, F) \text{ and } D_B = f(R_B)\},$$

where $g(D_B, F) = c + (1 + r) + F/D_B$ is the pricing function and $D_B = f(R_B)$ the demand function. A sufficient condition for the banking system to indeed develop is $D_B(R_B^*) \leq F/(R_I - (1 + r) - c)$ e.g. at R_B^* the demand is high enough to guarantee that it is indeed cheaper to borrow from a bank rather than an informal lender). Let F_0 be the fixed cost for which equality holds (see figure below). As the equilibrium informal interest rate R_I is also a non-decreasing function of R_B, F_0 is implicitly defined by: $D_B(R_B^*(F_0)) \leq F_0/(R_I(R_B^*(F_0)) - (1 + r) - c)$.~$D_B(R_B^*(F_0))$ is unambiguously decreasing with respect to F_0. The right hand side (RHS) may be decreasing or increasing. However, RHS $\to 0$ when $F_0 \to 0$ whereas $g(D_B, F) \geq c + (1 + r)$. Hence at least one solution F_0 exists. ■

Proof of Proposition 3.

$$D_B(R_B) = \int_0^l \int_{a_B(R_B)}^{\bar{a}} (l - b)\, dF(a) dG(b) = l \int_0^l \left(1 - \frac{a_B}{a}\right)\left(1 - \frac{b}{l}\right) dG,$$

$$D_B = l\left[\int_0^{b_X} \left(1 - \frac{a_1}{a}\right)\left(1 - \frac{b}{l}\right) dG + \int_{b_X}^l \left(1 - \frac{a_B}{a}\right)\left(1 - \frac{b}{l}\right) dG\right].$$

It is direct to check that the two functions

$$\left(1 - \frac{a_1}{\bar{a}}\right)\left(1 - \frac{b}{l}\right) \text{ and } \left(1 - \frac{a_B}{a}\right)\left(1 - \frac{b}{l}\right).$$

are humped-shaped. Hence the demand for credit is maximized for an intermediate level of inequalities. ■

Proof of Proposition 4. Aggregate demand for capital is given by

$$\begin{aligned} D(r) &= D_B(R_B(r)) + D_I(R_I(r, R_B(r))) \\ &= \int_0^l \int_{a_D}^{\bar{a}} (l - b)\, dF(a)\, dG(b). \end{aligned}$$

Aggregate supply is

$$\begin{aligned} S(r) = &\int_0^l \int_0^{a_D} b\, dF(a)\, dG(b) + \int_l^\infty \int_{1+r}^{\bar{a}} (b - l)\, dF(a)\, dG(b) \\ &+ \int_l^\infty \int_0^{1+r} b\, dF(a) dG(b). \end{aligned}$$

The equilibrium on the capital markets is given by

$$\frac{W}{l} = \int_{l}^{\infty} \int_{1+r}^{\bar{a}} dF\, dG + \int_{0}^{l} \int_{a_D}^{\bar{a}} dF\, dG = \mu(r).$$

One can easily check that a_D is an increasing function of r. Hence $\mu(r)$ is a well-behaved demand curve, and the solution verifies $\hat{r} = \underline{r}$ if $\mu(\underline{r}) < W/l$ and $\mu(\hat{r}) < W/l$ otherwise.

Rearranging gives:

$$\frac{W}{l} = \underbrace{\left[1 - \frac{1+r}{\bar{a}}\right]}_{\text{first best}} - \underbrace{\int_{0}^{l} \frac{a_d - (1+r)}{\bar{a}}\, dG.}_{\text{rationing + intermediation costs}}$$

■

Individual Transition Functions

1. The agent borrows in the local credit market if $\tilde{a}_l(b_t^i) < a_t^i < a_1(b_t^i)$:

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

2. The agents borrows from a bank if $a_t^i \geq a_B(b_t^i)$:

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

3. The agent self-finances his project if $b_t^i \geq l_t$ and $a_t^i \geq 1 + r_t$:

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

4. The agent is a saver in all other cases:

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

Dynamics of the First-Best Economy

The dynamics of the first-best economy is given by:

$$\frac{W_{t+1}}{S} = \int_0^{\infty} \int_0^{1+r} (1+r)b \, dF(a) \, dG_t(b) + \int_0^{\infty} \int_{1+r}^{\bar{a}} [(a-(1+r))l_t + (1+r)b] \, dF(a) \, dG_t(b).$$

Proof of Theorem. We use quite extensively remark 1 of Theorem 2 of Hopenhayn and Prescott (1992) to establish uniqueness and existence of equilibrium. Moreover, the stationary wealth distribution (and the distribution H) is ergodic. It describes the frequency at which any dynasty visits any neighborhood. The two conditions to be checked are as follows.

1. The Markov process P must be increasing, which is straightforward to verify: in any case, a initially poorer dynasty will on average end up with a lower wealth than an initially richer dynasty from one period to the next one.

2. It must verify a mixing condition. Formally: there exists $b'', \varepsilon > 0$ and n such that, for all t, a dynasty with initial wealth equals to zero, will reach a wealth level greater or equal to b'' in n period with a probability greater than ε. And conversely, a dynasty initially very rich (b close to the upper bound of the support), will end up after n periods with a wealth level below b'' with a probability greater than ε. This must be verified uniformly with respect to t.

If long-run growth is not possible, necessarily $\max(R_{I,t}) < \bar{a}$. Hence it exists $\vartheta > 0$ such that agents drawing $a \in [\bar{a} - \vartheta, \bar{a}]$ always undertake their project, hence can escape the bottom of the distribution. Conversely, all agents fail and fall back to zero with probability $1-p$. Therefore the mixing condition is met if long-run growth is not possible.

The next steps of the proof are the following: (1) we characterize the relationship between the level of development and the capacity constraint, (2) we show that long-run growth is not possible, (3) we establish that inequalities have an ambiguous impact on the rate of growth.

(1) **Lemma A** For all initial conditions W_0, G_0 there exist $\bar{W}_0$ and $\underline{W}_0$ such that (a) $W_t > \bar{W}_0 \Rightarrow D_{I,t} > \kappa$, (b) $W_t < \underline{W}_0 \Rightarrow D_{I,t} < \kappa$.

Proof. (a) $D_I = \int_0^{l_t} \int_{a_I}^{\bar{a}} (l_t - b) \, dG_t \, dF \geq \int_0^{l_t} \int_{a_I(R_I^{\gamma})}^{\bar{a}} (l_t - b) \, dG_t \, dF$, where

$R_I^{\gamma} = 1 + r^* + t\gamma$ hence

$$D_I \geq \int_0^{\frac{l_t}{2}} \int_{a_I(R_I^{\gamma})}^{\bar{a}} \frac{l_t}{2} \, dG_t \, dF \geq \frac{l_t}{2} \rho G_t(0),$$

where

$$\rho = 1 - \frac{a_I(R_I^{\gamma}, b=0)}{\bar{a}} \quad \text{and} \quad l_t = L \cdot W_t.$$

Choose

$$\overline{W}_0 = \frac{\kappa}{\frac{L}{2}\rho \min_{t\geq 0} G_t(0)}$$

(note that $\min_{t\geq 0} G_t(0)$ exists necessarily and $\min_{t\geq 0} G_t(0) > 0$ if $G_0(0) > 0$.)[48]

(b) Trivially: $D_{I,t} < l_t = L \cdot W_t$, choose $\underline{W}_0 = \kappa/L$.

(2) Before showing that a positive rate of growth is not sustainable, let us write the dynamics of the aggregate wealth. Two cases must be considered: (a) the capacity constraint is not binding, (b) the capacity constraint is binding. If the capacity constraint is not binding, the dynamics of aggregate wealth is given by:

$$\frac{W_{t+1}}{S} = \underbrace{\int_0^{\infty} \int_{1+r}^{\bar{a}} a l_t \, dF \, dG_t}_{\text{1st best}} - \underbrace{\int_0^{l_t} \int_{1+r}^{a_I} a l_t \; dF \; dG_t}_{\text{foregone projects}}$$
$$- \underbrace{\Delta R_I \int_0^{l_t} (l_t - b)\left(1 - \frac{\tilde{a}_I}{\bar{a}}\right) dG_t}_{\text{market power of intermediaries}}, \tag{A}$$

where $\Delta R_I = R_I + (1 - r)$.

If the capacity constraint is binding, the relation becomes:

$$\frac{W_{t+1}}{S} = \underbrace{\int_0^{\infty} \int_{1+r}^{\bar{a}} a l_t \, dF \, dG_t}_{\text{1st best}} - \underbrace{\int_0^{l_t} \int_{1+r}^{a_I} a l_t \; dF \; dG_t}_{\text{foregone projects}}$$
$$- \underbrace{\Delta R_I \cdot \kappa}_{\text{market power}} + \underbrace{(1 + \underline{r})[S_t(\underline{r}) - \kappa]}_{\text{idle saving}}. \tag{B}$$

Note that the economy grows at a lower rate than the first-best economy because (1) some valuable projects are not undertaken, (2) intermediaries enjoy a market power, and (3) some savings are invested in the low-yield, traditional project when the capacity constraints are binding.

Assume that a strictly positive rate of growth is sustainable. Then, according to Lemma A, $R_I \to \bar{a}$ as $W \to +\infty$. This implies that the proportion of intermediated savings $\to \infty$, the probability of escaping the poverty trap ($b = 0$) converges to zero. However, at each period a proportion $1 - p$ of agents fall in the bottom of the distribution. Hence, asymptotically, $G_t(0) \to 1$, which implies that, as $R_I \to \bar{a}$, the porportion of projects undertaken converges to zero. This is clearly not consistent with the assumption of sustainable growth.

(3) *Impact of inequalities.* Consider equation (A). The term corresponding to foregone investment opportunities can be written $l_t \cdot \int_{1+r}^{R_I} a G_t(\tilde{b}_I(a))\, dF$. This term will increase with inequalities if the proportion of agents with wealth below $\tilde{b}_I(R_I)$ is a good proxy for inequalities. This result is intuitive: very poor agents are more likely

not to invest in their project because of the high cost of borrowed funds. Conversely, for the market power term, it can be shown easily that too much equality can be detrimental, especially in poor economies, because it may lead to an inelastic demand for capital. When the capacity constraint is binding (as in the case of relatively developed economies), the overall effect is therefore unambiguous: inequalities are bad for growth. ■

Proof of Theorem 2. When the banking system exists, the dynamics of the aggregate wealth is given by:

$$\frac{W_{t+1}}{S} = \underbrace{\int_0^{\infty}\int_{1+r}^{\bar{a}} a l_t \, dF \, dG_t}_{\text{first best}} - \underbrace{\int_0^{l_t}\int_{1+r}^{a_I} a l_t \, dF \, dG_t}_{\text{foregone projects}} - \underbrace{\Delta R_I \cdot D_I(R_I)}_{\substack{\text{market power of} \\ \text{local intermediories}}} - \underbrace{c_B \cdot D_B(R_B)}_{\substack{\text{cost of banking or,} \\ \text{intermediation.}}}$$

where

$$\hat{a} = \begin{cases} \tilde{a}_I & \text{if } b \le b_z, \\ a_1 & \text{if } b_z \le b \le b_x, \\ \tilde{a}_B & \text{if } b \ge b_x. \end{cases}$$

Lemma B $\exists \bar{W}', W > \bar{W}' \Rightarrow D_I \kappa$. One just needs to adapt the proof of Lemma A:

$$D_I = \int_0^b \int_{a_I}^{a_{1(r^*+cb)}} (l_t - b)\, dG_t \, dF \ge \int_0^{bz/2} \int_{a_1(R_I^{\gamma})}^{a_1(r^*+c_B)} (l_t - b)\, dG_t \, dF$$

where

$$\frac{b_z}{l_t} = 1 - \frac{1 + r - \Delta}{R_B + 1 + r - R_I} < 1.$$

Hence

$$D_I > \int_0^{b_z/2} \left(l_t - \frac{b_z}{2}\right) \frac{a_1 - a_I}{\bar{a}} d(G)(b) > \frac{l_t}{2} G_t(0)\sigma \quad \text{where} \quad \sigma = \frac{a_I(b_z/2) - a_I b_Z/2}{\bar{a}} > 0,$$

and $l_t = L \cdot W_t$. Choose for instance

$$\bar{W} = \frac{\kappa}{\frac{L}{2}\sigma \min G_t(0)}.$$

From Lemma B we know that the capacity constraint of local intermediaries is binding, hence cost or local intermediaries' market power is a fixed cost once the economy is rich enough. Thus, we can concentrate on the two other terms which will be the relevant ones asymptotically.

Next, we look for an upper bound on the cost of bank intermediation:

$$D_B = \int_0^{l_t} \int_{a_B}^{\bar{a}} (l_t - b)\, dF\, dG_t < \int_0^{l_t} \int_{1+r}^{\bar{a}} l_t\, dF\, dG_t = l_t[1 - 1 + r/\sigma]G_t(l_t).$$

This lower bound grows as the economy develops.

In addition, it is clear that the sum of first two parts (first best + foregone projects) is porportional to l_t and leads to a positive rate of growth if the saving rate is high enough (in particular higher than S_0). If c_B is low enough relative to $\bar{a}$, it is clear that the economy will exhibit a strictly positive rate of growth. Finally if Δ is low enough, the cost of local finance can be overcome by a sufficiently high saving rate (to be convinced that this is indeed the case, consider the limit case $\Delta - c_B - \to 0$: in this case $\Delta R_I \to 0$, and we converge to the first best).

Existence and uniqueness of the equilibrium is proved as theorem 1.

Notes

1. ''The economy is 'fragmented' in the sense that firms and households are so isolated that they face different effective prices for land, labor, and capital''.
2. Under the term ''financial repression'' are grouped various forms of intervention in credit markets, ranging from directed credit (often to politically powerful groups rather than productive firms), subsidized loans, deposit rate ceilings, and, more generally, any form of preemption of the limited lending resources of the deposit banks by the government.
3. See, for instance, The World Bank Economic Review, September 1990.
4. Note that MacKinnon (1973) is aware of the substantial informational requirement for expanding the role of bank finance in small-scale lending (p. 77).
5. Conversely, given wealth, more productive firms borrow from a bank while less productive ones borrow from a local intermediary.
6. Acemoglu and Zilibotti (1999) differ from the other papers to the extent that information is endogenous to the process of development, and the agency issue between investors and managers is modeled.
7. Bencinvenga and Smith (1993) make a similar argument; however, they consider an economy with a representative agent which reduces the scope to discuss the full implications of collateral accumulation.
8. Banerjee and Newman (1998) introduce the distinction between the informal and the formal credit market. However, they are primarily interested in understanding migration patterns, and for this reason, the formal and informal credit do not operate in the same sectors, or regions (the informal market is associated with the less productive sector). On the contrary, in our model, financial institutions can finance all existing projects. This is consistent with the claims of Biggs, or Kan (see Section 2), on the importance of the informal market for Taiwan's industrial development. In particular, traditional financial institutions (such as rotating saving and credit associations) were particularly active in urban areas as well.
9. Part III, period 1789–1880, Chapter on Money and Credit.
10. ''Warm-glow'' preferences are common in the literature: see Aghion and Bolton, 1997; Banerjee and Newman, 1993; Galor and Zeira, 1993; LLoyd-Ellis and Bernhardt, 2000; Piketty 1997, among others.
11. This variable is distributed according to the cumulative function $H_t(x) = G_t(W_t \cdot x)$ and the density function $h_t(x) = H_t'(x) = W_t \cdot g_t(Wt \cdot x)$.
12. See Aghion and Bolton (1997) for a similar assumption.
13. MacKinnon (1973) stresses the importance of indivisibilities in poor regions of developing and emerging economies (p. 13), which makes external finance important for poverty alleviation.
14. We choose a model based on an *ex ante* moral hazard story. We could also model an *ex post* moral hazard story (see, for instance, Bernanke and Gertler (1989)) as in the ''costly state verification'' literature (Townsend, 1979). The conclusions of the paper would not be substantially affected.
15. Contrary to Banerjee and Newman (1998), we assume away the possibility to escape repayment obligations.
16. The sanction may also be based on a judicious use of existing laws. Biggs (1991) argues, for instance, that the

Taiwanese government indirectly supported the curb market by enacting a law in the 1950s that made it a criminal offense to fail to honor a postdated check. As a result, informal credit loans could be secured against postdated checks. A similar use of postdated checks has been observed in the informal credit markets of Paraguay in the 1990s.

17. Punishment is assumed to be credible.
18. See Banerjee and Newman (1998) for a model in which the duality of the financial system is the outcome of strategic default by borrowers.
19. In a more general analysis, the distribution of wealth (and average wealth) may differ across villages. In such a framework, which we do not analyze here, an interesting question is whether all villages eventually converge to the same average wealth and distribution of wealth, irrespective of initial conditions, or whether differences among villages may persist in the long run, in particular the penetration of the banking system.
20. See Freixas and Rochet (1997, Chapter 3).
21. What we really need is a convex cost function of gathering savings. In the previous version of the paper, a quadratic cost function was considered. Assuming a capacity constraint drastically simplifies the analysis.
22. The capacity constraint could be endogenized by assuming that the cost of enforcing repayment is a function of the number of projects financed, as in Bose (1998).
23. Note that letting local intermediaries borrow from the formal financial systems would not affect the analysis. Indeed, (1) they are subject to the same moral hazard problem as entrepreneurs are, hence their formal borrowing is limited by their own collateral, (2) the total mass of local intermediaries is negligible from a macroeconomic point of view, hence allowing them to borrow from banks does not modify the macroeconomic outcome significantly.
24. ''Important as they are, the traditional or informal credit markets are quite inadequate for reducing dispersion in real rates of interest for the majority of the rural population.'' Mac Kinnon (1973).
25. In Greenwood and Jovanovic's paper, the evolution of each dynasty can be tracked down independently of the other dynasties: dynasties are not connected with each other because there is no market clearing price (it could be the interest rate as in Aghion and Bolton, 1997; Piketty, 1997, or the wage rate on the labor market as in Banerjee and Newman, 1993). Thus, dynasties can be interpreted as disconnected economies in which a unique world mutual fund invests national savings.
26. Necessarily $r \geq \underline{r}$. When $r = \underline{r}$, agents are indifferent between lending and investing in the traditional technology.
27. Note that, given the simple productive structure and our focus on moral hazard, the question of the optimal contract simply does not make sense here. In particular, debt and equity contracts are formally identical. For this reason, we limit ourselves to debt contracts.
28. Notably Aghion and Bolton (1997), Lloyd-Ellis and Bernhardt (1996), and Evans and Jovanovic (1989).
29. In Saint Paul (1992), there is indetermination of equilibria in presence of a fixed cost of intermediation at intermediate levels of development.
30. When the capacity constraint is binding, the price constraint resulting from other informal lenders' competition cannot be active in equilibrium. Hence, when capacity constraints are binding, local intermediaries only face competition from the banking system. In addition, if there is no banking system and the capacity constraint is binding in equilibrium, savers get their reservation rate of return $\underline{r}$.
31. We assume that c_B is low enough to ensure that this is indeed the case.
32. See the Appendix for the explicit definition of the demand and supply functions.
33. If we do not make this assumption and keep the same model as in the static analysis, our result would translate to two different steady-states levels of economic development, as in Aghion and Bolton (1997), the ''high'' equilibrium being associated, under reasonable hypothesis, to a financially developed economy, and the ''low'' equilibrium to an underdeveloped economy.
34. That is, lenders receive a return of $(1+r)/p$ with probability p and 0 with probability $1-p$.
35. Because agents are risk-neutral.
36. See Hopenhayn and Prescott (1991).
37. Note that the first-best equilibrium interest rate does not depend on the state variables (i.e., the aggregate wealth and the distribution of wealth).
38. This property is not specific to our model; in particular it is not the consequence of Assumption 3: a similar

result would hold, for instance, if an externality *a la Romer* is introduced in the neoclassical model with imperfect credit market studied by Piketty (1997) or Aghion and Bolton (1997).

39. The argument is that, even in the best possible (second-best) financial system, there remains a core of irreductible capital market imperfections which justify a permanent redistribution of wealth in order to reduce productive inefficiencies.
40. The market power, and the borrowing interest rate, increases when the economy develops and the capacity constraint is binding.
41. Consider for instance a redistribution from the bottom of the distribution to the middle of the distribution.
42. The fact that informal credit has thrived in many developing economies since the 1980s, with high market power, despite bank subsidies, does not prove per se that subsidies did not have an impact on informal interest rates. They might have been even higher without subsidized loans.
43. The high information and enforcement costs are likely to limit the size of these institutions and explain why most MFIs are subsidized NGOs (Bond and Rai, 2002, explain why it is difficult to find collateral subsitutes in microfinance).
44. In both models, contrary to Galor and Zeira (1993) in which the limit wealth distributions are non-ergodic, all lineages are equally well-off on average in the long-run. A similar property holds in. our model.
45. Such as development banking (see for instance Armendariz de Aghion, 1999), and also microcredit programs. It can be also subsidized loans or ceilings on deposit rates.
46. With a binding capacity constraint, an additional effect will worsen the impact of the ceiling, e.g., some agents will choose the low return traditional activity and fewer projects will be undertaken.
47. The result would hold if one considers that the subsidized loans benefit as well some agents with wealth $b < l$, as long as it benefits the agents who are not credit rationed more than the former.
48. If $G_0(0) = 0$, then start at $t = 1$ because $G_1(0) = 1 - p$.

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