

# Financial Liberalization, Financial Restraint, and Entrepreneurial Development

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## Abstract

This paper considers the effects of financial sector reform on entrepreneurial development with a focus on identifying policies appropriate for fostering entrepreneurial discovery and learning. Using a simple model of occupational choice with moral hazard, it analyzes the effects of *Financial Liberalization* policies on the development of industrial entrepreneurship. The analysis shows that in a fully liberalized and competitive banking economy (i) banks may fail to finance potential industrial entrepreneurs because of poaching externality, and (ii) systematically favor short-term projects with front-loaded returns at the expense of projects with strong learning effects. We show that two types of policies are helpful in escaping from a no entrepreneurial experimentation equilibrium: (1) intersectoral policies that improve the relative profitability of new industrial lending and (2) intertemporal policies that aim to ensure that enough share of the net present value of rent on successful entrepreneurship can be appropriated by the financier bank. Among intersectoral policies, a tax on the deposit interest rate coupled with a subsidy to the new industrial financing works better than simple deposit rate control policies for entrepreneurial discovery. Among intertemporal policies, a dual track policy where competition is preserved in the lending to competing activities (agriculture) but limited duration monopoly is awarded to industrial lending is shown to be effective in inducing banks to experiment with new industrial entrepreneurs.. In a dual track regime, the government can use a tax on second period lending rate to eliminate the distortion resulting from the constraint faced by a bank because of time inconsistency. While deposit rate policies can encourage entrepreneurial discovery in a competitive banking economy, it is not effective in weeding out short-termism in project choice. The dual track policy can be especially useful for reducing the bias against the projects with low initial returns but strong learning and productivity gains later. Our analysis thus shows that well-designed deposit rate policies and temporary restriction on competition in banking as advocated recently in the *Financial Restraint* paradigm are appropriate when the focus of development strategy is the discovery of entrepreneurial talents and stimulating dynamic learning.

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## (1) Introduction

The *Financial Liberalization* approach that grew out of the critique of *Financial Repression* in developing countries in 1950s and 1960s (McKinnon (1973) and Shaw (1973)) has become a corner-stone of the market-oriented development strategy of the last few decades. Financial liberalization advocates a free market determination of interest rates and increased competition in the financial sector. A liberalized and competitive financial market is viewed as a necessary and enabling factor for the success of private sector led development. In fact, the combination of privatization and financial liberalization has become no less than a new orthodoxy in both theory and practice of development by early 1980s. However, a curious aspect of this development strategy is that, until recently, it largely ignored the most critical factor in a private sector led development, the role of entrepreneurs.<sup>2</sup> As a corollary, the implications of financial liberalization for entrepreneurial development are treated only tangentially, if at all. This paper develops a simple two-sector occupational choice model with moral hazard to explore what kind of financial sector reform policies are appropriate for discovery of entrepreneurial talents and fostering learning in the industrial sector of a developing economy.

The standard approach, both in theory and policy of development, has been to assume (implicitly or explicitly) that either there exists a repressed entrepreneurial class which can be unleashed by reducing government intervention, or a new entrepreneurial class will emerge spontaneously in response to liberalization without any significant time lag. For example, in a very influential book on *financial repression*, McKinnon (1973) assumes that there are household-entrepreneurs dispersed in the rural economy each with an idiosyncratic indivisible investment opportunity. A segmented capital and financial market prevents realization of highly profitable indivisible investment opportunities. In this framework there is no dearth of entrepreneurship, the problem lies with government intervention in financial market that hinders efficient allocation of resources across sectors and also stunts financial mobilization. The implicit assumption of a well-developed private entrepreneurial class has played a critical role in the policy advice of the international

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<sup>2</sup>There are alternative perspectives in the literature about the role of entrepreneurs in an economy. For Schumpeter, entrepreneurs are innovators; for Knight, they are basically risk-takers. The concept of entrepreneurship used here is different from the Schumpeterian view and closer to the Knightian perspective. The entrepreneurs in the developing countries are imitators rather than innovators. The critical aspect of good entrepreneurship is the capability to organize, adapt and manage a new venture or new technology, new in the context of the country but borrowed from other developed countries. The entrepreneur in a developing country is thus a risk taker, but the risk is due to the unproven entrepreneurial skill and unfamiliarity with a new technology.

organizations like World Bank and IMF also, especially in the decades of 1980s and early 1990s.

<sup>3</sup> Over the last few decades, under the auspices of IMF and World Bank sponsored structural adjustment programs, a large number of developing countries have pursued massive privatization. The growth experience of the private sector has, however, been largely disappointing; the private investment had been sluggish in a large number of countries for a long time following privatization (Serven and Solimano (1994), Chibber et. al., 1992). The standard explanation of slow investment response is that because of macro-economic instability the option value of not committing resources into irreversible investment has been high, and private investors were holding back. But as the evidence accumulated showing that investment sluggishness remained a problem even in economies with stable macro-economic environment (Caprio, 1994, Serven and Solimano, 1994), the plausibility of macro-economic instability hypothesis became suspect. An alternative explanation which has been largely ignored is that the disappointing performance of the private investment reflects a deep-seated structural problem in the economy, the absence of a well-developed entrepreneurial class.

This paper addresses two issues central to the development of industrial entrepreneurship in developing countries where the entrepreneurial base with proven capability is very small. They are: (i) the discovery of entrepreneurial talents, and (ii) incentives for entrepreneurial learning. In contrast to the standard adverse selection models of credit markets in the tradition of Stiglitz and Weiss (1981), we start from the observation that the first order problem for the development of industrial entrepreneurship in a developing country is one of revelation and accumulation of information capital, not the asymmetry of information between the bank and an entrepreneur. In the standard models of credit market, the entrepreneur knows her own type, but the bank does not. However, in a developing country, the set of people who know their entrepreneurial type is extremely small. The more realistic assumption, in this context, is one of ‘symmetric ignorance’ where both bank and the potential entrepreneur do not know the entrepreneurial type.<sup>4</sup> The critical policy issue from this perspective is what kind of financial sector reform will foster experimentation with new entrepreneurs by the banks. The discovery of good entrepreneurs from a vast pool of potential candidates in a developing country may, however, prove extremely difficult due to number of factors including lack of collateral, risk aversion, and time preference (impa-

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<sup>3</sup>There has, however, been a recent revival of interest in the development of private entrepreneurship, especially in the context of transition economies. See, for example, McMillan and Woodruff (2002).

<sup>4</sup>This symmetric ignorance assumption is, however, standard in the occupational choice literature in the tradition of Kanbur (1979) and Kihlstrom and Laffont (1979).

tience)as emphasized in the traditional literature on occupational choice and entrepreneurship. While acknowledging the importance of these factors, we focus on the implications of *inalienability* (Hart and Moore, 1994) of entrepreneurial capital which has largely been ignored in the discussion of financial sector reform policies in developing countries. The return to the discovery of a good industrial entrepreneur is spread over time, and the banks might find it difficult to appropriate adequate share of the future returns to justify the risk taking because of *inalienability* of entrepreneurial capital. This appropriability problem becomes especially severe as the banking sector becomes more competitive. The negative effects of competition in the financial sector on new entrepreneurs due to *poaching externality* (i.e., bidding for good entrepreneurs once the information is revealed) is well recognized in the literature on developed countries (for a survey, see Cetorelli (2001)).<sup>5</sup> More important in the context of developing countries is the implication that, contrary to the privatization-financial liberalization view of development, financial liberalization may not be conducive to the discovery of entrepreneurial talents in developing countries as it significantly increases the degree of competition in the financial sector. The second issue under focus in this paper is that of *short-termism* in project choice by private banks which is likely to retard entrepreneurial learning (both active and passive). That the private banks, especially in a liberalized and competitive environment, are averse to financing long-term industrial investment is widely discussed in the policy literature. The private banks tend to concentrate their lending to activities like trading that yield quick returns, but unlikely to confer significant learning benefits for industrialization. The so-called *development banks* were initially conceived in the developing countries to provide finance for long-term industrial projects precisely because of the problem of short-termism<sup>6</sup>. The projects with strong learning effects that result in significant productivity gains later but may not yield adequate returns initially are likely to be red-lined in a regime of financial liberalization. The reason again is that the banks are unwilling to finance learning if it cannot ensure an adequate share of the future stream of profits because of poaching in a competitive financial sector. Learning enriches human capital of an entrepreneur, but absence of indentured servitude, the banks cannot claim “property rights” to this human capital. The upshot of the above discussion is that the two corner-stones of the prevailing consensus in development

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<sup>5</sup>Increased competition in the product market may also be detrimental to the development of industrial entrepreneurship in a developing economy. For an interesting analysis using the general equilibrium framework of occupational choice a la Kanbur (1979, 1981), see Grossman (1984). Grossman (1984) shows that free trade can reduce the pool of industrial entrepreneurs in LDCs relative to autarky when there is no efficient risk sharing mechanism to start with, and, in equilibrium, the developing economy is an importer of the industrial good.

<sup>6</sup>for a discussion, See Aghion (1999).

policy, private sector led development and financial liberalization, seem to work at cross purposes.

This paper thus reopens the debate on the appropriate financial sector reform policies by focusing on the development of industrial entrepreneurship as a process of self-discovery in the sense of Hausman and Rodrik (2003).<sup>7</sup> The focus of Hausman and Rodrik (2003) is on the discovery of cost of production of new products in a developing country and the attendant problem of rent dissipation due to imitation by the followers once a suitable product is discovered. In contrast, our focus is on the discovery of entrepreneurial talents and the rent dissipation by competition in the banking sector. In the Hausman and Rodrik (2003) analysis, the financing of the entrepreneurs is not addressed. Implicit in their analysis is the assumption that once a certain suitable product is discovered (like ready-made garments in the case of Bangladesh), the potential entrepreneurs have little difficulty in managing the finance to enter into the sector.<sup>8</sup> Our analysis focuses on the fact that even if there is no competition from imitative entrepreneurs, the competition among banks resulting from financial liberalization can create rent dissipation problems. In the Hausman and Rodrik (2003) world, the rent dissipation negatively affects the ex ante incentives of the potential entrepreneurs to experiment with new products, and thus it is a *demand side* failure in the discovery process. In this paper, the failure in the discovery process comes from the supply side of the credit market, the banks may not be willing to experiment with new entrepreneurs because of poaching externality.

The analysis presented in this paper has important policy implications. It shows that, contrary to the financial liberalization view, measured interventions in the financial sector may be appropriate for development of an industrial entrepreneurial class at an early stage of development. We show that there are two types of policies that can help in the discovery of entrepreneurial talents: (i) policies that affect the intersectoral margin (agriculture vs. industry), (ii) policies that affect the intertemporal calculus of the bank. Under competition in banking, it is not possible to tax the agricultural lending to tilt the intersectoral returns in favor of the industrial lending. An indirect but effective policy instrument that affects the intersectoral margin is the deposit interest rate; any policy that reduces the deposit interest rate (like deposit rate control as advocated in the Financial Restraint literature (see Hellmann et. al, 1997), or a tax on deposit rate) can be effective in encouraging banks to lend to new industrial entrepreneurs. An appropriately designed

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<sup>7</sup>For an earlier related contribution, see Hoff (1997).

<sup>8</sup>This assumption is a good description of the case of ready made garments export industry in Bangladesh discussed in Hausman and Rodrik (2003). The government owned banks in Bangladesh provided the credit required by the entrepreneurs setting up ready made garments factories at very favorable terms.

subsidy to industrial lending is also effective in inducing the banks to lend to the industrial sector. However, when such subsidy is paired with a tax on the deposit rate is shown to be a better policy. The policies that affect the intersectoral margin are, however, ineffective in tackling the problem of short-termism in project choices by both the entrepreneurs and banks. These policies fail to weed out the projects with front-loaded returns that do not confer any learning benefits. A dual-track policy regime where restriction on competition is implemented in the industrial lending but competition is preserved in agricultural lending is shown to be effective in both discovery of new industrial entrepreneurs and implementing projects with strong learning effects. The results of this paper thus provide complementary arguments for the policies of *Financial Restraint* recently advanced by Hellmann, Murdock, and Stiglitz (1996, 1997, 2000), where policies that restrain competition (temporarily) and mild interest rate controls enhance the franchise value of a bank, and thus provide incentives to control moral hazard, and to mobilize savings from previously unexplored segments of an economy (see also Chiappori et. al. (1995)).

The rest of the paper is structured as follows. Section 2 places the present research in proper perspective by tracing out its intersections with the existing literature in greater detail. Section 3 presents a two sector occupational choice model with moral hazard in industrial activity. The subsection (3.1) considers a simplified version of the model without moral hazard and discusses the negative effects of poaching externalities in competitive banking on entrepreneurial discovery. The following sub-section (3.2) sets up the details of the model with moral hazard in industrial activity. Section 4 derives conditions for no-industrial-financing trap in an economy and establishes the desirability of a dual-track policy regime for entrepreneurial discovery. The next section (5) is devoted to the analysis of short-termism under alternative policies. The paper ends with a summary of the results and a discussion of the major policy implications for financial sector development in developing countries.

## (2) Related Literature

The standard approach to the analysis of entrepreneurial development is that of *occupational choice* models (Kihlstrom and Laffont, 1979; Kanbur, 1979, 1981; Banerjee and Newman, 1993, Eswaran and Kotwal, 1990). The basic theoretical approach is to analyze the effects of differential risk preference and intertemporal discount factor on the choice between safe wage labor and a risky entrepreneurial activity. With the assumption of a perfect capital market, the choice to

become an entrepreneur solely depends on time preference and risk aversion parameters (This strand of literature started with the contributions of Kihlstrom and Laffont, 1979; and Kanbur, 1979, 1981). However, the untenability of the assumption of a perfect capital market was soon recognized in the face of pervasive evidence of credit rationing, and internal finance constraints on the investment behavior of firms even in countries with most developed credit and capital markets ( see for example, Fazzari et al. 1988, Stiglitz, 1992, Hubbard, 1998). The subsequent literature, both theoretical and empirical, placed increasing emphasis on the critical role played by access to financial capital. On theoretical level, the contributions of Shorrocks (1988), Evans and Jovanovic (1989), Holtz-Eakin et al. (1994), and Eswaran and Kotwal (1990) have shown that differential access to capital results in differential risk-bearing capacity and thus lead to different occupational choice even though time preference and risk aversion parameters are identical across agents. This paper departs from the standard occupational choice model of entrepreneurship in a critical way by assuming that both the entrepreneur and the bank are risk neutral.

The critical difference of our model from the standard Stiglitz-Weiss (1981) type credit rationing models is that a potential entrepreneur may be red-lined from the credit market even in the absence of any informational asymmetry. In fact, in contrast to the adverse selection models, in our analysis of poaching externality, the prospective entrepreneur does not know her type and the crux of the issue is who bears the cost of discovery of the entrepreneurial type.<sup>9</sup> This feature of the model makes clear the connection of the present research to the literature on patent rights in R&D competition. As in the literature on R&D competition, the private market is inefficient in the present case because it is difficult to ensure that the firm (bank) financing the discovery of a good entrepreneur will be able to capture enough rent to cover its cost before competition dissipates the rent. But there is a critical difference from the standard R&D problem. It arises from *inalienability* of the object of discovery, i.e. entrepreneurial capability. In the R&D case, a contract can be written which ensures sufficient share of the rent to the discoverer and the standard way of doing it is to grant a limited duration patent right to the discoverer. However, in the case of discovery of entrepreneurs, it is not possible to design a patent right for the financier bank. Because it would tantamount to *financial Slavery*. Observe that the rent to good entrepreneurship is not restricted only to the first project undertaken, but accrues to other projects undertaken by

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<sup>9</sup>This ignorance about ones own type and the associated problem of discovery is a feature of the credit market model of Lang and Nakamura (1990). Although there is a generic similarity between their and our analysis, their focus was on the explanation of persistence of boom and bust in an economy.

the same entrepreneur throughout her lifetime. Thus even if the entrepreneur can be restricted to the bank for refinancing needs for the first project, the entrepreneur has the freedom to go to the lowest bidder for all other projects undertaken after the revelation of her entrepreneurial type. This implies that allowing for equity contracts between the bank and the entrepreneur only partially alleviates the problem, as the bank is still unable to capture most of the future rents associated with the good entrepreneurship.

The problem of commitment failure addressed here has close similarity to a branch of literature on *on-the-job training* (in Becker's phrase *general training*). The problem there is that a private firm always provides less than socially optimal level of training to the employee, because after accumulating the human capital the employee can leave the firm and get a better job with another firm (see, for example, Evans, 1994). A recent contribution that discusses the problems created by poaching externality is Petersen and Rajan (1995) where they point to the negative effects of competition in banking sector on small business financing in USA due to bidding for the good entrepreneurs. However, the focus and the objectives of our analysis is very different from theirs. Unlike Petersen and Rajan (1995), we are interested in analyzing the efficacy of alternative financial sector reform policies (*financial liberalization* versus *financial restraint*) for entrepreneurial discovery and tackling short-termism in project choice, especially in the context of developing countries.

### (3) The Model

The economy consists of two sectors called agriculture and industry.<sup>10</sup> Investment in agriculture is divisible and yields a constant rate of return of  $R^a$ .  $R^a$  is the rate of return net of principal but before deduction of the interest charges. Investment in industry is lumpy and requires a fixed amount of financial capital which is normalized to 1. The return on industrial investment depends on the characteristics of the entrepreneur. There are two types of entrepreneurs: good and bad. In case of a good entrepreneur, the success of the project depends on the effort chosen  $E \in [0, 1]$ . The cost of effort to the entrepreneur is

$$C(E) = \frac{\alpha}{2} E^2$$

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<sup>10</sup>We emphasize here that "agriculture" is meant to represent any competing activity where the uncertainty about entrepreneurial type is not important. This may include sectors like real estate and trading, among others.



The return from the industrial investment for a successful entrepreneur is  $R^m > R^a$  and  $R^m > 1$ .<sup>11</sup> We assume that a good entrepreneur does not suffer from moral hazard in effort choice if she can finance the industrial investment with her own funds. As shown below, this implies that  $\alpha \leq R^m$ . Under this restriction on the intensity of moral hazard, the effort choice of a good type entrepreneur is distorted by a debt contract, but  $E^* = 1$  under self financing. If the investment is undertaken by a bad type, the gross return (before deduction of principal and interest charges) from industrial investment is zero irrespective of the effort level chosen. So a failed entrepreneur does not repay anything to the bank. The above assumptions imply that the effort and entrepreneurial type are strong complements. There is no asymmetry of information between the bank and the entrepreneur regarding the distribution of entrepreneurial talents and thus they entertain identical estimate of probability of drawing a good entrepreneur. We denote this common estimate by  $P$ .

A bank can lend to four groups of people: (i) safe “agricultural sector”, (ii) safe loan to industrial entrepreneurs already proven good, (iii) finance the experimentation of new industrial entrepreneurs, or (iv) give industrial loan to a previously failed entrepreneur. The bank maximizes the expected return on its loan portfolio. When the banking sector is competitive, the banks compete for the proven good entrepreneurs and satisfy zero profit condition for this segment of the market along with the lending to agriculture. We denote the interest rate on agricultural loan by  $i^a$ . The deposit interest rate at which the banks can get funds in period  $t$  is denoted by  $i_t^d$ .<sup>12</sup>

A prospective industrial entrepreneur can either apply for an industrial loan or take an agricultural loan and earn a safe agricultural income. If she does not take any loan (agricultural or industrial), her reservation payoff is  $\hat{w} \geq 0$ . The  $\hat{w}$  may reflect the return on agriculture without any purchased inputs (like traditional farming without fertilizer, pesticide etc for which no bank loan is needed). Note that under competition in the agricultural lending, the return on agricultural loan in any given period  $t$  may be higher than the reservation payoff, i.e.,  $Y_t^a = R^a - i_t^a = R^a - i_t^d \geq \hat{w}$ . The bank that finances the discovery of entrepreneurial type observes the type of an entrepreneur at the end of the first period when the information is revealed. An entrepreneur who is successful in the industrial activity can credibly reveal its type to the outside banks by incurring a cost  $\tilde{C}$  at the beginning of the next period. One way to think about  $\tilde{C}$  is

<sup>11</sup>This last condition that  $R^m > 1$  is needed to rule out negative profit maximizing interest rate by a monopolist bank.

<sup>12</sup>We assume, for simplicity, that the potential entrepreneurs have zero savings. The supply of savings is generated by households which are not explicitly modeled.

that it represents the market structure in banking, the smaller is the number of banks around, the higher is  $\tilde{C}$ . In this interpretation,  $\tilde{C}$  is a negative function of the number of banks competing in the industrial sector, i.e.  $\tilde{C}(N_b)$  and  $\tilde{C}'(N_b) < 0$ , where  $N_b$  is the number of banks active. An unsuccessful industrial entrepreneur can re-apply for the industrial loan or go back to the agricultural sector in the second period.<sup>13</sup> We assume that there exists a threshold  $\hat{N}_b \geq 1$  such that  $\forall N_b > \hat{N}_b$ , the entrepreneur finds it optimal to incur the cost and thus reveal its type to the outside banks. We assume that even in a perfectly competitive banking market, i.e., with large number of banks, the entrepreneur needs to incur a positive cost to reveal her type, and denote the lower bound on cost of switch for an entrepreneur by  $\hat{C}$ . To keep the model as simple as possible, we abstract from savings-investment decision, and assume that the entrepreneur needs to borrow the whole amount for industrial investment in the second period even though it can use part of the first period income to incur the information revelation cost  $\tilde{C}$  at the beginning of the second period.

In this economy, we analyze the decision problem of a bank facing a random applicant for industrial loan from the unrevealed segment of the population. For simplicity, it is assumed that each individual has a life span of two periods and a period is defined to cover the life cycle of the industrial project.

The time line in the model is as follows: at the beginning of period 1, the potential entrepreneur decides whether or not to apply for industrial loan. If she applies and the loan is approved by the bank, she chooses the optimal effort given the common estimate of the probability of a good entrepreneur in the population. At the end of the first period, the returns to the investment accrues and the information about the entrepreneurial type is revealed costlessly to the entrepreneur herself and the financier bank, but not to the other banks. At the beginning of the second period, the entrepreneur, if a good type, decides whether or not to switch banks by incurring the information revelation cost  $\tilde{C}$ . If  $\tilde{C}$  is small enough, i.e., the banking market structure is competitive enough, it is optimal to reveal information and apply for industrial loan in the second period. A failed entrepreneur, on the other hand, goes back to agricultural sector at the beginning of the second period.

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<sup>13</sup>Note that the bank will prefer an untested entrepreneur to finance industrial activity over a failed one. So if at the initial equilibrium there is no financing for the new industrial entrepreneur, it means that the failed entrepreneurs are also redlined. Since we are interested in analyzing what policies can induce the banks to provide loans to new industrial entrepreneurs starting from a no-industrial finance trap, we concentrate on the case where a failed entrepreneur goes back to the agriculture in the second period.

### (3.1) A Benchmark: Entrepreneurial Discovery in the Absence of Moral Hazard

We first consider the simple case where there is no effort choice and thus no moral hazard in industrial activity, i.e. set  $E = 1$ . The rate of return in this case is  $R^m$  when the entrepreneur turns out to be a good type. This implies that the bank does not worry about moral hazard due to high interest rate. The main result in this simple setting is that even without the limits on interest rate arising from moral hazard, a competitive banking economy can be trapped in an equilibrium where the banks refuse to finance the discovery of industrial entrepreneurs. This is due to *binding liquidity constraint* faced by an entrepreneur. The liquidity constraint results from the fact that the entrepreneur cannot credibly commit to share the returns to good entrepreneurship in the second period as the entrepreneurial capability is *inalienable*; the entrepreneur finds it optimal to switch banks by incurring the information revelation cost  $\hat{C}$  in the second period. Let  $i_1^b$  stands for the minimum first period interest rate needed by the bank for giving loan to the new entrepreneur. From the individual rationality constraint of the bank, we have:

$$i_1^b = \frac{1 + i^a}{P} - 1 \quad (1)$$

Denote the maximum interest rate that the entrepreneur is willing to pay (ignoring the liquidity concerns) and still take the industrial loan by  $i_1^e$ . From the participation constraint of the entrepreneur, we have:

$$i_1^e = R^m \left( \frac{1 + \beta}{\beta} \right) - R^a \left( \frac{P + \beta}{\beta P} \right) + \frac{i^a}{P} - \frac{\hat{C}}{\beta} \quad (2)$$

where  $\beta = 1 + \rho$  is the discount factor of the entrepreneur. We concentrate on the case where  $i_1^e \geq i_1^b$ . Then we say that the bank is unwilling to finance a potential new industrial entrepreneur because of *binding liquidity constraint* if the following holds:

$$i_1^e \geq i_1^b > R^m \quad (3)$$

Note that the entrepreneur is always liquidity constrained in a liberalized competitive banking economy in the sense that the maximum interest rate she is willing to pay is higher than the

maximum she can credibly commit to (assuming  $\hat{C}$  is low enough) , i.e.,

$$i_1^e > R^m \tag{4}$$

But the liquidity constraint can be *non-binding* allowing the bank to give loan to the new industrial entrepreneur. This happens when we have

$$i_1^e > R^m \geq i_1^b \tag{5}$$

The following result follows from the definition of a binding liquidity constraint as in inequality (4) above.

**Proposition 1** *In a competitive banking economy: the likelihood of a binding liquidity constraint is, ceteris paribus, higher (i) the lower is the productivity of the industrial sector,  $R^m$ , (ii) the lower is the initial probability estimate of a good entrepreneur,  $P$ , and (iii) the higher is the agricultural interest rate,  $i^a$ .*

The developing countries are, in general, characterized by low values of  $P$  and  $R^m$  compared to a developed economy. The return to industrial activities common in developing countries like textile or ready-made garments are relatively low especially given the competition in the world market.

### (3.2) The Model with Moral Hazard

We now turn to the analysis of the case when the bank's ability to increase the first period interest rate might be limited by the fact that a higher interest rate reduces the probability of success (optimal effort) by a good entrepreneur in the industrial activity. The existence of moral hazard has important implications for alternative policy instruments like deposit rate interventions and entry restrictions. We first provide an analysis of the optimal effort choice when the entrepreneur can finance the industrial investment with self financing. The case of self-financing provides a good benchmark to understand the costs of debt contract arising from moral hazard. Then we analyze the optimal effort choice of an entrepreneur under a debt contract.

## Optimal Effort Choice Under Self-financing

The time consistent optimal effort choices by an entrepreneur who invests own funds in the industrial activity are denoted by  $E_1^{*s}$  and  $E_2^{*s}$ . The second period optimal effort choice is solution to the following:

$$Max_{E_2} Y_2^s = \left[ E_2 R^m - \frac{\alpha}{2} E_2^2 \right] \quad (6)$$

$$E_2^{*s} = \frac{R^m}{\alpha} \quad (7)$$

$$Y_2^{*s} = \frac{R^m}{2}; \text{ assuming } \alpha \leq R^m \quad (8)$$

Note that if the degree moral hazard is so high that  $\alpha > R^m$ , the optimal effort level in second period is less than one and thus the probability that the industrial project succeeds is less than one for a self-financing entrepreneur who has already proven to be of good type. To focus on the case where moral hazard is driven by debt contract, we assume that  $\alpha \leq R^m$ . This implies that for a self financed entrepreneur the optimal effort choice is at a corner solution when  $\alpha < R^m$  because the upper bound on the effort level is equal to one.

Now the optimal (and time consistent) first period effort choice is solved from the following:

$$Max_{E_1} Y^s = Y_1^s + P E_1 \frac{Y_2^{*s}}{\beta} + (1 - P E_1) \frac{R^a}{\beta} \quad (9)$$

$$Y_1^s = P E_1 R^m - \frac{\alpha}{2} E_1^2 \quad (9)$$

$$E_1^{*s} = \frac{P}{\alpha} \left[ R^m + \frac{1}{\beta} (Y_2^{*s} - R^a) \right] \quad (10)$$

$$Y_1^{*s} = P E_1^{*s} R^m - \frac{\alpha}{2} (E_1^{*s})^2 \quad (11)$$

It is efficient for an unproven entrepreneur to invest in the industrial activity if the discounted expected returns is higher than the returns from investing in the competing activity, i.e., agriculture. This implies that the following holds:

$$Y^{*s} = Y_1^{*s} + P E_1^{*s} \frac{Y_2^{*s}}{\beta} + (1 - P E_1^{*s}) \frac{R^a}{\beta} \geq R^a + \frac{R^a}{\beta} \quad (12)$$

In the rest of the paper, we assume that the investment in the industrial activity is efficient

in the sense of inequality (12) above.

### The Optimal Effort Choice Under a Debt Contract

The optimal effort choice by an untested entrepreneur solves the following problem in the first period facing interest rates  $i_1$  and  $i_2$  (before revelation of entrepreneurial type):

$$Max_{E_1, E_2} Y = Y_1 + PE_1 \frac{Y_2}{\beta} + (1 - PE_1) \frac{Y_2^a}{\beta} \quad (13)$$

$$Y_1 = PE_1 (R^m - i_1) - \frac{\alpha}{2} E_1^2 \quad (14)$$

$$Y_2 = \left[ E_2 (R^m - i_2) - \frac{\alpha}{2} E_2^2 \right] - \tilde{C} \quad (15)$$

$$Y_2^a = R^a - i_2^a \quad (16)$$

Denote the solution to the optimal effort choice problem (13) above by  $\dot{E}_1$  and  $\dot{E}_2$  and the resulting entrepreneurial income as  $\dot{Y}$ . This solution is, however, not time consistent. Time consistency requires that the entrepreneur solves the following problem first:

$$Max_{E_2} Y_2 = \left[ E_2 (R^m - i_2) - \frac{\alpha}{2} E_2^2 \right] - \tilde{C} \quad (17)$$

The solution to the above problem (17) are:

$$E_2^*(i_2) = \frac{1}{\alpha} (R^m - i_2) \quad (18)$$

$$Y_2^*(i_2) = \frac{1}{2\alpha} (R^m - i_2)^2 - \tilde{C} \quad (19)$$

Note that when the entrepreneur does not switch in the second period (for example, when there is a monopoly bank) we have  $\tilde{C} = 0$ .

The optimal (time consistent) first period effort choice is solved from:

$$Max_{E_1} Y = Y_1 + PE_1 \frac{Y_2^*}{\beta} + (1 - PE_1) \frac{Y_2^a}{\beta} \quad (20)$$

The optimal first period effort is given by:

$$E_1^* = \frac{P}{\alpha} \left[ (R^m - i_1) + \frac{1}{\beta} (Y_2^* - Y_2^a) \right] \quad (21)$$

## (4) Financial Sector Reform for Entrepreneurial Development

### (4.1) Financial Liberalization and Entrepreneurial Stagnation

#### **Proposition 2**

Consider a free entry banking economy where the banks would finance new industrial entrepreneurs if the success were certain, i.e.,  $P = 1$ . Such an economy is trapped in a no information revelation equilibrium with no credit to the new industrial entrepreneurs if the probability estimate belongs to an open interval  $P \in (\check{P}, \tilde{P})$ , even though it is efficient to finance the new industrial entrepreneurs.

#### **Proof:**

Under free entry, the second period interest rate on industrial lending  $i_2^c$  is determined from the zero profit condition:

$$\begin{aligned} \Psi_2 &= E_2^*(i_2^c) (1 + i_2^c) - 1 = i_2^d \\ &\Rightarrow \frac{(R^m - i_2^c)}{\alpha} (1 + i_2^c) - 1 = i_2^d \\ i_2^c &= \frac{1}{2} (R^m - 1) \pm \frac{1}{2} \sqrt{(R^m - 1)^2 + 4 \{R^m - \alpha (1 + i_2^d)\}} \end{aligned} \quad (22)$$

Denote the profit maximizing interest rate for a bank in the first period by  $i_1^{*c}$  when the second period interest rate is given by  $i_2^c$  above in equation (22):

$$\begin{aligned} i_1^{*c} &= \text{ArgMax}_{i_1} \Psi_1(i_2^c) = PE_1^*(i_2^c) (1 + i_1) - 1 \\ i_1^{*c} &= \frac{1}{2} (R^m - 1) + \frac{1}{\beta} \left[ \frac{1}{2\alpha} (R^m - i_2^c)^2 - \hat{C} - Y_2^a \right] \end{aligned} \quad (23)$$

$$= \frac{1}{2} (R^m - 1) + \frac{1}{\beta} [Y_2^c - Y_2^a] \quad (24)$$

Now denote the maximum possible return (assuming the bank chooses the profit maximizing interest rate  $i_1^{*c}$ ) on a first period loan when the bank faces competition in the second period by

$\Psi_1^{*c}$  :

$$\begin{aligned}\Psi_1^{*c} &= PE_1^*(i_1^{*c}, i_2^c) (1 + i_1^{*c}) - 1 \\ &= \frac{P^2}{\alpha} \left[ (R^m - i_1^{*c}) + \frac{1}{\beta} (Y_2^c - Y_2^a) \right] (1 + i_1^{*c}) - 1\end{aligned}\quad (25)$$

The threshold probability estimate  $\tilde{P}$  which makes the bank indifferent between new industrial lending and lending to agricultural lending is given by the following:

$$\begin{aligned}\Psi_1^{*c}(\tilde{P}) - i_1^a &= 0 \\ \frac{\tilde{P}^2}{\alpha} \left[ (R^m - i_1^{*c}) + \frac{1}{\beta} (Y_2^c - Y_2^a) \right] (1 + i_1^{*c}) &= 1 + i_1^a\end{aligned}\quad (26)$$

Given the assumption that it is profitable to lend to the new industrial entrepreneurs in a competitive banking economy when there is no uncertainty about the entrepreneurial type in the first period, we have  $\tilde{P} < 1$ , because in this case the following inequalities hold (assuming that  $i_1^a > 0$ ):

$$\begin{aligned}\Psi_1^{*c}(P = 1) &> i_1^a \\ \Psi_1^{*c}(P = 0) &< i_1^a\end{aligned}$$

Now the bank refuses to finance a new industrial entrepreneur if the probability estimate  $P$  is such that the highest possible return on a first period loan when facing competition in the second period is lower than the return on the competing activity in the bank's loan portfolio (i.e., agriculture). Note that  $\Psi_1^{*c}(P)$  is a positive function of the probability estimate  $P$ , because  $i_1^{*c}$  and  $i_2^c$  are independent of  $P$ . This implies that if  $P < \tilde{P}$ , the expected return from the new industrial lending is lower than the return on agricultural lending  $i_1^a$ .

The requirement that the financing of new industrial entrepreneurship is efficient implies that the initial probability estimate cannot be smaller than a threshold (denoted as  $\check{P}$ ), where  $\check{P}$  is defined by the following equation (individual rationality constraint of a self-financed entrepreneur):

$$Y^{*s}(\check{P}) = Y_1^{*s} + \check{P}E_1 \frac{Y_2^{*s}}{\beta} + (1 - \check{P}E_1) \frac{R^a}{\beta} = R^a + \frac{R^a}{\beta}$$

So if the initial probability estimate of successful industrial entrepreneurship in a free banking



developing economy is such that  $P \in (\check{P}, \tilde{P})$ , then the banks do not finance the new industrial entrepreneurs, even though such investment would be efficient. QED.

## (4.2) Financial Restraint: Policies for Development of Industrial Entrepreneurship

A major focus of this paper is on identifying financial sector policies that can help discover the entrepreneurial talents in a developing country that is trapped in an inefficient no information revelation equilibrium as characterized in proposition (2) above. As noted before, the current emphasis on financial liberalization in the form of increased competition in the banking sector and market determined interest rates are likely to be counterproductive if the central policy issue is how to induce banks to experiment with new industrial entrepreneurs. There are two types of policies that one might design to make financing of new industrial entrepreneurship possible starting from such a no new industrial financing equilibrium: (1) inter-sectoral policies, and (2) inter-temporal policies. The intersectoral policies are aimed at improving the relative profitability of lending to new industrial entrepreneurs, while the intertemporal policies aim to increase the share of the future rent on good entrepreneurship that goes to the financier bank. We show that policies like interventions

### (4.2.1) Inter-sectoral Policies

A simple Pigouvian policy that alters the intersectoral profitability in favor of new industrial lending is a subsidy to the bank for new industrial financing. Such a subsidy can be made contingent on the discovery of good entrepreneurs. An interest rate subsidy on the first period industrial lending to new entrepreneurs would be such a “contingent” policy. An alternative is to provide subsidy on lending to new industrial entrepreneurs irrespective of the outcome of the project. This second policy reduces the risk borne by the banks and thus dominate a policy of interest rate subsidy in the context of the simple model set up in this paper (i.e., the required interest rate subsidy is higher than the uncontingent subsidy). However, in a more general model where banks are involved in interim monitoring of the new industrial projects which can affect the success probability, an uncontingent lending subsidy may not be desirable, as the subsidy does not depend on bank’s monitoring intensity.

The most critical issue that works against the Pigouvian subsidy policies is that revenue raising in developing countries is very difficult and can have significant efficiency costs (for a discussion,

see Emran and Stiglitz, 2007). Estimates from Auriol. One might argue that a better policy instrument from this perspective is to tax lending to agriculture. However, under competition in banking, such a policy only increases the interest rate charged to agricultural loans as the banks try to satisfy the zero profit condition. A policy that does not involve any government tax revenue but can improve relative profitability of new industrial lending is to implement deposit rate controls to reduce the first period deposit rate  $i_1^d$ . Such policies have recently been advocated by Hellmann et. al. (1997, 2000) in their work on Financial Restraint where they show that a deposit rate control in conjunction with capital requirement can create franchise value in banking and thus reduce incentives for “looting” (a la Akerlof and Romer, 1993) and bankruptcy for profit. In the context of present analysis, while a deposit rate control helps in discovery of new entrepreneurs, we find that a combination of a tax on the deposit rate and a subsidy to the industrial lending is a better policy for escaping from a ‘no new industrial financing equilibrium’. The following proposition states the results related to deposit rate policies.

**Proposition 3**

*Consider an economy trapped in an equilibrium with no credit to new industrial entrepreneurs as characterized in proposition (2) above. Assume that the probability estimate for a good entrepreneur is  $P = \tilde{P} - \eta$ , with  $\eta > 0$  arbitrarily small.*

*(3.1) there exists a threshold level of first period deposit interest rate  $\bar{v}_1^d = i_1^d - v$  below which the banks provide credit to new industrial entrepreneurs;*

*(3.2) a subsidy (uncontingent)  $\sigma_1$  to new industrial lending in the first period combined with a tax  $0 < \tau_1^d < v$  on first period deposit rate makes new industrial lending possible at lower efficiency costs.*

**Proof:**

(3.1) To see that a deposit rate control that reduces the first period deposit interest rate may help in inducing banks to experiment with new entrepreneurs, note that zero profit condition in agricultural lending implies that  $i_1^a = i_1^d$ . This implies that when deposit rate is reduced, it also pulls down the equilibrium interest rate charged by the bank on its agricultural lending. Define

$v$  as below:

$$\begin{aligned}\Psi_1^{*c}(\tilde{P} - \eta) - i_1^a + v &= 0 \\ \Psi_1^{*c}(\tilde{P} - \eta) &= i_1^d - v = \bar{i}_1^d\end{aligned}$$

So a deposit rate control that reduces the first period deposit rate to  $\bar{i}_1^d$  (or below it) induces banks to lend to new industrial entrepreneurs. Note that such a threshold  $\bar{i}_1^d > 0$  exists as long as the expected return on new industrial entrepreneurship is positive at the prevailing estimate of a good industrial entrepreneur, i.e.,  $P = \tilde{P} - \eta$ .

(3.2) Define the first period tax-subsidy scheme  $(\tau_1^d, \sigma_1)$  as follows:

$$\Psi_1^{*c}(\tilde{P} - \eta) + \sigma_1 = i_1^d - \tau_1^d \tag{27}$$

So the bank facing the tax-subsidy scheme will be willing to lend to an unproven industrial entrepreneur. Now as long as  $\sigma_1 > 0$ , we have  $\tau_1^d < v$  and thus the distortion created in the deposit interest rate is lower compared to the deposit control. Note that the above equation (27) admits a continuum of solutions for the tax-subsidy schemes all of which are less distortionary compared to a deposit rate control policy. When the tax and subsidy rates are equal, i.e.,  $\sigma_1 = \tau_1^d = \kappa$ , then we have  $\kappa = \frac{v}{2}$ . QED

## Discussion

Proposition (3.2) above pins down the tax and subsidy rates by assuming that they are equal to each other. However, such a tax-subsidy scheme raises more revenue than required for financing of the subsidy as long as the bank's loan portfolio is diversified, i.e., the bank lends not only to the new industrial entrepreneurs. This is because the tax base for  $\tau_1^d$  is the total deposits in the bank part of which finances the safe investments in agricultural projects and proven industrial entrepreneurs. This implies that the tax rate required to finance a given subsidy in a revenue-neutral way is smaller than the subsidy rate. The simple model developed so far in this paper is, however, not well suited for this exercise. To design a revenue-neutral tax reform we need to analyze the proportion of the loan portfolio allocated to the new entrepreneurs under a given tax-subsidy scheme which is left for future extension of the current paper.

One concern with the policies that work through deposit interest rate is that a reduction in the deposit rate may reduce the savings and bank deposits in the economy. A closely related issue is

if taxing deposits is likely to be part of an optimal tax structure to raise revenue for financing the subsidy to new industrial lending. A tax on deposits is especially suitable as a policy instrument in the present context for the simple reason that unlike other tax instruments a reduction in the deposit rate itself improves the relative profitability of new industrial lending without taking into account the revenue generated. Moreover, the marginal cost of public funds for a tax on the deposits depends on the elasticity with respect to the interest rate. The available evidence shows that the interest rate elasticity of savings and deposits is close to zero as the substitution and income effects of an interest rate change tend to offset each other (see, for example, Bandiera et al. (??)). This low elasticity makes it an attractive tax base as is well known from the inverse elasticity rule of optimal taxation (Atkinson and Stiglitz, 1980).

The results in proposition 3 focuses on the role that the policies targeting the first period deposit rate can play in the development of industrial entrepreneurship in developing countries. A reduction in the second period deposit rate might also help in making lending to a new industrial entrepreneur possible as it reduces the second period interest rate  $i_2^c$  and thus reduces the moral hazard in effort choice in the first period (from equation (21) optimal first period effort choice is a negative function of the second period interest rate an entrepreneur faces). A higher effort level in turn increases the expected return from industrial lending in the first period and thus may make such lending possible. A straight-forward but important implication of the above discussion is that high deposit interest rates that typically follow financial liberalization in a developing country will be especially detrimental to entrepreneurial discovery as it might result in an equilibrium where banks are unwilling to experiment with new industrial entrepreneurship.<sup>14</sup>

#### (4.2.2) Intertemporal Policies

The policies to tackle the equilibrium trap with no new industrial financing discussed above are targeted at the margin of intersectoral profitability in banks loan portfolio. However, the fundamental source of the market failure in our model of entrepreneurial discovery is an intertemporal one; the banks are unable to appropriate large enough share of the future rent on good entrepreneurship which accrues entirely to the entrepreneur in a competitive banking economy established through financial liberalization. As discussed before, unlike the standard model of innovation and discovery in the industrial organization literature in the context of research and

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<sup>14</sup>For evidence that the deposit rate increased dramatically in many developing countries after financial liberalization in the 1980s, see Honohan (undated).

development, it is not possible to design a limited duration patent right for the financier bank that allows it to appropriate enough future rent on a good entrepreneur once its type is revealed. This is because of the fact that a bank cannot write a legally enforceable contract on the inalienable entrepreneurial ability. Given the incompleteness of the contract, the potential entrepreneur cannot credibly commit not to switch bank in the second period. An indirect way to provide “patent right” to a pioneer bank financing unproven industrial entrepreneurs is to restrict entry into banking so that switching banks becomes non-profitable for a good entrepreneur in the second period. Such entry restriction policies have been advocated by Hellmann et. al. (1996, 2000) in a series of papers on Financial Restraint. However, when the bank has market power, it extracts rents from not only the new industrial entrepreneurs, but also all other activities. This can be seen most transparently by considering the polar case where the pioneering bank is awarded monopoly rights. In this case, the monopoly bank increases the agricultural interest rate to capture all the rents, i.e., it sets the interest rate as below:

$$i_t^a = R^a - \hat{w}; t = 1, 2$$

where  $\hat{w}$  is the outside option if the agent decides not to take an agricultural loan. This higher return on competing activity attenuates the bank’s incentives for new industrial lending. Thus a better policy is where competition is preserved in the agricultural lending, but monopoly right is awarded for industrial lending. The following proposition shows that such a dual track entry restriction policy can help escape the no information revelation banking equilibrium with no new industrial lending.

## Entry Restraint and Entrepreneurial Discovery: A Dual Track Policy

### Proposition 4

*Assume that the economy is initially trapped in an equilibrium with no credit to new industrial entrepreneurs as characterized in proposition (2) above. Assume that the probability estimate for a good entrepreneur is  $P = \tilde{P} - \eta$ , with  $\eta > 0$  arbitrarily small and  $\tilde{P} \leq 1$ . Consider a dual track policy regime implemented in this economy where competition is preserved in agricultural lending, but a bank is awarded monopoly for industrial lending. The dual track policy makes lending to*

new industrial entrepreneurs possible if the degree of moral hazard is not too high, i.e.  $\alpha < \hat{\alpha}$  and the probability estimate belongs to an interval, i.e.,  $P \in (\hat{P}, \tilde{P})$ .

**Proof:**

With  $P = \tilde{P} - \eta$ , a bank under financial liberalization declines to finance new industrial entrepreneurs by proposition (2) above. In a dual track policy regime, denote the optimal time-consistent interest rates as  $(\hat{i}_1, \hat{i}_2)$ , where

$$\hat{i}_1 = \frac{1}{2}(R^m - 1) + \frac{1}{2\beta} \left[ \frac{1}{8\alpha} (R^m + 1)^2 - Y_2^a \right] - \frac{1}{8\alpha\tilde{\beta}} \left[ (R^m + 1)^2 - 4\alpha(1 + i_1^a) \right] \quad (28)$$

$$\hat{i}_2 = \frac{1}{2}(R^m - 1) > 0 \quad (29)$$

For details of the optimization of the bank under a dual track policy regime, see appendix 1. When  $P < \tilde{P}$ , the bank earns negative profit under competition. This also implies that the bank incurs loss in the first period when it chooses optimal interest rates under the dual track, because first period effort choice function is higher under competition, i.e.,  $E_1^*(i_1 | i_2^c) \geq E_1^*(i_1 | \hat{i}_2)$ . This is because of the fact that under competition the second period interest rate is lower than under the dual track with monopoly power over industrial lending, i.e.,  $i_2^c \leq \hat{i}_2$ . But if the moral hazard is not too strong, the bank makes profit on a successful entrepreneur in the second period under dual track for all  $P > 0$ . This can be seen from the profit maximizing return in the second period for a monopoly bank (denoted as  $\hat{\Psi}_2$ ):

$$\hat{\Psi}_2 - i_2^d = \frac{1}{4\alpha} (R^m + 1)^2 - 1 - i_2^d \quad (30)$$

$$\hat{\Psi}_2 > i_2^d \Leftrightarrow \alpha < \hat{\alpha} \equiv \frac{(R^m + 1)^2}{4(1 + i_2^d)} \quad (31)$$

So the expected second period profit for a bank financing a new industrial entrepreneur is positive for any  $P > 0$  if  $\alpha < \hat{\alpha}$ , i.e.,  $PE_1^*\hat{\Psi}_2 > 0$ . Now observe that for  $\eta > 0$  small enough, the first period loss incurred by a bank under dual track is more than compensated by the expected profit to be made in the second period. To see this, note that at  $\eta = 0$  (so that  $P = \tilde{P}$ ), the monopoly bank can charge the competitive interest rate in the second period (i.e.,  $i_2^c$ ) and thus can ensure at least zero profit. This implies that when it chooses the profit maximizing interest rate in the second period, it makes strictly positive profit. By continuity, there exists a threshold

$\hat{\eta} > 0$  (denote the corresponding threshold probability as  $\hat{P} = \tilde{P} - \hat{\eta}$ ) such that the bank breaks even under a dual track policy regime. So we have

$$\hat{P}E_1^*\hat{\Psi}_2 = \tilde{\beta} \left[ i_1^d - \hat{\Psi}_1 \right] \quad (32)$$

So for all probability estimate  $P \in (\hat{P}, \tilde{P})$  the bank in a dual track regime lends to a new industrial entrepreneur if  $\alpha < \hat{\alpha}$ , but the economy is trapped in no new industrial financing equilibrium under financial liberalization (i.e., competitive banking). QED.

## Discussion

The simple two period model used in this paper undervalues the advantages of a dual track policy regime for two reasons. First, the bank does not take into account the value of the information revealed by the entrepreneurial experiment. In a multiperiod model a Bayesian bank would value the information generated and update the probability estimate  $P$  accordingly. One can extend the basic model in a two-armed bandit framework (with one arm known, i.e., agriculture) to analyze such a model.<sup>15</sup> But the intuition is straight forward that the bank will be willing to experiment more in a dual track policy regime when it takes into account the value of information. Second, the fact that the net present value of entrepreneurial rent a bank can reap is higher the higher is the number of periods it is granted monopoly over industrial lending. So even if a bank in a dual track regime finds it unprofitable to lend to new industrial entrepreneurs in a two period context, it may still find it profitable in a multi-period model. However, a more general multi-period model also raises the issue of optimal duration of the dual track regime. The government can use the duration of the dual track as a policy instrument to make sure that the pioneer bank gets just enough share of the net present value of the entrepreneurial rent to make it possible to escape an inefficient equilibrium where no new industrial lending takes place.

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<sup>15</sup>An earlier version of the paper contained a simple two-armed bandit model with three periods to show that it is easier to get financing for new industrial entrepreneurs when the bank factors in the value of information generated in second period for loan decisions in the third period.

## Dual Track and Time Consistency

The monopoly awarded to the bank for new industrial lending creates two types of distortions. First, monopoly interest rate in the second period reduces effort levels in both the first and second periods (compared to a competitive benchmark). The other inefficiency arises from the fact that the bank cannot credibly commit to the interest rates that maximizes the net present value of profits from a new industrial lending because of time inconsistency. Denote the optimal (time inconsistent) interest rates that maximizes the net present value of returns for a monopoly bank by  $i_1^*$  and  $i_2^*$  which are solved from the following problem:

$$Max_{i_1, i_2} \Psi = \Psi_1 + PE_1^* \frac{\Psi_2}{\beta} + (1 - PE_1^*) \frac{i^a}{\beta} \quad (33)$$

$$\Psi_1 = PE_1^* (1 + i_1) - 1 \quad (34)$$

$$\Psi_2 = E_2^* (1 + i_2) - 1 \quad (35)$$

But absence a credible commitment mechanism the bank charges the dynamically consistent interest rate  $\hat{i}_2 > i_2^*$ , thus leading to inefficiently low effort choices in both the periods. The government can use its tax instrument to correct this distortion arising from time inconsistency in a dual track policy regime and thus can make it possible to induce banks experiment with new entrepreneurs, even though it is not profitable under a dual tack policy regime alone. The government can impose a tax  $\tau_2^*$  such that  $\hat{i}_2(\tau_2^*) = i_2^*$ . With a tax  $\tau_2$  on the second period lending interest rate, the bank under a dual track chooses the optimal interest rate in the second period interest rate from the following:

$$\begin{aligned} Max_{i_2} \Psi_2(\tau_2) &= E_2^* [1 + i_2 (1 - \tau_2)] - 1 \\ E_2^*(i_2) &= \frac{1}{\alpha} (R^m - i_2) \\ \hat{i}_2(\tau_2) &= \frac{1}{2} \left[ R^m - \frac{1}{1 - \tau_2} \right] \end{aligned} \quad (36)$$

So to make sure that the second period interest rate faced by the entrepreneur is  $i_2^*$ , the government sets the tax rate  $\tau_2^*$  such that:

$$\hat{i}_2(\tau_2^*) = \frac{1}{2} \left[ R^m - \frac{1}{1 - \tau_2^*} \right] = i_2^* < \hat{i}_2 = \frac{1}{2} (R^m - 1) \quad (37)$$



Note that we need  $\tau_2^* > 0$  (i.e., a tax not a subsidy on second period lending rate) for inequality (37) to be valid. The government can make sure that the return in the second period on a successful entrepreneur does not suffer by complementing this tax with a transfer scheme that returns the tax revenue to the bank in a lumpsum manner. This result is formally stated in the following proposition.

## Dual Track with Tax-Subsidy Scheme

### Proposition 5

*In dual track policy regime, the government can design a revenue-neutral tax-subsidy scheme where a tax  $\tau_2^*$  is imposed on the lending interest rate in the second period and the expected revenue  $T_2 = E_2^* \tau_2^* i_2^*$  is returned to the bank in a lumpsum way at the beginning of second period. Such a dual track regime with tax-subsidy scheme can help escape from a ‘no new industrial financing equilibrium’ even when the dual track policy alone is not effective.*

### (4.2.3) Entrepreneurial Discovery: Deposit Rate Policies versus Dual Track

As discussed in propositions (2)-(4) above, both a reduction in the deposit interest rate and a temporary entry restraint can induce banks to experiment with new industrial entrepreneurs. The cost of entry restraint is that it leads to higher interest rate and thus less than optimal effort choice in the second period. This adversely affects the probability of success in the second period. Note that a reduction in the deposit rate actually reduces the interest rate charged to the new industrial entrepreneurs under competition and thus improves optimal effort. But the cost of deposit rate policies is the potential negative effects on the household savings. As discussed before, the potential adverse effects on savings, however, is likely to be small. There is an important caveat to the above though; one should be careful about not pushing an economy to very low deposit interest rate as the supply of savings (intermediated through banks) may be very sensitive around zero real interest rate. This high sensitivity is due to the fact that a lot of inflation hedges (like land, gold etc.) become attractive as savings instruments when the real interest rate on bank deposits is close to zero or negative. Also, as emphasized by Hellmann et. al. (1996) and Chiappori et. al. (1995), among others, an appropriately chosen deposit rate ceiling can, in fact, increase the aggregate savings mobilization through financial deepening. This may

be especially important in the context of developing countries where the rural areas are usually not served by the private banks<sup>16</sup>. When such positive effects of deposit rate ceiling are taken into consideration, the conclusion regarding desirability of tax-subsidy scheme reached earlier in proposition (3.2) needs to be qualified accordingly.

The costs of entry restraint arising from moral hazard caused by monopoly interest rate depends on the slope of the maximum income function of the entrepreneur with respect to interest rate. If the degree of moral hazard as captured by the parameter  $\alpha$  is high enough, then deposit rate control in a free entry banking might dominate as a policy instrument for entrepreneurial discovery. However, there are limits to deposit rate control as a policy instrument for the development of industrial entrepreneurship. As we discuss in more detail in what follows, deposit rate control may be ineffective in weeding out short-termism in project choice; entry restraint is a superior policy instrument for reducing the bias against long gestation industrial projects with strong learning effects.

## (5) Financial Sector Reform and Short-Termism

### Tackling Short-Termism in Project Choice: A Special Role for Intertemporal Policies

As noted in the introduction, one of the central concerns in developing countries is that the private banks are, in general, not willing to finance long gestation industrial projects, especially those with strong dynamic learning effects and productivity gains. It is thus extremely important to structure incentives for the banks to reduce the short-termism in project choice. The policies of financial liberalization creates perverse incentives for the banks to concentrate their lending to quick-yield projects with front-loaded returns at the expense of long-gestation projects with significant learning effects. The reason behind this type of short-termism in project choice in a free-entry banking economy is again the poaching externality discussed before. The banks that finance the initial investment and thus make learning and productivity gains possible are unable to appropriate a sufficient share of the productivity gains because of poaching by other banks waiting in the sidelines. This may create an equilibrium where every bank waits for others to

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<sup>16</sup>For evidence that deposit rate ceiling can help in financial deepening and deposit mobilization in the context of USA, see Sarr (2000).

move first so that they can reap the benefits of both information revelation about entrepreneurial type and also the productivity gains from learning by doing.

The intersectoral policies that work through deposit interest rate (discussed in section (2.2.1) above) are, however, not likely to be effective in tilting bank's incentives in favor of projects with low initial return but high net present value due to strong learning effects later. This is due to the fact that the reduction in the deposit rate makes entrepreneurial discovery possible by making agricultural lending relatively less attractive to the bank. This policy thus works at the margin of intersectoral returns, but the banks still need to satisfy zero profit condition in each period. This implies that the banks finance those projects first which give them maximum return in the first period. A dual track regime with entry restraint on the other hand allows the bank to look at the net present value of different projects and finance the ones with highest NPV irrespective of the intertemporal pattern of the returns.

In the context of our model, dynamic learning can take two different forms: (i) a low initial return and a higher return in the second period, i.e.,  $R_1^m < R_2^m$ , (ii) a reduction in the cost of effort to the entrepreneur in the second period, i.e.,  $\alpha_1 > \alpha_2$  where subscripts denote the periods.

**Proposition 6**

*A reduction in deposit interest rate alone fails to provide banks with incentives not to finance low NPV projects with front-loaded returns. Under entry restraint, the banks have the appropriate incentives to finance projects according to NPV and thus help implement projects with low initial returns but strong productivity gains or cost reduction later due to learning effects.*

**Proof:**

Consider three first period deposit interest rates  $i_1^{d1} < i_1^{d2} < i_1^{d3}$ , and two industrial projects with the first period expected returns for the bank  $\Psi_1^1(i_1^d) > \Psi_1^2(i_1^d)$ , and the net present values (NPV) as follows:

$$\Psi_1^1(i_1) + \frac{\Psi_2^1(i_2)}{\tilde{\beta}} < \Psi_1^2(i_1) + \frac{\Psi_2^2(i_2)}{\tilde{\beta}} \quad (38)$$

Choose the first period deposit interest rates such that the following holds:

$$i_1^{d3} > \hat{\Psi}_1^1(\hat{i}_1^1) > i_1^{d2} > \hat{\Psi}_1^2(\hat{i}_1^2) \geq i_1^{d1} \quad (39)$$

In inequality (38) and (39), the superscripts to  $\Psi$  denote the projects and the subscripts the

time periods. What inequality (39) says is that (i) the maximum expected return in the first period for a bank from project 1 is less than the agricultural interest rate at the deposit rate  $i_1^{d3}$  but higher than the agricultural interest rate when deposit rate is  $i_1^{d2}$ , (ii) the maximum expected return in the first period for a bank from project 2 is less than the agricultural interest rate at the deposit rate  $i_1^{d2}$  but higher than the agricultural interest rate when deposit rate is  $i_1^{d1}$  (assuming competition in agricultural lending). Now, consider a fully liberalized banking sector with competition both in agricultural and industrial lending. Starting from an initially high deposit rate  $i_1^{d3}$ , a policy that reduces it to  $i_1^{d2}$  makes it profitable to finance the project with front loaded return (project 1). A further reduction of deposit rate to  $i_1^{d1}$  induces the bank to lend to the entrepreneur with the back-loaded but higher NPV project (project 2). But it is still profitable for the bank to finance project 1. A dual track policy on the other hand allows the bank to rank the industrial projects according to NPV. In this case, given an appropriate deposit rate, the bank finances the socially efficient projects first, i.e., with the highest NPV. QED.

## (6) Conclusions

This paper, using a simple model of occupational choice with moral hazard, shows that financial liberalization in the form of competition in the banking sector and free market determination of interest rates is likely to be a constraining factor for the development of industrial entrepreneurship in a developing economy. The two corner-stones of current development policy consensus: private sector led development and financial liberalization thus work at cross purposes. The analysis focuses on two issues: (i) discovery of entrepreneurial talents, and (ii) tackling short-termism in project choice to foster learning. We show that poaching externality in a competitive banking can result in binding liquidity constraint and thus banks in a liberalized competitive market may fail to finance entrepreneurial discovery. A policy of temporary entry restraint that awards limited duration monopoly right to a bank investing in entrepreneurial discovery can avoid such ‘no entrepreneurial experimentation’ trap. Deposit interest rate policies (like deposit rate ceiling, tax on deposit rate) can encourage banks to experiment with new entrepreneurs in a competitive banking economy. But deposit rate policies (more broadly intersectoral policies) are ineffective in weeding out short-termism in project choice. Entry restrictions in industrial lending is necessary for inducing banks to rank projects according to the net present value, and thus finance those projects which yield low initial returns but strong learning and productivity gains later on. Our analysis points to the importance of a dual-track policy regime where temporary entry

restraint is implemented in the industrial sector, but competition is preserved in the lending to agricultural sector. Such a dual-track policy regime when coupled with an appropriate deposit rate policy can be effective in tackling the problems of poaching externality and short-termism. The conclusions of this paper thus run counter to the current consensus in development policy that a completely liberalized competitive financial sector is a necessary and enabling factor in private sector led development strategy. Since development of industrial entrepreneurship is at the heart of a private sector led development, the results presented here suggest that policies of *Financial Restraint* (Hellman et. al. (1997, 2000)) instead of *Laissez Faire* financial liberalization are appropriate for the success of a decentralized private sector led development strategy.

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## Appendix 1: A Bank’s Optimal Interest Rate Choices Under Dual Track

Dynamic consistency requires that the second period optimal interest rate is determined as below:

$$\begin{aligned}
 Max_{i_2} \Psi_2 &= E_2^* (1 + i_2) - 1 \\
 \hat{i}_2 &= \frac{1}{2} (R^m - 1) > 0 \\
 \hat{\Psi}_2 &= \frac{1}{4\alpha} (R^m + 1)^2 - 1
 \end{aligned}$$

I



I The optimal first period interest rate is solved from:

$$\begin{aligned}
Max_{i_1} \Psi(i_1 \mid \hat{i}_2) &= \Psi_1 + PE_1^* \frac{\Psi_2}{\tilde{\beta}} + (1 - PE_1^*) \frac{i^a}{\tilde{\beta}} \\
&= PE_1^*(\hat{i}_2) (1 + i_1) - 1 + PE_1^*(\hat{i}_2) \left[ \frac{\frac{1}{4\alpha} (R^m + 1)^2 - (1 + i^a)}{\tilde{\beta}} \right] + \frac{i^a}{\tilde{\beta}} \\
\hat{i}_1 &= \frac{1}{2} (R^m - 1) + \frac{1}{2\beta} \left[ \frac{1}{8\alpha} (R^m + 1)^2 - Y^a \right] - \frac{1}{8\alpha\tilde{\beta}} \left[ (R^m + 1)^2 - 4\alpha (1 + i^a) \right]
\end{aligned}$$