Financial Intermediation and Employment

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Abstract: This paper explores the relationship between financial intermediation and employment. We explain why some economies have low financial intermediation even when financial intermediation is safe for depositors. Moreover, we seek to explain why these economies tend to be poor and vulnerable, and also have large self-employment even though the latter has low productivity. We show that the effects of bad banking can be overcome only partially by corrective taxes.

Key words: Financial intermediation, wage-employment, self-employment.

JEL Classification: G20, J23, O17.

1 Introduction

This work was motivated by two stylized facts regarding less developed countries (LDCs from now on), poor financial development and the low level of formal sector employment. We use a simple theoretical model to examine the linkages between these two aspects.

That the level of financial development in LDCs is relatively low compared to that in developed countries is well known. Private credit, for example, constitutes less than 25% of GDP in low income countries. In high income countries, the corresponding minimum figure exceeds 50% (the maximum figure exceeds 110%). Similarly, market capitalization is less than 20% in LDCs, whereas it lies between 20% and 80% in high income countries (World Bank (2001)). There is also evidence to show that financial depth is positively correlated with growth

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(pp. 5-6, World Bank (2001)). Moreover, there is some evidence on causality as well. It has been shown that the causality runs from financial development to the real sector (e.g. Levine et al. (2000), and Rajan and Zingales (1998)). Theoretically Greenwood and Smith (1997), Levine (1997), and Levine and Zervos (1998), among others, discuss the interlinkages between the real sector and the financial sector. This paper further explores the relationship between these two sectors.

The second stylized fact in the context of LDCs is that employment in the formal sector, sometimes also called the organized sector, is relatively small e.g. it is less than 10% in India (see Government of India (2002)). The bulk of the work force is engaged in the informal sector, unlike in the case of developed countries.[2] The informal sector is characterized by self-employment. In fact, in India 52.9% of employment is of the self-employment category (see Table 30, pp. 166, Gupta (2002)). On the other hand, in a developed country like USA, about 12.5% of the male labor force and about 7% of the female labor force was self-employed around 1982 (Figure 1, Blau (1987)).

The literature has, however, treated the two phenomena of low employment in the formal sector and the low level of financial intermediation as if they are unrelated. In a series of papers, it has been shown that investor protection is important for financial markets (e.g. Shleifer and Wolfenzon (2002), and La Porta et al. (2002)). This literature suggests that financial development is low if investor protection is low. This is indeed the case in LDCs. Another part of the literature views low financial development as a part of the more general problem of low economic development. Similarly, while studying the low level of formal sector employment in LDCs, the emphasis has been mainly on the artificially high levels of wages,[3] the absence of infrastructure, the inappropriate choice of technology[4] etc.

In this paper we seek to fill this gap in the literature by examining the inter-

[2]The share of *non-corporate businesses* in total assets in USA in 1998 was 10.4% (pp. 186, Table 5.1, Bertant and StarrMcCluer, chapter 5 in Guiso et al. (2002)). Percentage of households with holdings in *business equity* in 1998 in USA was 11.5% (pp. 190, Table 5.3, op. cit.)

[3]In the Harris-Todaro model, for example, such high wages can be attributed to governmental regulations or the presence of unionized labor in the formal sector. Also see Fallor et al. (1993). Of course, the formal sector sometimes deliberately pays a higher wage rate so as to attract the best quality labor, or to reduce labor turn-over (see Ray (1998)).

[4]See Sen (1968) on the debate regarding the choice of appropriate technology.

connections between low employment in the formal sector and little financial intermediation. Our hypothesis is that *financial intermediation increases with the level of wage employment*. The basic idea is as follows. When economic agents get regular wage employment, they deposit their wealth in a bank. Otherwise they opt for self-employment, using their wealth to set up an owner managed enterprise (OME from now on). So they deposit a smaller fraction of their wealth in banks. Hence, bank deposits depend on the volume of formal sector employment. This linkage is central to our analysis and, as far as we are aware, has not been explored in the literature.

While most of our arguments apply to financial intermediation in general, our analysis was, to a large extent, motivated by the problems facing the banking sector. The reason is that in many LDCs, the banking sector is more important compared to non-bank financial intermediaries and the financial market. This can be attributed, at least partially, to the fact that there is reasonably strong protection of an investor as a bank depositor,[5] as compared to protection of an investor as an equity or (non-bank) debt holder. Henceforth, we will refer to banking and financial intermediation interchangeably.

In the context of the inefficiencies in financial intermediation, one factor that has received considerable attention is the large volume of non-performing assets (NPAs from now on) in the banking sector. Following their bad experiences in the past, the governments in many countries are now serious about avoiding NPAs. While NPAs undoubtedly constitute a serious problem, their importance may have been somewhat over-estimated. Leaving aside the distributional issues, NPAs are a serious problem if they are accompanied by allocative inefficiency. Since the issue is allocative inefficiency and not NPAs *per se*, we may, for simplicity, abstract from NPAs and focus on allocative inefficiency. The latter can, we will show, arise even in the absence of NPAs. Accordingly, we consider a scenario where there are no NPAs but there is, nevertheless, allocative inefficiency.

There has been some literature on the role of the banking sector in the

[5]The reason is the presence of public sector banks or deposit insurance. State banks are more common in low income countries (Figure 5, pp. 15, World Bank (2001)). Moreover, deposit insurance coverage is relatively generous in low income countries. The ratio of deposit insurance coverage to per capita GDP is more than 6 in India as compared to a figure of less than 4 for USA (pp. 108, World Bank (2001)).

economy.[6] Most of these papers, however, deal with developed economies. The usual framework is that of competition among banks and government regulations that drive managers to behave reasonably responsibly, barring some agency cost due to non-verifiable action. In this paper, however, we are concerned with a scenario in which public sector banks (PSBs from now on) dominate the banking sector. The crucial assumption is that there is a separation between ownership and management in the bank. Following Jensen and Meckling (1976), this problem is well recognized in the literature in the context of the corporate sector and private sector banking. In the context of the PSBs, the problem due to separation of ownership and management gets further aggravated. The reasons are as follows. First, monitoring of the bank managers in PSBs by the owner viz. the government is, *ceteris paribus*, weaker than in the case of the private sector. Second, bank managers are public sector officials who can rarely be dismissed. Third, in most LDCs, a borrower has, for all practical purposes, no access to the judiciary even if she can prove that she deserves to get a loan and has not got one (without bribing the bank officials).

In this paper we focus on one particular manifestation of such self-serving behavior by bank managers, forcing the entrepreneurs to select inefficient projects. While this aspect of banking is well known in the literature, the implications of this behavior seem to have been underestimated. Usually it is assumed that deposits are given exogenously so that the nature of banking affects only the allocation of *given* deposits. We will show that deposits are endogenous and therefore, the implications of bad banking can be more serious than they are usually thought to be.

Our framework is as follows. Consider an agent with some endowment of labor and capital. Suppose she has a job. She will obviously look for an optimal portfolio for her capital. This is the *standard finance problem*. But now suppose that she is, instead, unemployed and is likely to remain one. Will she forget her unemployment and consider the issue of optimal portfolio, or will she consider a portfolio that allows her to take care of both the wealth aspect as well as the employment aspect? We may refer to this as the *finance-cum-employment problem*. Investment in financial assets solves only her problem of choice of optimal portfolio. But she has another, possibly more, serious problem. She is

[6] See, among others, Allen and Gale (2000), Diamond (1984), Holmstrom and Tirole (1997), Stiglitz (1985, 1993), and Bencivenga and Smith (1991).

unemployed! So it is the finance-cum-employment problem that is relevant and not the standard finance problem. The latter is a familiar problem (following Markowitz (1952)). But the former is not. The question is - what solves the finance-cum-employment problem? Can an agent invest in such a way that there is a job as well as an optimal combination of risk[7] and return on capital? Yes, provided she invests little (possibly zero, as in our model) in financial assets and mostly in an OME in which she has a job. She is, in other words, self-employed. This is a typical LDC problem. This is where it differs from the standard finance problem that is relevant in the context of a developed country.

We build a simple model comprising three classes of agents viz. an entrepreneur, banks and households. The entrepreneur has two projects that require labor and capital. The entrepreneur has zero endowment of both labor and capital and must borrow money from the capital market and hire labor from the labor market, if she wants to start either project. A household is endowed with both labor and capital and, as mentioned before, she also has access to an OME which requires some capital investment, as well as labor. She can either opt for wage employment and put her wealth in the bank, or she can opt for the OME and invest the whole of her capital and labor in the OME.

The entrepreneur has access to two projects, good and bad, where the good project is more productive compared to the bad one. The bad project, however, yields a non-verifiable benefit to the entrepreneur. In case the bad project is chosen, the bank manager obtains a fraction of the private benefits accruing to the entrepreneur. We begin by showing that compared to the first best, the outcome is sub-optimal. This inefficiency can be traced to two sources. First, we have the choice of the bad, rather than the good project. Second, even under the bad project, the level of formal sector employment is less than optimal.

We then demonstrate that the interdependence between formal sector employment and the volume of financial intermediation may aggravate these inefficiencies. If the volume of financial intermediation was independent of the volume of formal sector employment, then the inefficiencies may have been less.

The above analysis also throws some light on one very important question: Why is one country rich, while another is poor? We show that the cost of financial intermediation can explain differences in income across countries. Another

[7]The treatment of risk is familiar in the literature. So we abstract from risk altogether in our simple model in order to focus on issues that are less familiar in the literature.

issue is that, in some cases, the developed countries tend to be less vulnerable than the LDCs to financial distress. For example, in the 1980s, the USA went through the savings and loan crises but it did not significantly affect the economy. Again, in 1987, there was a stock market crash in the USA which hardly affected the economy. On the other hand, in the case of East Asia in late 1990s, the financial crises had considerable impact on the real sector. Our analysis suggests the following answer. In developed countries most of the economy is in the formal sector. Unless the shock is relatively large, this continues to be the case even after the shock. Since the size of the formal sector is not affected, neither is the volume of financial intermediation, given our hypothesis that deposits depend on employment in the formal sector. Hence the economy is not affected. For LDCs, however, with financial distress the size of the formal sector declines, leading to a further fall in the volume of financial intermediation.

We then examine if the effects of bad banking can be overcome through corrective taxes. We show that an increase in taxes increases the size of the formal sector. In fact, a tax can be a corrective measure countering the problem of less than optimum employment in the bad project. However, it can never ensure that the good project is selected. Thus taxes can have only a partially corrective effect.

The plan of the paper is as follows. Section 2 introduces the basic model. In section 3 we solve the model and examine the role of the endogenous supply of deposits. Section 4 examines the implications of tax policies. We conclude in section 5.

2 The Basic Model

We consider a model with a single homogeneous output. The price of this good is normalized to 1. The model comprises three classes of agents viz. an entrepreneur, a bank and a number of identical, single-agent households. The economy consists of two sectors - the formal and the informal. The formal sector consists of the entrepreneur and the agents employed for a wage. The informal sector consists of the remaining agents, who are self-employed.

The Entrepreneur

The entrepreneur can invest in either one of two projects, G or B, both

requiring labor (L) and capital (K). Project returns are of two kinds, verifiable and non-verifiable. Project G yields a verifiable return of $gf(K,L)$ and no non-verifiable income, whereas project B yields a verifiable return of $qf(K,L)$ and a non-verifiable income of $pf(K,L)$. The amount $pf(K,L)$ represents the private benefit of the entrepreneur and can be interpreted as *tunneling* (see Johnson, et al. (2000)), i.e. the entrepreneur diverting a part of the output for private use.[8] The amount of capital and labor actually used in the project is verifiable, so that diverting capital or labor for private use is not possible.

The entrepreneur has zero endowment of both labor and capital. Hence she must borrow funds and hire labor if she wants to start a project.

Project G (respectively B) is a good (respectively bad) project in the sense that, for any given K and L, the aggregate return from G exceeds that under B. Formally, we have

Assumption 1. $g > q + p$.

We make the following assumption on the production function.

Assumption 2. $f(K,L)$ is twice differentiable, $f_L(L,K)$, $f_K(L,K) > 0$, $f_{LL}(L,K)$, and $f_{KK}(L,K) < 0$. Furthermore, $f_{LL}(y,y) + f_{LK}(y,y) < 0$, and $f_{KK}(y,y) + f_{LK}(y,y) < 0, \forall y > 0$.

Note that Assumption 2 is standard and is satisfied, for example, by all functions of the form $f(K,L) = (KL)^{\gamma}$, where $\gamma < \frac{1}{2}$. For explicit solutions, we will sometimes use $f(K,L) = (KL)^{\frac{1}{4}}$.

The Household Sector

The number of house-holds is normalized to 1. Every household has an endowment consisting of 1 unit of labor and 1 unit of capital. Thus the total labor endowment, as well as the total capital endowment in the economy equals 1. Hence, factors of production used in the formal sector (L,K) must satisfy the

[8] Note that q and p are taken to be exogenous. It is possible to consider an alternative model in which q and p (i.e. the extent of tunneling), are endogenous. However, since this formulation does not add too much to the economics of the paper, we refrain from describing this case here.

following feasibility condition:

$$0 \leq L, K \leq 1. \tag{1}$$

Every household has two options, either to work as a laborer with the entrepreneur and invest her capital optimally, or to work as self-employed, when she can run an OME requiring 1 unit each of labor and capital.[9] Whenever both the input levels are at least 1, the net return from her OME is s (> 0). Thus the total income to a household from operating the OME is s.

In order to formalize the idea that the informal sector is inefficient compared to the best practice technology in the formal sector, we have

Assumption 3. $gf(1,1) > s$.

This reflects the fact that firms in the formal sector find it easier, because of greater information and/or funds, to access technology and other complementary inputs. Furthermore, the formal sector in our model includes the entrepreneur, and the informal sector includes self-employed agents i.e. agents who are not employed for a wage. One view in the literature is that a professional entrepreneur has a comparative advantage in business (Schumpeter (1961)).

Because of transaction costs, households cannot lend directly to the entrepreneur. Thus in case a household agent works as a laborer in the formal sector, she earns a wage of w, and, by depositing her one unit of capital in the bank, a rental income of r (> 0), yielding her a total income of $w + r$.[10]

In order to ensure that the equilibrium involves some of the households opting for employment in the informal sector, we assume that $s > r$.

The households have neither any disutility from working, nor any utility from leisure. Thus for a household agent, her utility maximization exercise simplifies to income maximization. Hence, her labor supply curve is given by

$$\begin{cases} 0, & \text{if } s > w + r, \\ x, & \text{if } s = w + r, \\ 1, & \text{if } s < w + r. \end{cases}$$

[9] The endowment per household can be interpreted as the average endowment. It is not difficult to extend the model to allow for unequal endowments across households (including zero capital for some households). In that case, there would be owner-managed enterprises of varying sizes in the informal sector.

[10] Thus the implicit assumption is that the household sector does not have a storage technology for capital, or, if such a technology exists, then the return is lower compared to r.

where $x \epsilon \{0, 1\}$. Given that the number of households is normalized to 1, the aggregate labor supply for the formal sector (L) is 0, if $s > w + r$, and 1, if $s < w + r$. If $s = w + r$, then the labor supply can take any value in the interval $[0, 1]$. In that case the actual employment in the formal sector will be determined by the level of demand.

Note that the households who work in the formal sector are the only source of capital for the entrepreneur who borrows from the bank. The capital of the self-employed households are used up in their own OMEs. Since there are no other sources of capital, the supply of deposits $D = L$.[11] Since the cash reserve ratio of the bank is zero by assumption, and the entrepreneur can not borrow more than the deposits of the bank, it follows that $K \leq D$.

The Banking Sector

The situation that we are trying to model is one where there are a number of public sector banks operating in the formal sector. For ease of exposition we will, however, consider one representative bank. The rate of interest r is given exogenously.[12]

The bank is run by a manager, whose objective is to maximize her own income. In case the entrepreneur opts for project B, the bank management obtains a part of the private benefit $(1-\alpha)pf(K, L)$, while the entrepreneur obtains $\alpha pf(K, L)$, where α is an index of the bargaining power of the entrepreneur and $0 < \alpha < 1$.[13] In case project G is chosen, however, the bank management does not obtain any private benefit.

The problem of 'bad' banking arises since the bank manager, in her own interest, has an incentive to make the entrepreneur choose the bad project.

[11] Note that there is a similarity between our model and Clower (1965). The latter had interpreted Keynes' General Theory as a case of feedback from the labor market to the goods market. Similarly, in our model, there is a feedback from the labor market to the financial sector. In Clower (1965), when unemployment is high, there is low demand for goods. In our model, when self-employment (instead of unemployment) is high, then there is low supply of deposits to the banks.

[12] For many less developed countries, this is quite realistic. Moreover, in this paper we focus on establishing a relationship between financial intermediation and wage employment, rather than between financial intermediation and the rate of interest.

[13] The exact value of α would depend on various things, e.g. the nature of the bargaining process, the nature of the technology, the social norms etc. For simplicity we assume that α is exogenously given.

This is possible since, as the only source of capital, the bank manager has considerable bargaining power vis-a-vis the entrepreneur.

Clearly, bad banking can have many other dimensions. One well known aspect is that of NPAs.[14] We would like to argue that while this problem is important, it does not capture all potential problems associated with 'bad' banking. While it is not too difficult to incorporate NPAs in our model, we would like to stress that even in the absence of NPAs, there can be difficulties. Accordingly, we assume that bank managers maximize their income subject to a zero NPA condition.

The zero NPA condition implies that the entrepreneur repays the loan fully. This is possible only if the verifiable income of the entrepreneur satisfies the following condition:

$$qf(K,L) - wL - rK \geq 0.$$

Note that since only the verifiable output can be used for repaying the bank loan, the zero NPA condition is not written as $(q+\alpha p)f(K,L) - wL - rK \geq 0$.

3 Bad Banking

Before we consider the implications of bad banking, let us first consider the first best outcome which serves as a benchmark for the equilibrium analysis.

First Best Outcome

Clearly, under the first best outcome the whole of the capital must be invested, and all labor must be utilized. Moreover, given Assumption 1, project G must be chosen in the formal sector. Since L denotes the employment level in the formal sector, the volume of labor engaged in self-employment must be $(1-L)$. Given the technology, the output in the informal sector is $(1-L)s$. Moreover, the amount of capital employed in the informal sector is exactly equal to employment in the informal sector, i.e. $1-L$. Thus, in the formal sector $L = K$. Given (1), the first best solves the following program:

$$\max_{L,K} \quad gf(K,L) + (1-L)s \text{ s.t. } K = L \leq 1. \tag{2}$$

[14] In India, the legal aspect, as well the enforcement of loan recovery have been made tougher in recent times. In fact, the ratio of NPAs to assets has come down marginally in the last few years (Datar (2002)).

Let (L^g, K^g) denote the first best solution. Clearly, given Assumption 2, the second order condition is satisfied.

Market Equilibrium

Note that the interaction between the bank management and the entrepreneur involves a bilateral monopoly like situation. The bank management, as the monopoly supplier of the capital, has some bargaining power. On the other hand, given that the bank management has a positive payoff only if the entrepreneur chooses project B, the entrepreneur also has some bargaining power. As is well known, under bilateral monopoly, the equilibrium is indeterminate. Hence in order to pin down the solution, we assume that the market equilibrium involves the following features:[15]

(i) The entrepreneur selects project B, which allows the bank management to earn a positive income.

(ii) The entrepreneur chooses a level of capital $K = D$, since, given $D = L$, this maximizes the income of the bank management $(1 - \alpha)pf(K, L)$.[16]

(iii) The entrepreneur chooses K, L and w so as to maximize her profit, subject to conditions (i) and (ii), and other feasibility conditions (e.g. the households' participation constraint).[17]

We can now write down the market equilibrium condition more formally. The market equilibrium consists of a vector (w, K, L) that solves the following problem:

$$\max_{L,K,w} \quad (q + \alpha p)f(K, L) - wL - rK, \quad \text{s.t.}$$

$$K = L \leq 1, \tag{3}$$

$$qf(K, L) - wL - rK \geq 0, \tag{4}$$

$$w + r \geq s. \tag{5}$$

Recall that (4) represents the no NPA condition, whereas (5) represents the

[15] Of course, one can use a somewhat different set of assumptions while pinning down the outcome. That, however, would not change our results qualitatively.

[16] The bank management would have an even greater incentive to impose the condition that $K = D$, in case the government imposes a no profit condition for the bank, i.e. $r(K - D) = 0$, where it is assumed that the lending rate and the borrowing rate are equal.

[17] Given that the entrepreneur acts as a monopolist in the formal sector, it is natural to assume that it can select the level of w as well.

participation constraint of the household.[18]

We then establish some preliminary observations. Let (L^b, K^b, w) denote the equilibrium outcome.

(i) First, note that in equilibrium the participation constraint of the household must be satisfied with an equality, i.e. $w + r = s$. Suppose to the contrary that $w > s - r$. If the entrepreneur announces a wage rate of $w - \epsilon \geq s - r$, then, for the same value of L^b, the entrepreneur's profit will be strictly higher, which is a contradiction.[19]

(ii) Next, observe that (L^b, K^b) does not lead to bankruptcy provided the verifiable income is sufficient to cover the rental and the wage bills i.e. condition (4) holds. Formally, we assume that $qf(L^b, L^b) - sL^b \geq 0$. Note that, as argued earlier also, this is not meant to suggest that NPAs are not a serious problem in reality. It basically allows us to abstract from the NPA problem, and focus on other aspects of bad banking that we are interested in.

Given the above two observations, the market equilibrium problem simplifies to the following:

$$\max_{L} \quad (q + \alpha p) f(L, L) - sL, \quad \text{s.t. } L \leq 1. \tag{6}$$

Next, define $\hat{\alpha}$ by the condition[20]

$$(q + \hat{\alpha} p)[f_L(1, 1) + f_K(1, 1)] = s. \tag{7}$$

Clearly, the solution is given by

$$L^b = \begin{cases} 1, & \text{if } \alpha \geq \hat{\alpha} \\ \hat{L}, & \text{if } \alpha < \hat{\alpha}, \end{cases} \tag{8}$$

[18] In fact, we shall argue that in equilibrium, (5) is satisfied with an equality, so that $w + r = s$. Hence the households are indifferent between working in the two sectors. Thus employment in the formal sector is determined from the demand side. Hence we refrain from introducing any additional notations for the demand of labor.

[19] One implication of the above result is that the level of w, though endogenous, is, in equilibrium, always set equal to $s - r$.

[20] From (7), it follows that

$$\hat{\alpha} = \frac{s - q[f_L(1, 1) + f_K(1, 1)]}{p[f_L(1, 1) + f_K(1, 1)]}.$$

Clearly,

$$0 < \hat{\alpha} < 1 \Leftrightarrow q[f_L(1, 1) + f_K(1, 1)] < s < (q + p)[f_L(1, 1) + f_K(1, 1)].$$

where $\hat{L}$ is the interior solution, given implicitly by the condition[21]

$$(q + \alpha p)[f_L(L, L) + f_K(L, L)] = s, \quad \alpha < \hat{\alpha}. \tag{9}$$

Let x^b and x^g denote the aggregate output under bad banking and the first best outcome respectively. Since $(q + \alpha p) < (q + p) < g$, it follows from (2) and (6), that the market equilibrium is different from the first best i.e. $x^b < x^g$. Observe that $L^b \leq L^g$, where $L^b = L^g$ if the constraint $L \leq 1$ is binding. We have, thus, established

Proposition 1. *Let Assumptions 1- 3 hold. Then the market equilibrium is sub-optimal i.e.* $x^b < x^g$*, and the equilibrium level of employment in the formal sector is less than or equal to that under the first best outcome i.e.* $L^b \leq L^g$.

It is easy to show that the first best outcome can be attained if the entrepreneur has *direct* access to capital (and labor) from households.

It is also easy to check that, if $f(K, L) = (KL)^{\frac{1}{4}}$, then

$$L^b = K^b = \min\left[\frac{(q + \alpha p)^2}{4s^2}, 1\right] \leq \min\left[\frac{g^2}{4s^2}, 1\right] = L^g = K^g. \tag{10}$$

Since aggregate output is the sum of output produced in the formal sector and that produced in the informal sector, we have

$$x^b = (q + p)f(K^b, L^b) + (1 - L^b)s < gf(K^g, L^g) + (1 - L^g)s = x^g. \tag{11}$$

So far we have shown that under bad banking, output in an economy is sub-optimal and employment in the formal sector under bad banking is less than or equal to that in the first best case. Next, we will compare two economies which differ in the degree of bad banking.

3.1 Cross-country Comparison

We then use our model to comment on a very important question - why are some countries rich, while others are poor?

We may interpret $(1-\alpha)$ as *the cost of financial intermediation.* If $(1-\alpha) > (1 - \hat{\alpha})$, then part of the labor force is employed in the informal sector. For

[21] This equation follows from the first order condition after using $L = K$. Note that for $\alpha \geq \hat{\alpha}$, $L = 1$, i.e. self-employment is zero and all employment is in the formal sector.

reasons that will become clear soon, we interpret $(1-\hat{\alpha})$ as *the threshold of vulnerability*.

Consider two countries, A and B, which are identical in every respect except the cost of financial intermediation, $1-\alpha$. In what follows, α^i will refer to α in country i.[22] Let country A (respectively B) be characterized by $1-\alpha^A$ (respectively $1-\alpha^B$). Suppose that $\alpha^A > \widehat{\alpha} > \alpha^B$. Thus country B has a greater cost of financial intermediation. Note that, in country A, the whole of the labor force is in the formal sector, whereas, in country B, it is divided among the formal and the informal sectors. It immediately follows that the welfare level in country A is greater than that in B, i.e. $x^A > x^B$.

It is often suggested that LDCs tend to be more vulnerable to deterioration in the financial sector as compared to developed countries. Why? In the context of our model, in country A, if $(1-\alpha^A)$ increases (up to a point i.e. $1-\hat{\alpha}$), output is not affected. But in country B, a rise in $1-\alpha^B$ affects output adversely. We will use $-\frac{\partial x}{\partial(1-\alpha)}$ as the measure of vulnerability of an economy to a deterioration in financial intermediation. Formally, $-\frac{\partial x^B}{\partial(1-\alpha^B)} > -\frac{\partial x^A}{\partial(1-\alpha^A)} = 0$. So country B is not only poor, but it is also vulnerable to deterioration in financial intermediation. Thus despite both the countries having the same endowment and technology, greater cost of financial intermediation in country B implies that it is poorer, as well as more vulnerable compared to country A.

We then consider comparative statics on s. What is the effect of a change in s on the vulnerability of the economy in country B? If $f(K,L) = (KL)^{\frac{1}{4}}$ then, it is easy to check that $-\frac{\partial^2 x^B}{\partial s \partial(1-\alpha^B)} < 0$. In other words, the magnitude of vulnerability $(-\frac{\partial x}{\partial(1-\alpha)})$ decreases as s increases. The intuition is straightforward. A shock in the financial sector adversely affects the economy. It results in a shift of allocation from the (efficient) formal sector to the (inefficient) informal sector. In such a situation, it helps to have high productivity in the informal sector. The higher is s, the less is the impact of a deterioration in financial intermediation.

Summarizing the above discussion, we have

Proposition 2. *Consider countries A and B which are identical in every respect except that* $\alpha^A > \widehat{\alpha} > \alpha^B$.

(i) Then $x^A > x^B$. *Moreover, while country B is vulnerable to an increase*

[22] For other variables we follow a similar notation.

in the cost of financial intermediation, i.e. $-\frac{\partial x^B}{\partial(1-\alpha^B)} > 0$*, country A is not, i.e.* $-\frac{\partial x^A}{\partial(1-\alpha^A)} = 0$.

(ii) If $f(K,L) = (KL)^{\frac{1}{4}}$ then*, vulnerability of B decreases as the productivity of the informal sector rises, i.e.* $-\frac{\partial^2 x^B}{\partial s \partial(1-\alpha^B)} < 0$.

The formal proof of Proposition 2 is given in the Appendix.

Proposition 2 suggests that developed countries are not vulnerable to financial shocks unless they are very large (i.e. $1-\alpha^A$ increases beyond $1-\hat{\alpha}$ if we identify country A with a developed country[23]). For example, in the context of the Great Depression of 1930s, Bernanke (1983) suggests that the weaknesses in the financial sector were large enough to affect the real sector in USA.

We then provide a decomposition analysis of the inefficiencies involved with bad banking. Let the inefficiency be measured by $L^g - L^b$. Assuming that $\alpha < \hat{\alpha} < 1$, and $f(K,L) = (KL)^{\frac{1}{4}}$ then, from (10), we can decompose $L^g - L^b$ as follows:

$$\begin{aligned} L^g - L^b &= \frac{g^2}{4s^2} - \frac{(q+\alpha p)^2}{4s^2} \\ &= \left[\frac{g^2}{4s^2} - \frac{(q+p)^2}{4s^2}\right] + \left[\frac{(q+p)^2}{4s^2} - \frac{(q+\alpha p)^2}{4s^2}\right] \end{aligned}$$

Note that the first term within square brackets represents the pure inefficiency effect of a switch from a good project to a bad project, the second term within square brackets represents the inefficiency arising out of the fact that the entrepreneur does not obtain the full value of the project, with both the terms being positive in sign.[24]

3.2 Endogenous Supply of Deposits

One important aspect of this paper is what we call the endogenous supply of deposits. In this sub-section we argue that the endogeneity of deposits can

[23] It is true that even in developed countries, self-employment is not negligible (Blau (1987)). The self-employment in many developed countries is, however, more comparable with the self-employment of the entrepreneur in our model (in the sense that the productivity of the self-employed agents in the developed countries is quite high) than with the self-employment of households in the informal sector in LDCs.

[24] At the cost of some additional notation, a similar decomposition analysis can be performed even if a general production function is used.

make the economy more sensitive to any change in the cost of intermediation i.e. $1-\alpha$.

We examine the impact of an increase in α (so that the degree of bad banking decreases) on the level of formal sector employment. We first consider the present model where the supply of deposits and hence capital is endogenous. We then repeat this exercise for a hypothetical economy where the level of capital is exogenously kept constant at the initial capital level K^b.

We need the following technical assumption before we can proceed further.

Assumption 4. $f_L(a,a)[f_{KK}(a,a)+2f_{LK}(a,a)] > f_K(a,a)f_{LL}(a,a), \forall a > 0$.

Note that Assumption 4 is satisfied, for example, by all functions of the form $f(K,L) = (KL)^\gamma$, where $\gamma < \frac{1}{2}$.

First consider the present model. Totally differentiating equation (9) with respect to α, K and L, and using the fact that $dK = dL$, we obtain that

$$\frac{dL^b}{d\alpha} = \frac{-p[f_L(K^b,L^b) + f_K(K^b,L^b)]}{(q+\alpha p)[f_{LL}(K^b,L^b) + f_{KK}(K^b,L^b) + 2f_{LK}(K^b,L^b)]} > 0, \quad \alpha < \hat{\alpha} \tag{12}$$

where the inequality sign for the derivative follows from Assumption 2.

We then consider a benchmark economy (without a bank) where the representative entrepreneur has an exogenously given capital level of K^b, every household has one unit of labor but no capital, the wage rate is $\tilde{w}$ and the rate of interest is $\tilde{r}$, where $\tilde{w}$ and $\widetilde{r}$ are given exogenously. We want to calibrate this hypothetical economy such that the equilibrium level of employment is L^b. To this end, let

$$\tilde{w} = s - (q+\alpha p) f_K(K^b, L^b).$$

In this hypothetical case, the problem is

$$\max_L \pi = (q+\alpha p)\, f\left(K^b, L\right) - \tilde{w}L - \widetilde{r}K^b.$$

Since the optimization is with respect to L only, the level of $\widetilde{r}$ does not really matter.

Note that in the hypothetical economy, capital is given exogenously. In our model, on the other hand, capital is endogenous. Capital available for the formal sector is equal to deposits of the intermediary, and deposits come from agents who are engaged in wage employment.

Clearly, the first order condition for the entrepreneur in this hypothetical economy is given by

$$(q + \alpha p) f_L(K^b, L) = \tilde{w}. \tag{13}$$

Let L^* denote the optimal employment in this hypothetical economy. Under the given calibration, $L^* = L^b$. Next, totally differentiating equation (13) with respect to α and L, we obtain

$$\frac{dL^*}{d\alpha} = \frac{-p f_L(K^b, L^b)}{(q + \alpha p) f_{LL}(K^b, L^b)} > 0, \tag{14}$$

where the inequality sign follows from Assumption 2. From Assumption 4, it is easy to see that $\frac{dL^b}{d\alpha} > \frac{dL^*}{d\alpha}$ (see (12) and (14)). Summarizing the above discussion, we obtain

Proposition 3. *Suppose that $\alpha < \hat{\alpha} < 1$, and let Assumptions 1-4 hold. Then an improvement in financial intermediation has a greater effect on employment if deposits are endogenous than if they are exogenous. Formally, $\frac{dL^b}{d\alpha} > \frac{dL^*}{d\alpha}$.*

The intuition behind the above proposition is simple. In our model the self-employed agents have endowment of capital as well. When they get a job in the formal sector, they deposit their capital in a bank. The latter makes it available to the entrepreneur. This additional stock of capital increases the demand for labor, compared to the case where such a stock is not available or perceived to be unavailable.

Typically LDCs are perceived as capital constrained and labor abundant economies (Lewis (1954)). It is in line with this perception that we considered the alternative problem in which capital is fixed and labor is variable. In our model, on the other hand, we recognize that any improvement in the system leads to two effects. One is increase in employment (as in the hypothetical economy), and the other effect is that capital mobilized also goes up (which is absent in the hypothetical economy). The additional capital comes from those agents who close their OMEs, and shift to the formal sector. The additional capital, in turn, further increases employment.

The role of Assumption 4 is as follows. There are two differences between our model and the hypothetical economy. *First*, as mentioned already, capital is endogenous in our model whereas it is exogenously given in the hypothetical

economy. *Second*, the formal sector in our model is constrained to increase labor and capital in a fixed ratio, whereas there is no such constraint in the hypothetical economy. Assumption 4 essentially ensures that the first effect dominates, hence the result.

So far we have seen how bad banking leads to inefficiency. Apart from the fact that project B is chosen, bad banking has the effect that it reduces the size of the formal sector. Can we have a tax policy that can correct this distortion? We turn to this question in the next section.

4 Tax Policy and Bad Banking

In our model, the government cannot prove that a bad project has been selected. Therefore, it is not possible to prevent entrepreneurs from choosing such projects. However, through an appropriate choice of tax policies it may be able to affect the choice of employment in the formal sector.

Let t be the tax rate on profits of the entrepreneur. We assume that only the verifiable income can be taxed. There is no tax on the income of the self-employed agents, or on the capital or labor income of the employees. Thus the entrepreneur must pay a tax of $t.\max\{f(K,L)-wL-rK,0\}$. Observe that in case of bankruptcy the firm does not have to pay any taxes. To ensure that in equilibrium, the bank does not have any non-performing asset, we assume that $qf\left(L^b(t), L^b(t)\right) - sL^b(t) \geq 0$, where $L^b(t)$ is the equilibrium employment in the formal sector for a given tax rate t. Similarly, let $K^b(t)$ denote the capital in the formal sector, given the tax rate t. Recall that a similar zero NPA condition was used in the previous section (see (4)).

In the previous section, we considered the general case i.e. $L \leq 1$. In the context of a developed country, it is reasonable to consider a corner solution (see footnote 22), whereas in an LDC, typically, $L < 1$. Henceforth, we focus on the interior solution. Formally, we will need the following parametric restriction to ensure an interior solution: $\left[q + \frac{\alpha p}{1-t}\right](f_K(1,1), f_L(1,1)) < s$.

The entrepreneur's decision problem is the same as before, except that the optimization problem in (6), is replaced by

$$\max_L \pi = (1-t)[qf(L,L) - sL] + \alpha p f(L,L). \tag{15}$$

Let t^* denote the optimal tax rate. The formal result is as follows.

Proposition 4. *Let Assumptions 1 - 3 hold. Employment in the formal sector $L^b(t)$ is increasing in the tax-rate t. Furthermore, $t^* = 1-\alpha$ and $x^b(t^*) < x^g$.*

The proof is given in the appendix.

Note that we have the somewhat surprising result that an increase in taxes increases the size of the formal sector. The intuition is as follows. Under this framework, only the entrepreneur's net verifiable income is taxed. Hence, in effect, only the verifiable part of her gross payoff is taxed, while she obtains a tax deduction on the whole of the labor employed by her. Thus, with an increase in tax rate, there is a greater incentive to increase employment.

Moreover, there is an optimal tax rate $t^* > 0$ so that a tax is not necessarily distorting. In fact, a tax can be a corrective measure countering the distortionary effect of the moral hazard problem. To see this, recall that the entrepreneur obtains only a fraction α of her non-verifiable output. Since the tax is imposed on the verifiable return of the entrepreneur, the effect of taxation and bad banking together is that the entrepreneur gets a fraction $(1-t)$ of the verifiable return, and a fraction α of the non-verifiable return on a given project. Observe that if the entrepreneur gets a fraction α of both the verifiable and the non-verifiable output, then there would be no distortion at the margin, given the project choice. Therefore, given a leakage from the non-verifiable return, an additional leakage from the verifiable return is a corrective measure up to a point. In our model, a tax rate up to $(1-\alpha)$ acts as a corrective measure. If the tax rate exceeds this rate, then it becomes counter-productive.

Finally note that taxes can only rectify the problem of less than optimum employment in the bad project. It can never ensure that the good project is selected.

5 Conclusion

In this paper we demonstrate that an increase in the cost of financial intermediation may result in a shift of factors away from the (efficient) formal sector to the (inefficient) informal sector. This *ongoing* misallocation of resources may possibly be as serious than the more familiar banking crises problem,[25] the

[25]This has received considerable attention following Diamond and Dybvig (1983).

problem of NPAs, or the moral hazard problem arising from deposit insurance.

We have argued that the small size of the formal sector in most LDCs can be linked to an apparently unrelated factor, viz. financial intermediation. In the literature, however, the small size of the formal sector is often attributed to labor laws which make employing labor in the formal sector relatively unattractive. The high capital-labor ratio in the formal sector in LDCs is often cited as evidence.

While labor laws are undoubtedly important, it is possible that the high capital-labor ratio observed in the formal sector in LDCs may be more apparent than real. Let us assume, not too unrealistically, that the formal sector in the LDC consists of two parts, the legal and the illegal. Given that the legal sector is subject to labor laws, while the illegal sector is not, there is an incentive to shift some activity to the illegal sector.[26] In that case an entrepreneur has an incentive to pretend that she is using all the capital in the legal sector, and report the use of labor in the legal sector correctly.[27] This would lead to a reported capital-labor ratio which is apparently very high, but only because some of the capital actually employed in the illegal sector is being reported as being employed in the legal sector.

In our model, there is no difficulty due to labor laws or inappropriate technology. Yet, the employment in the formal sector is low. This is due to bad banking.

In conclusion, we show that for efficient financial intermediation, it is not sufficient that banking is 'safe' (in the sense that there is deposit insurance). Safe banking only ensures that there is a safe outlet for an household agent's wealth, but it does not ensure the availability of a job, which in turn implies that

[26] Clearly there is also a cost of operating in the illegal sector. This may be due to the cost of hiding, bribing, and so on. So the entrepreneur seeks an optimal allocation between the legal and the illegal sector.

[27] The asymmetric treatment of labor and capital is motivated by the following considerations. Observe that given the labor laws, it is not rational to overstate the use of labor in the legal sector. So we need to explain why the use of labor is not understated. Firstly, there is a risk that laborers may leak out the information if number of workers is understated in the legal sector. In the case of capital, on the other hand, there is no similar risk. Secondly, it is easier to overstate the use of capital because typically what is relevant is not the number of machines but the value of machines. The latter is easier to overstate than the number of machines. In the case of labor, on the other hand, it is the number of laborers, which is relevant. And that is not easy to hide. Thirdly, in our model, the entrepreneur borrows funds from the bank. Therefore, there is a need to pretend that it is all used in the legal sector.

the agent has enough funds to deposit in the banks. If banking is, in addition, also 'good', then it will increase formal sector employment, which will, in turn, increase deposits.

From a policy perspective, our analysis suggests that apart from other considerations, governance in the banking sector needs to be improved to tackle the problem of large employment in the informal sector. Further, banking sector reform has to go beyond ensuring that banks do not have NPAs, which has been the focus recently. Moreover, while taxation policies may partially solve the inefficiencies arising out of bad banking, these cannot achieve complete efficiency. Hence policymakers in LDCs need to improve the financial system.

6 Appendix

Proof of Proposition 2. For expositional reasons, in what follows we do not explicitly write that $f(.)$, $f_L(.)$, $f_K(.)$, $f_{KK}(.)$, $f_{LL}(.)$ and $f_{LK}(.)$ are all functions of $L^b(\alpha)$ and $K^b(\alpha)$.

From (8) and (12), the following comparative statics result follows:

$$\frac{\partial L^b}{\partial \alpha} = \begin{cases} 0, & \text{if } \alpha \geq \hat{\alpha} \\ \frac{-p(f_L+f_K)}{(q+\alpha p)(f_{LL}+2f_{LK}+f_{KK})} > 0, & \text{if } \alpha < \hat{\alpha}. \end{cases} \tag{16}$$

From (11),

$$\frac{\partial x^b}{\partial \alpha} = \left[(q+p)(f_L+f_K) - s\right]\frac{\partial L^b}{\partial \alpha}, \tag{17}$$

after using $K^b = L^b$. Hence, from (16) and (17), we have

$$\frac{\partial x^b}{\partial \alpha} = \begin{cases} 0, & \text{if } \alpha \geq \hat{\alpha} \\ \frac{-[(q+p)(f_L+f_K)-s]p(f_L+f_K)}{(q+\alpha p)(f_{LL}+2f_{LK}+f_{KK})}, & \text{if } \alpha < \hat{\alpha}. \end{cases} \tag{18}$$

If $f(K,L) = (KL)^{\frac{1}{4}}$, then from (18), we get

$$\frac{\partial x^b}{\partial \alpha} = \frac{p(q+p)(L^b)^{\frac{1}{2}}}{q+\alpha p} - \frac{2sp}{q+\alpha p}L^b, \ \forall \alpha < \hat{\alpha}.$$

Next, using (8) and substituting for L^b from (10), we obtain

$$\frac{\partial x^b}{\partial \alpha} = \frac{p^2(1-\alpha)}{2s}, \ \forall \alpha < \hat{\alpha}.$$

This implies that $\frac{\partial^2 x^b}{\partial s \partial \alpha} < 0$, $\forall \alpha < \hat{\alpha}$. ■

Proof of Proposition 4. For expositional reasons, in what follows we do not explicitly write that $f(.)$, $f_L(.)$, $f_K(.)$, $f_{KK}(.)$, $f_{LL}(.)$ and $f_{LK}(.)$ are all functions of $L^b(t)$ and $K^b(t)$.

From (15), the first order condition is

$$\left[q + \frac{\alpha p}{(1-t)}\right](f_K + f_L) = s. \tag{19}$$

This gives the solution $L^b(t)$ implicitly. It is easy to check the following comparative statics result:

$$\frac{\partial L^b}{\partial t} = \frac{-(f_K+f_L)\alpha p}{(1-t)^2[f_{KK}+2f_{KL}+f_{LL}]} > 0, \tag{20}$$

where the inequality sign follows from Assumption 2. Next, consider the aggregate output. From (11), the optimum tax rate t^* is given by

$$\frac{\partial x^b}{\partial t} = \left\{(q+p)[f_K + f_L] - s\right\}\frac{\partial L^b}{\partial t} = 0,$$

after using the fact that $dL^b = dK^b$. Since $\frac{\partial L^b}{\partial t} > 0$ (see (20)), it follows that

$$(q+p)\left[f_L + f_K\right] - s = 0.$$

Finally using (19), we obtain

$$t^* = 1 - \alpha.$$

■

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