Collateral vs. Project Screening: A Model of Lazy Banks

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Abstract

Many economist argue that the primary economic function of banks is to provide cheap credit, and to facilitate this function, they advocate the strict protection and enforcement of creditor rights. But banks can serve another important economic function: through project screening they can reduce the number of project failures and thus mitigate their private and social costs. Strict protection of creditor rights would leave the tradeoff between these two banking functions to the market. In this paper, we show that because of market imperfections in the banking industry, strong creditor protection may lead to market equilibria in which cheap credit is inappropriately emphasized over project screening. Restrictions on collateral requirements and the protection of debtors in bankruptcy proceedings may redress this imbalance and increase credit-market efficiency.

1 Introduction

What is the role of collateral in lending? A recent strand of economic literature argues that it is central to the relationship between lenders and borrowers, to the point that credit would not be extended in the absence of the right to repossess collateral:

> ...[C]reditors are paid because they have the right to repossess collateral. Without these rights, investors would not be able to get paid, and therefore firms would not have the benefit of raising funds from these investors. (La Porta, Lopez-de-Silanes, Shleifer and Vishny, 1998)

This view of collateral derives from the idea that moral hazard is the main problem in financial relationships, especially in the relationship between lenders and borrowers. Borrowers may have the incentive to use the money borrowed unproductively, say, to finance their own consumption, or simply to hide the proceeds of the project from their creditors and default on their promise to repay (strategic default). The right to repossess collateral gives lenders an essential threat to ensure that borrowers will not behave in this way. This disciplinary role of collateral is central to the whole theory of incomplete financial contracts developed by Aghion and Bolton (1992), Hart (1995) and others.

An immediate implication of this view is that the stronger is the protection that creditors obtain via collateral, the more abundant and the cheaper credit will be for entrepreneurs and households. Some evidence points in this direction. La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997) use empirical measures of the protection of creditor rights (among which is the right to repossess collateral) to explain the cross-country variation in the availability of external financing to the private sector. They find that countries where the protection of creditor rights is more tenuous (especially French civil law countries) have more narrow debt markets than other countries. Even within the US legal system, interstate differences in the rules governing the right to repossess collateral appear to affect the terms at which credit is available. Alston (1984) reports that the farm foreclosure moratorium legislation during the 1930s led both to fewer farm loans and to higher interest rates in states which enacted this legislation. Gropp, Scholz and White (1997) analyze how cross-state differences in the US personal bankruptcy rules affect the supply and demand for household credit, using data from the 1983 Survey of Consumer Finances. They find that generous state-level bankruptcy exemptions reduce the amount of credit available to low-asset households (controlling for their observable characteristics) and increase their interest rates on automobile loans. The effect is opposite for high-asset households.

Based on this literature, one may be tempted to conclude that, at a normative level, the best thing that legislators can do for the development and efficiency of the credit market is to grant a steely protection to the creditor right to repossess collateral and eliminate bankruptcy exemptions (or reduce them to a minimum). In this paper, we argue that this conclusion is unwarranted. This conventional view of creditor rights neglects a number of reasons why lenders' unrestricted reliance on collateral might have a negative impact on credit-market efficiency. We discuss several such reasons in Section 4. Here, we focus on a very important one: banks may be better able than entrepreneurs to predict the performance of potential investment projects, and a high level of collateral will weaken a bank's incentive to do so.

Banks that finance large numbers of investment projects in a specific sector of the economy are well placed to appraise the potential performance of those projects. Unlike individual entrepreneurs, they may have considerable experience with similar projects undertaken by a range of businesses. Banks often have access to valuable statistical information that is not readily obtained by entrepreneurs. Also, banks can be expected to have considerable familiarity with the economic features of their locality and general economic trends. Banks are, or ought to be, in the project-evaluation business.

Of course, in markets with perfectly competitive banks and complete contracts, banks would offer to screen projects as a service to entrepreneurs, who would then bear the cost of screening. However, if the screening services of banks cannot be enforced by contract, banks that are highly protected by collateral may perform too little screening of the projects that they finance. Clearly, collateral and screening are substitutes from the point of view of banks. Yet, they are not equivalent from the social standpoint. Because of their superior expertise in project evaluation, the screening activity of banks is a value-enhancing activity for society, whereas the posting of collateral is not, since it merely allows a transfer of wealth from the borrower to the bank when things go badly.

This implies that there is an economic-efficiency case in favor of collateral limitations, bankruptcy exemptions, and the "fresh-start" provisions of some bankruptcy codes, which require the discharge of all debts remaining at the conclusion of bankruptcy proceedings. This is not a novel insight – it was stressed years ago by one of the most authoritative experts on bankruptcy law:

> Discharge...heightens creditors incentives to monitor: by providing for a right of discharge, society enlists creditors in the effort to oversee the individual's credit decisions ... [Jackson, 1986, p. 249]

The complaint that banks do too little screening and tend to rely excessively on collateral is also frequently heard in the business community. Small entrepreneurs often complain that banks place too little weight on the future prospects of their company and too much on their ability to post personal assets, especially real estate, as collateral for the loan. And history is replete with examples in which bankers have carelessly expanded credit to entrepreneurs who post collateral, only to be sorry later when massive defaults and declines in the value of posted collateral threatened the financial soundness of their own institutions. Most of the recent banking crises, from the Scandinavian crisis of the early 1990s to the more recent Mexican and East-Asian banking crises are cases in point here.

To develop our argument, we have chosen a very simple model of competitive banking in which investment projects may differ in quality. Banks, and only banks, have the expertise to determine project quality, which they can accomplish by engaging in a costly screening process. In Section 2, we show that, given certain types of imperfect information, some entrepreneurs and banks might voluntarily choose loan contracts that specify a high level of posted collateral and leave banks without an incentive to screen projects, even though project screening would be efficient. Interestingly, we find that this inefficiency disappears as we move from a competitive to a monopolistic banking model. In Section 3, we show that a monopolistic bank will screen efficiently, because it can extract all surplus from entrepreneurs, and, by doing so, it internalizes the problem of choosing the level of screening activity that maximizes total social surplus. This suggests that limiting creditor rights to repossess collateral may be of special importance in highly competitive credit markets.

Section 4 places the argument made in this paper in the context of the literature on the role of collateral and in the even wider debate on the role and limits of creditor protection in bankruptcy procedures. On the whole, the literature highlights both the need to use collateral to correct moral hazard problems in credit relationships and a number of reasons to avoid excessive reliance on collateral. Section 5 concludes.

2 The Competitive Model

In this section we illustrate how the unrestricted availaibility of collateral may lead to an inefficient outcome in a competitive credit market. To help the reader grasp the intuition of the model, we begin with a simpler example in which credit markets are efficient.

Suppose projects come in two qualities, good (positive expected present value) or bad (negative expected present value). All entrepreneurs are identical, and each one selects a project at random. Entrepreneurs know the probability of choosing a good project, but they cannot observe actual project quality directly.

Entrepreneurs cannot finance their own projects; they must obtain loans from banks. Banks can discover the quality of a project by screening it at a cost. The act of screening is assumed to be nonobservable and noncontractible, so that banks are not able to sell screening to entrepreneurs as a service. Nor can banks require loan applicants to pay for screening when their applications are denied, because in that situation banks would have an incentive to deny loan applications without screening and thus accrue revenue costlessly. Therefore, banks will screen a project as part of a loan-approval procedure only when the direct benefit to the bank of the information obtained exceeds the screening cost. And entrepreneurs whose loan applications are approved will have to pay not only their own screening costs, but also a prorated share of the screening costs of those applicants whose loans are denied.

A bank would never have an incentive to screen a project when a borrower posts full collateral, because then the bank would be fully protected from the consequences of default. If a bank does screen, then it will be in the bank's interest to finance a project only when the project turns out to be a good one.

Suppose, now, that screening costs are sufficiently small that screening is socially efficient for all entrepreneurs. This implies that, among loan contracts that earn zero profits for the bank, an entrepreneur would choose a contract with collateral sufficiently small so as to induce the bank to screen. This is because, in a competitive equilibrium, entrepreneurs appropriate all social surplus. Thus, in equilibrium, banks would screen all projects, fund only the entrepreneurs with good projects, and charge an interest rate equal to the cost of funds plus the screening cost for the individual applicant plus the screening costs of all unapproved applicants prorated over all approved loans. The competitive equilibrium would be efficient despite the non-contractibility of screening by banks.

We now argue that with an additional dimension of imperfect information, a competitive credit market may turn out to be inefficient. Consider the above scenario but now with two types of loan applicants: a high-type applicant with a high probability of selecting a good project, and a low-type applicant with a lower probability of selecting a good project. Suppose that applicants can observe their own type, but banks cannot observe applicant types. In any competitive pooling equilibrium in which all projects are screened, only applicants with good projects will have their loan applications approved, so no entrepreneurs of either type will default. However, high-type entrepreneurs will have to pay a prorated share of the screening costs for unapproved loans not only of high-type applicants but of low-type applicants as well, and the latter costs will be higher, because low-types are more likely to have bad projects. This means that high types would have something to gain by separating from low types. Thus, high-type entrepreneurs might be attracted to contracts that require the posting of sufficient collateral so as to remove the incentive of banks to screen; low types would be relatively less attracted to such contracts because of their higher probability of default.

In the model that follows, we will show that for a region of the parameter space, the unique competitive equilibrium is a separating equilibrium in which high-type entrepreneurs post collateral and are not screened. In this equilibrium, the high types trade away protection from bad projects, which has a positive social value, in order to avoid the transfer of screening-cost subsidies from themselves to low-type entrepreneurs, a transfer which has no social-welfare implications. Thus, in this region the competitive equilibrium is inefficient.

We now proceed to a precise description and analysis of the model.

2.1 Model description

Suppose there is a continuum of entrepreneurs. Each entrepreneur chooses a project of fixed size, which for simplicity is normalized to 1. Each project has one of two possible quality levels: good (G) and bad (B). The good project pays $X > 0$, and the bad project pays 0. In order to finance his project each entrepreneur borrows from at most one bank. Entrepreneurs have an outside option that pays 0, so that they will participate only if their expected payoff is non-negative.

Each entrepreneur is one of two types, H and L, who are represented in the economy in proportions μ and $1 - \mu$. The H-type entrepreneurs have a good project with probability P_H, and L-type entrepreneurs have a good project with probability $P_L < P_H$. Entrepreneurs know the value of all parameters, they know their own type, but they do not know the quality of project that they have. Entrepreneurs are risk-neutral.

There is a continuum of banks, which are perfectly competitive and face a perfectly elastic supply of funds at the interest factor $\bar{R} < X$. Banks are risk-neutral profit maximizers. They offer standard debt contracts with a required repayment R and a required level of posted collateral. For their contracts, banks choose between full collateral R and a parametrically given minimal collateral level of K, which is presumed to be sufficient to inhibit moral hazard on the part of the borrowers.

Banks know the values of all model parameters, but they don't know either the type of their credit applicants or the quality of their projects. However, if they so choose, banks can ascertain the quality of an applicant's project by screening it at a fixed cost of S.

Let $\langle R, C \rangle$ represent a standard debt contract with repayment R and collateral $C = K$ if minimal collateral is acceptable to the bank and $C = R$ if full collateral is required. We assume that all such contracts are legally enforceable.

Let Y denote the net payoff of the project to the entrepreneur, π, the profits of the bank, and p, the probability that the project is good, with the subscripts s and n indicating the presence or absence of screening. If a project is screened by the bank, then it would be approved and implemented only if it is good, though the screening cost would have to be paid by the bank in any case. Thus, the entrepreneur's expected payoff would be

$$Y_s = P(X - R), \tag{1}$$

and the bank's expected profits would be

$$\Pi_s = P(R - \bar{R}) - S. \tag{2}$$

If a project is not screened by the bank, then its approval does not depend on its quality. This implies that, if the project is approved, the entrepreneur's expected payoff will be

$$Y_n = PX - R \tag{3}$$

and the bank's expected profits would be

$$\Pi_n = PR + (1 - P)C - \bar{R}. \tag{4}$$

Let us define the term *creditworthy* as applied to a potential borrower to mean that the expected return to the borrower's planned investment is greater than the cost of capital, $\bar{R}$. We assume:

A1. *All entrepreneur types are creditworthy.* For L-type entrepreneurs, this implies that $P_L X > \bar{R}$, or

$$X > \frac{\bar{R}}{P_L}, \tag{5}$$

which in turn implies the analogous equations for H-types and randomly selected members of any mixed groups as well.

A2. *The process of screening is not observable or contractible.* Banks will not screen a project unless the direct benefit to the bank of the information obtained exceeds the screening cost.

A3. *Screening of all project proposals is efficient.* If it is efficient to screen the projects of H-types, then it must be efficient to screen the projects of L-types as well, so we concern ourselves only with H-types. Screening can avoid the expected social cost of funding bad projects, which for H-type entrepreneurs is $(1 - P_H)\bar{R}$ per project. Therefore, this assumption is equivalent to

$$S < (1 - P_H)\bar{R}. \tag{6}$$

A4. *The minimum collateral K that banks require to secure a loan is small:* $K \leqslant \bar{K} < \bar{R}$, where $\bar{K}$ is defined by

$$\bar{K} \equiv (1 - \frac{\bar{P}}{P_H})\bar{R} > 0. \tag{7}$$

This assumption will permit H-types to use higher collateral as a means of separating themselves from the L-types.

A5. *Screening costs S are sufficiently small that, with minimal collateral K posted, banks find it profitable to screen the projects of both entrepreneur types.* As in Assumption **A3**, if for banks it is optimal to screen high-type entrepreneurs, it is also optimal to screen low-type entrepreneurs or members of a mixed group, so we need only apply our requirement to high types. With P set to P_H and C set to K, (2) and (4) give us bank profits from H-types with and without screening, and we find that assumption **A5** is equivalent to

$$S < (1 - P_H)(\bar{R} - K) \equiv \bar{S}. \tag{8}$$

Inasmuch as $K < \bar{R}$, we know that $\bar{S} > 0$. Thus, for $0 \leqslant S \leqslant \bar{S}$, banks find it optimal to screen all projects, when the minimal collateral K is posted.

Note that (8) implies (6), so that technically speaking assumption **A3** is redundant.

2.2 Competitive Credit-Market Equilibria

As illustrated in Figure 1 below, banks and entrepreneurs act as follows:

- Each bank offers a loan contract, which specifies an interest factor or repayment R and the amount of required collateral C.
- Each entrepreneur applies to at most one bank for the full amount of the desired loan.[1]
- Banks screen their applicants if they choose to do so.
- Banks approve or reject applications.

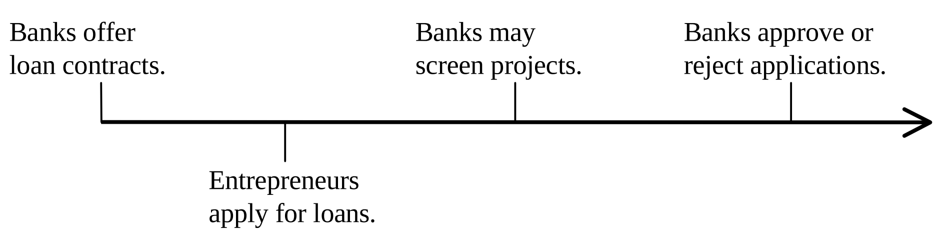

Figure 1. Time Line

[1] We do not allow an entrepreneur to apply to two banks simultaneously or apply to another bank after the first bank acts on his loan application. Clearly, an entrepreneur would have no incentive to apply to another bank if his application were approved, as no new information can be forthcoming within the context of our model. A rejected application could result only from a negative screening outcome. But no bank would finance the project of an entrepreneur whose loan application is known to have been previously rejected. If banks share information about loan applications (as we assume), then entrepreneurs will not apply to another bank upon rejection.

We say that a contract is *adopted* if it has been offered, applied-for, and approved (with or without screening).

A *competitive credit-market equilibrium* is defined as a set of adopted debt contracts that meet the following conditions:

E1. *Zero-profit condition:* Each adopted debt contract earns zero profits for the bank.

E2. *No entry:* No unadopted contract can be designed that would generate both positive bank profits and positive entrepreneur payoffs (or, equivalently, non-negative bank profits and positive entrepreneurial payoffs.)

E3. *Bank rationality:* Each bank's screening and approval decision is profit-maximizing.

E4. *Participation constraint:* Each adopted debt contract yields a non-negative payoff to the entrepreneur.

E5. *Payoff maximization:* Each adopted debt contract maximizes the payoff of the entrepreneur.

We now proceed to demonstrate that there is a range of parameter values for which some projects will not be screened in equilibrium even though screening would be efficient. So suppose that Ω is a set of contracts adopted in equilibrium. We will say that a member of Ω is an $\mathcal{H}$-contract if it is adopted only by H-type entrepreneurs; that it is an $\mathcal{L}$-contract if it is adopted only by L-type entrepreneurs; and that it is a $\mathcal{P}$-contract if it is adopted by both types of entrepreneurs. We show:

Proposition 1 *Only two configurations of Ω are consistent with the definition of competitive equilibria: those containing $\mathcal{P}$-contracts only and those containing both $\mathcal{H}$- and $\mathcal{L}$-contracts only. Consequently, there are no partial-pooling equilibria.*

Proof. We know, as is standard, that an L-type would strictly prefer any $\mathcal{P}$-contract to an $\mathcal{L}$-contract, so that both cannot coexist in equilibrium. Furthermore, suppose Ω contains both an $\mathcal{H}$-contract and a $\mathcal{P}$-contract. Then, with a sufficiently small reduction in the interest rate of the $\mathcal{P}$-contract, a bank could attract all of the entrepreneurs, have an increased proportion of H-type entrepreneurs as compared to that of the $\mathcal{P}$-contract, and so earn a profit. But this would violate the no-entry equilibrium condition **E2**. It follows that a $\mathcal{P}$-contract cannot coexist in equilibrium with members of either of the other two classes. Moreover, our assumptions imply that all entrepreneurs must be served in equilibrium, otherwise banks could construct profitable contracts that would attract the unserved entrepreneurs, also a violation of **E2**. Thus, Ω cannot contain either an $\mathcal{H}$-contract or an $\mathcal{L}$-contract alone. ■

We now proceed to characterize banks' equilibrium contract offers and entrepreneurs' application decisions. In the following propositions, we show that depending on the size of the screening cost S, this model generates either a pooling or a separating equilibrium. Relatively small values of S lead to a pooling equilibrium, because, as we show, penalties paid by the H-types for pooling with the L-types are derived only from the screening costs for those L-types with unsuccessful projects. For the analogous reason, large screening costs will make it worthwhile for the H-types to separate from the L-types by using more collateral. We will show that the threshold $\widehat{S}$ between the interval of screening costs with pooling equilibria and the interval with separating equilibria is defined by

$$\widehat{S} \equiv \frac{(1 - P_H)}{P_H} \bar{P}\, \bar{R}, \tag{9}$$

where $\bar{P} = \mu P_H + (1-\mu) P_L$. That $\widehat{S} < \bar{S}$, the upper bound for S defined in **A5**, is guaranteed by assumption **A4**.

At the outset we can show that

Proposition 2 *Debt contracts have the following properties:*

a. Banks will screen the proposed projects of contracts with minimal collateral K, but not those with full-collateral R.

b. The only minimal-collateral contract that can pool all entrepreneurs in equilibrium is $\langle \bar{R} + \frac{S}{\bar{P}},\ K \rangle$.

c. The only full-collateral contract that can be adopted in equilibrium is $\langle \bar{R}, \bar{R} \rangle$.

d. The contract $\langle \bar{R} + \frac{S}{\bar{P}},\ K \rangle$ yields a larger payoff to H-type entrepreneurs than does $\langle \bar{R}, \bar{R} \rangle$ when $S < \widehat{S}$, a smaller payoff when $S > \widehat{S}$, and the same payoff when $S = \widehat{S}$.

Proof. a. Condition **A5** implies that banks will screen whenever the minimal collateral K is posted. However, suppose banks set an interest factor R and require full collateral. Then, if banks do not screen, they earn an expected profit of $R - \bar{R}$ with certainty, regardless of the success or failure of the underlying project. In this situation, information about project quality is useless to the banks, and inasmuch as screening is costly, we may conclude that banks will never screen when full collateral is posted.

b. When all entrepreneurs are pooled, the only minimal-collateral contract that yields zero profits to banks is $\langle \bar{R} + \frac{S}{\bar{P}},\ K \rangle$.

c. Any full-collateral contract with $R > \bar{R}$ would yield positive profits to banks and thus would be ruled out in equilibrium by the zero-profit condition. Any contract with $R < \bar{R}$ would lose money for banks and can be ruled out in equilibrium as well.

d. From (3) and (1) we see that the payoff to the H-type entrepreneur from $\left\langle \bar{R}, \bar{R} \right\rangle$, which is never screened, is $P_H X - \bar{R}$, whereas the payoff from $\langle \bar{R} + \frac{S}{\bar{P}},\ K \rangle$, which is always screened, is $P_H(X - \bar{R} - \frac{S}{\bar{P}})$. It is straightforward to verify that the difference in these two payoffs has the same sign as $S - \widehat{S}$. ■

Now, we can show:

Proposition 3 *A unique pooling equilibrium exists for S in the range $0 \leqslant S \leqslant \widehat{S}$. In that equilibrium, all entrepreneurs adopt the minimal-collateral contract $\langle \bar{R} + \frac{S}{\bar{P}},\ K \rangle$ and all proposed projects will be screened. No pooling equilibrium exists for S in the range $\widehat{S} < S \leqslant \bar{S}$.*

Proof. We start by narrowing the range of possible pooling equilibria to a single candidate. Then we show that the candidate does indeed satisfy all of the equilibrium conditions. The first important point is that only those $\mathcal{P}$-contracts that specify minimal collateral K can be part of a pooling equilibrium. To see this, note that $\langle \bar{R}, \bar{R} \rangle$, which by Proposition 2c is the only full-collateral contract that can be adopted in equilibrium, yields the payoff $P_L X - \bar{R}$ to an L-type entrepreneur and zero profits to the bank, whereas the contract $\langle \frac{\bar{R}-\varepsilon}{P_L},\ K \rangle$, which is always screened, would yield a payoff of $P_L X - \bar{R} + \varepsilon$ to the entrepreneur and expected bank profits of $(1 - P_L)\bar{R} - S - \varepsilon$, which by (5) and (6) are strictly positive for ε sufficiently small. It follows that, in a pooling equilibrium, the contract $\langle \bar{R}, \bar{R} \rangle$ must violate either condition **E2** or **E5**.

Consequently, as candidates for a pooling equilibrium, we need to consider only those $\mathcal{P}$-contracts that specify minimal collateral K. But the only contract of that form that yields zero profits to banks when all entrepreneurs are served is $\langle \bar{R} + \frac{S}{\bar{P}},\ K \rangle$. Therefore, if there is a pooling equilibrium, the set of adopted contracts must be of the form $\Omega_P \equiv \{\langle \bar{R} + \frac{S}{\bar{P}},\ K \rangle\}$.

Next, we show that $\Omega_P \equiv \{\langle \bar{R} + \frac{S}{\bar{P}},\ K \rangle\}$ is a pooling equilibrium if and only if $0 \leqslant S \leqslant \widehat{S}$. The zero-profit condition **E1** has already been taken into account by Proposition 2b and 2c, and the bank rationality condition **E3** by Proposition 2a. Payoff maximization **E5** is trivially satisfied, because Ω_P contains only one contract. The participation constraint **E4** requires only that the contract $\langle \bar{R} + \frac{S}{\bar{P}},\ K \rangle$ yield a positive payoff to entrepreneurs, which is always the case since only good projects are funded and banks just break even.

As for no-entry, **E2**, we must check that no unused contract can generate positive bank profits and attract some entrepreneurs away from the pooling contract. But any unoffered contract specifying minimal collateral K and an interest rate $R > \bar{R} + \frac{S}{\bar{P}}$ would attract no entrepreneur, while one with $R < \bar{R} + \frac{S}{\bar{P}}$ would attract all entrepreneurs at a loss to the bank. So consider unoffered contracts specifying full collateral that would earn non-negative profits for the bank. Among these, the contract most advantageous to the entrepreneur is $\langle \bar{R}, \bar{R} \rangle$. But the payoff of $\langle \bar{R}, \bar{R} \rangle$ to the H-type entrepreneur is $P_H X - \bar{R}$ as compared with $P_H(X - \bar{R} - \frac{S}{\bar{P}})$ from the pooling contract, and by (9), the difference between these two quantities has the same sign as $S - \widehat{S}$. This means that $\langle \bar{R}, \bar{R} \rangle$ cannot profitably attract H-type entrepreneurs away from the pooling contract for $S \leqslant \widehat{S}$, so that the no-entry condition is confirmed there; however, the opposite is true for $S > \widehat{S}$. It follows immediately that $\Omega_P \equiv \{\langle \bar{R} + \frac{S}{\bar{P}},\ K \rangle\}$ is a unique pooling equilibrium for $S \leqslant \widehat{S}$ and that there is no pooling equilibrium for $S > \widehat{S}$.

Note that $\widehat{S} \leqslant \bar{S}$ only if $K \leqslant \bar{R}(P_H - \bar{P})/P_H \equiv \bar{K}$. But this is precisely the restriction imposed by assumption **A4** above and, consequently, this is the relevant parameter range for this proof. ■

We have thus established the existence of a unique pooling equilibrium for one parameter range, and we proceed to establish the existence of a separating equilibrium for another parameter range.

Proposition 4 *A unique separating equilibrium exists for S in the range $\widehat{S} \leqslant S \leqslant \bar{S}$. In that equilibrium, H-type entrepreneurs adopt the full-collateral contract $\langle \bar{R}, \bar{R} \rangle$, and L-type entrepreneurs adopt the minimal-collateral contract $\langle \bar{R} + \frac{S}{P_L},\ K \rangle$. No separating equilibrium exists for S in the range $0 \leqslant S < \widehat{S}$.*

Proof. Both types of entrepreneurs have identical preferences for contracts within the set of all $\mathcal{H}$-contracts and within the set of all $\mathcal{L}$-contracts (namely, they prefer lower interest factors to higher ones). Furthermore, L-types have more to lose from full collateral contracts than H-types do, because L-types have a higher fraction of bad projects. It follows that any separating equilibrium must include an $\mathcal{H}$-contract with full collateral (and a relatively low interest factor), which is adopted by H-types, and an $\mathcal{L}$-contract with minimal collateral (and a relatively high interest factor), which is adopted by L-types. By Proposition 2c, the $\mathcal{H}$-contract must be $\langle \bar{R}, \bar{R} \rangle$. Also, the $\mathcal{L}$-contract must be $\langle \bar{R}+\frac{S}{P_L},\ K \rangle$, which is the only minimal-collateral contract that satisfies **E1** when adopted by only L-type entrepreneurs. Thus, whenever a separating equilibrium exists, the set of adopted contracts must have the form $\Omega_S \equiv \{\langle \bar{R}, \bar{R} \rangle, \langle \bar{R}+\frac{S}{P_L},\ K \rangle\}$ if they are to satisfy conditions **E1** and **E3**.

Next, we show that Ω_S is a competitive equilibrium for $\widehat{S} \leqslant S \leqslant \bar{S}$. The participation constraint **E4** requires that both entrepreneur types earn non-negative profits. From (3) we see that payoffs for H-types who adopt $\langle \bar{R}, \bar{R} \rangle$ are $P_H X - \bar{R}$. This must positive by assumption **A1**, which states that all entrepreneurs are creditworthy, and **E4** is satisfied for H-types. From (1), we have that payoffs for L-types who adopt $\langle \bar{R} + \frac{S}{P_L},\ K \rangle$ are $P_L(X - \bar{R} - \frac{S}{P_L})$. But by (5), we have that $P_L(X - \bar{R} - \frac{S}{P_L}) > (1 - P_L)\bar{R} - S$, and the latter is positive for $S \leqslant \bar{S}$ by (6), and **E4** is satisfied for L-types.

The payoff-maximization condition **E5** for L-types requires that their payoffs with $\langle \bar{R}, \bar{R} \rangle$ be no greater than their payoffs with $\langle \bar{R} + \frac{S}{P_L},\ K \rangle$, i.e. that

$$P_L X - \bar{R} \leqslant P_L(X - \bar{R} - \frac{S}{P_L})$$

which reduces to $S \leqslant (1 - P_L)\, \bar{R}$, and this follows from (6) for all $S \leqslant \bar{S}$. The payoff-maximization condition for H-types requires that their payoff from $\langle \bar{R}, \bar{R} \rangle$ be no less than their payoff from $\langle \bar{R} + \frac{S}{P_L},\ K \rangle$. But by Proposition 2d we know that for H-type entrepreneurs, $\langle \bar{R}, \bar{R} \rangle$ dominates $\langle \bar{R} + \frac{S}{\bar{P}},\ K \rangle$ when $\widehat{S} \leqslant S \leqslant \bar{S}$, and the latter dominates $\langle \bar{R} + \frac{S}{P_L},\ K \rangle$, which has a higher interest factor.

It remains to consider the no-entry condition **E2** for $S \geqslant \widehat{S}$. Given that $\langle \bar{R}, \bar{R} \rangle$ is adopted in the candidate equilibrium Ω_S, the only full-collateral contract that can attract entrepreneurs is $\langle R, R \rangle$ with $R < \bar{R}$, but such a contract must lose money for banks. Similarly, because $\langle \bar{R} + \frac{S}{P_L},\ K \rangle$ is adopted in Ω_S, any unoffered contract with minimal collateral K capable of attracting only L-type entrepreneurs will also lose money for the banks. So finally, let us consider minimal-collateral contracts $\langle R, K \rangle$ capable of attracting H-type entrepreneurs as well as L-types, while earning non-negative profits for the banks. Of these, the contract most attractive to the entrepreneurs is the pooling contract $\langle \bar{R} + \frac{S}{\bar{P}},\ K \rangle$, which by Proposition 2d is weakly dominated for H-type entrepreneurs by $\langle \bar{R}, \bar{R} \rangle$ when $\widehat{S} \leqslant S \leqslant \bar{S}$. Thus no entry is satisfied for $\widehat{S} \leqslant S \leqslant \bar{S}$ and Ω_S is an equilibrium there. But for $0 \leqslant S < \widehat{S}$, and for ε sufficiently small, the contract $\langle \bar{R} + \frac{S}{\bar{P}} + \varepsilon,\ K \rangle$ provides H-type entrepreneurs with a larger payoff than does $\langle \bar{R}, \bar{R} \rangle$ and yields positive profits to banks. This means that no-entry fails in this region, and a separating equilibrium cannot exist there. ■

The previous propositions yield:

Proposition 5 *For $0 \leqslant S < \widehat{S}$, there is a unique competitive credit-market equilibrium $\Omega_P \equiv \{\langle \bar{R}+\frac{S}{\bar{P}},\ K \rangle\}$. In this equilibrium, both entrepreneurial types are pooled and all proposed projects are screened.*

For $\widehat{S} < S \leqslant \overline{S}$, there exists a unique competitive credit-market equilibrium $\Omega_S \equiv \{\langle \bar{R}, \bar{R} \rangle, \langle \bar{R}+\frac{S}{P_L},\ K \rangle\}$. In this equilibrium, the two entrepreneurial types are separated, with H-types adopting $\langle \bar{R}, \bar{R} \rangle$ and L-types *adopting $\langle \bar{R} + \frac{S}{P_L},\ K \rangle$. Only the projects of L-type entrepreneurs are screened.*

At $S = \widehat{S}$, both the pooling and separating competitive credit-market equilibria exist.

Proof. Proposition 1 rules out the existence of partial pooling equilibria. By Proposition 3, we know that a unique pooling equilibrium exists on $[0, \widehat{S})$, and by Proposition 4 we know that there are no separating equilibria there. The remainder of the first paragraph of the current proposition is implied by Proposition 3. The second and third paragraphs are demonstrated analogously. ■

The main result of the paper now follows immediately from Assumption **A3**:

Corollary 6 *For $\widehat{S} < S \leqslant \bar{S}$, the unique competitive credit-market equilibrium is characterized by insufficient screening.*

The intuition behind these results was explained in the introduction to this section, but we recapitulate briefly here. On the one hand, in a separating equilibrium, full collateral requirements protect banks completely against the default of H-type entrepreneurs, so that banks have no incentive to screen their projects. On the other hand, when screening costs per loan applicant are sufficiently high, i.e. when $S > \widehat{S}$, H-type entrepreneurs have an incentive to separate from L-type entrepreneurs. This is because screening costs per *approved* L-type loan applicant are higher than analogous costs per approved H-type loan applicant, so that by separating from L-types, H-type entrepreneurs can avoid paying a prorated share of these higher costs. In order to separate, H-type entrepreneurs adopt the full-collateral contract $\langle \bar{R}, \bar{R} \rangle$ and thus forgo efficient screening.

It follows that when screening costs are high, limiting the maximum amount of collateral that can be posted in debt contracts (or, equivalently, limiting their enforceability in court) may constitute an appropriate public policy. For instance, if in this model the maximum legal collateral that can be posted in a debt contract were given by the minimal level K, banks would offer and entrepreneurs would adopt only the pooling contract $\langle \bar{R} + \frac{S}{\bar{P}},\ K \rangle$, which would lead banks to screen all projects. In other words, this regulation limiting collateral would induce the socially efficient level of screening.

2.3 Intermediate Levels of Collateral

In this section we show that our inefficiency result does not hinge on the assumption that banks are restricted to demand full collateral in order to separate among different entrepreneurial types. For that purpose, we modify the model of the previous sections by assuming that banks can offer contracts specifying either the minimum collateral K, where as above, $K \in [0, \bar{K}]$, and a high level of collateral F, where $F \in (\bar{K}, \bar{R}]$. Note that since $\bar{R}$ is the cost of capital, $F < \bar{R}$ implies that a bank offering a contract with collateral F cannot expect to break even in the event of default by the borrower. In other words, when $F < \bar{R}$, banks cannot fully collateralize their loans.

In this setting, we show that there is a range of values for the high collateral level in which the market equilibrium features insufficient screening. More formally,

Proposition 7 *There is an* $\widehat{F} \in [\bar{K}, \bar{R})$ *such that, for* $\widehat{F} < F \leqslant \bar{R}$ *and* $\widehat{S} < S \leqslant \bar{S}$*, a unique competitive credit market equilibrium* $\Omega_S \equiv \left\{ \left\langle \frac{\bar{R}}{P_H} - \frac{1-P_H}{P_H} F, F \right\rangle, \left\langle \bar{R} + \frac{S}{P_L},\ K \right\rangle \right\}$ *exists. In this equilibrium, the two entrepreneurial types are separated, and only the projects of L-type entrepreneurs are screened.*

Proof. Let $\widehat{F} = \max\{\bar{K}, \bar{F}\}$, where

$$\bar{F} = \frac{P_H \bar{S} - P_L \bar{R}(1 - P_H)}{P_H - P_L} > 0.$$

First we show that for $\widehat{F} < F \leqslant \bar{R}$ and $\widehat{S} \leqslant S \leqslant \bar{S}$, Ω_S is the unique separating competitive credit market equilibrium. Then we prove that no pooling competitive equilibrium exists in this parameter region.

Any separating equilibrium must include a contract with high collateral F (and a low interest factor), which is adopted only by H-types, and a contract specifying the minimum collateral K (and a high interest factor), which is adopted only by L-types. Furthermore, a separating equilibrium can exist only if banks find it privately optimal *not* to screen the contract with collateral F. Otherwise, the projects of entrepreneurs applying for this contract would be funded only if found to be good, collateral F would never be repossessed in equilibrium, and the L-types would choose to pool with the H-types.

So consider an arbitrary $\mathcal{H}$-contract $\langle R, F \rangle$. A bank that offers this contract earns profits equal to $P_H(R - \bar{R}) - S$ with screening, and equal to $P_H R + (1 - P_H)F - \bar{R}$ without screening. It follows from (7) and (9) that the bank will strictly prefer *not* to screen if $F > \bar{K}$ and $\widehat{S} < S$, so that separation is feasible. Moreover, in the absence of screening, the contract $\langle R_H, F \rangle$ with $R_H = \frac{\bar{R}}{P_H} - \frac{1-P_H}{P_H} F$, is the only $\mathcal{H}$-contract that satisfies the zero-profit condition **E1**. From Proposition 2a, we know that any contract with minimal collateral K will be screened in equilibrium, so that $\left\langle \bar{R} + \frac{S}{P_L},\ K \right\rangle$ can be the only $\mathcal{L}$-contract that satisfies **E1**. Consequently, if there is a separating equilibrium, the set of adopted contracts must be of the form $\Omega_S \equiv \left\{ \langle R_H, F \rangle, \left\langle \bar{R} + \frac{S}{P_L},\ K \right\rangle \right\}$.

Next, we show that Ω_S is a separating equilibrium if and only if $\widehat{F} < F \leqslant \bar{R}$ and $\widehat{S} < S \leqslant \bar{S}$. To do this, we need to verify conditions **E2**, **E4**, and **E5**. Proposition 4 implies that L-type entrepreneurs obtain a positive payoff from contract $\left\langle \bar{R} + \frac{S}{P_L},\ K \right\rangle$ and that H-types obtain a positive payoff from $\langle R_H, F \rangle$,which provides them with the same expected payoff $\langle \bar{R}, \bar{R} \rangle$. Thus, condition **E4** is trivially satisfied by the candidate separating equilibrium Ω_S.

Let us now consider the payoff-maximization condition **E5**. The L-type entrepreneurs can obtain the payoff $P_L \left(X - \bar{R} - \frac{S}{P_L} \right)$ from $\left\langle \bar{R} + \frac{S}{P_L},\ K \right\rangle$ and $P_L (X - R_H) - (1 - P_L)F$ if they deviate and adopt $\langle R_H, F \rangle$. It is easy to show that the former payoff is larger for $F > \bar{F}$ and $S \in [0, \bar{S}]$. Similarly, H-type entrepreneurs earn $P_H X - \bar{R}$ from contract $\langle R_H, F \rangle$ and $P_H \left(X - \bar{R} - \frac{S}{P_L} \right)$ from contract $\left\langle \bar{R} + \frac{S}{P_L},\ K \right\rangle$. Again, we can readily ascertain that the former exceeds the latter for $S \geqslant \widehat{S}$.

It remains to consider the no-entry condition **E2**. Given that $\langle R_H, F \rangle$ is adopted in the candidate equilibrium Ω_S, the only high-collateral contract that can attract entrepreneurs is $\langle R_H, F \rangle$ with $R < R_H$, but such contract must lose money for the banks. Likewise, because $\left\langle \bar{R} + \frac{S}{P_L},\ K \right\rangle$ is adopted in Ω_S, any unoffered contract with minimal collateral K that attracts only L-type entrepreneurs will also lose money for the banks. Thus, we need only consider contracts with collateral K that attract both types of entrepreneurs and earn nonnegative profits for banks. Of these, the most attractive to entrepreneurs is the pooling contract $\langle \bar{R} + \frac{S}{\bar{P}},\ K \rangle$, which is weakly dominated for H-type entrepreneurs by $\langle R_H, F \rangle$ when $\widehat{S} \leqslant S \leqslant \bar{S}$. Thus no-entry is satisfied for $\widehat{S} \leqslant S \leqslant \bar{S}$, so that Ω_S must be a unique separating competitive equilibrium for $\widehat{F} < F \leqslant \bar{R}$ and $\widehat{S} < S \leqslant \bar{S}$.

Finally, we proceed to show that there is no pooling equilibrium in this parameter region. As before, only $\langle \bar{R} + \frac{S}{\bar{P}},\ K \rangle$ pools both types of entrepreneurs and satisfies conditions **E3** and **E1** But for $\widehat{S} < S \leqslant \bar{S}$, the contract $\left\langle \bar{R} + \frac{S}{\bar{P}}, K \right\rangle$ yields a strictly smaller payoff to H-type entrepreneurs than does contract $\langle R_H, F \rangle$. Hence, for ε sufficiently small, $\langle R_H + \varepsilon, F \rangle$ provides H-type entrepreneurs with a larger payoff than does $\left\langle \bar{R} + \frac{S}{\bar{P}}, K \right\rangle$ and yields positive profits to banks as well. It follows that the no-entry condition **E2** fails in this region and that there can be no pooling equilibrium for $S > \bar{S}$. ■

3 The Monopolistic Banking Model

So far, we have considered the performance of a perfectly competitive credit market. In this section, we focus on a monopolistic banking industry to show that, perhaps surprisingly, market power makes it possible to achieve efficiency in our framework.

For a banking monopoly, the equilibrium conditions must be changed. The banks' zero-profit condition **E1** and the no-entry condition **E2** are replaced by a bank profit-maximization condition: if Ω is the set of contracts adopted in equilibrium, then, subject to the equilibrium conditions **E3**, **E4** and **E5**, no other set of contracts would earn greater profits for the bank. We can now show:

Proposition 8 *In equilibrium, for $0 \leqslant S \leqslant \bar{S}$, a monopoly bank offers only one contract $\langle X, K \rangle$ and screens all projects. Thus, a monopolistic banking industry is characterized by efficient screening.*

Proof. Because Proposition 2a remains valid in this setting, the projects of all applicants for the minimal collateral contract $\langle X, K \rangle$ will be screened, and loans will be approved only when those projects are good. Thus $\langle X, K \rangle$ provides a zero payoff to both entrepreneurial types and satisfies entrepreneurs' participation constraints. Bank profits derived from an H-type entrepreneur who adopts $\langle X, K \rangle$ are given by

$$\Pi_H(\langle X, K \rangle) = P_H(X - \bar{R}) - S,$$

and from an L-type entrepreneur, by

$$\Pi_L(\langle X, K \rangle) = P_L(X - \bar{R}) - S.$$

A monopoly bank would not offer a minimal-collateral contract $\langle R, K \rangle$ with $R < X$, because it would earn less profits for the bank than $\langle X, K \rangle$ does, whereas a minimal-collateral contract with $R > X$ would violate entrepreneurs' participation constraints and would not be adopted. Thus, $\langle X, K \rangle$ is the only minimal collateral contract that can be adopted in equilibrium.

So consider a full collateral contract of the form $\langle R, R \rangle$. We show that any such contract adopted by a given entrepreneur would yield a lower bank profit than $\langle X, K \rangle$ does. As in the previous sections, banks will have no incentive to screen projects associated with full-collateral contracts. The most profitable full-collateral contract for the bank that satisfies the participation constraint for an H-type entrepreneur sets $R = P_H X$, with profits given by

$$\Pi_H(\langle P_H X, P_H X\rangle) = P_H X - \bar{R}.$$

Likewise, maximum bank profits from an L-type entrepreneur are

$$\Pi_L(\langle P_L X, P_L X\rangle) = P_L X - \bar{R}.$$

We have

$$\Pi_H(\langle X, K\rangle) - \Pi_H(\langle P_H X, P_H X\rangle) = (1 - P_H)\bar{R} - S$$

and

$$\Pi_L(\langle X, K\rangle) - \Pi_L(\langle P_L X, P_L X\rangle) = (1 - P_L)\bar{R} - S$$

By (8), both expressions are strictly positive for $S \leqslant \bar{S}$. Thus, with respect to both entrepreneurial types, the minimal collateral contract $\langle X, K\rangle$ offers the monopoly bank greater profits than any full collateral contract does. We may conclude that in equilibrium only $\langle X, K\rangle$ will be offered. ■

The intuition behind this result is straightforward. We know that for screening costs in the interval $[0, \bar{S}]$, screening all projects maximizes social surplus. Given that the demand for capital is completely inelastic, high interest rates do not lead to lower lending volumes, and increased interest rates shift rents from entrepreneurs to the bank without causing any allocation distortion. Hence, the monopoly bank is able to appropriate all rents generated in the market and thus fully internalize the efficiency gain that derives from screening. Consequently, the monopoly bank will always screen and fund only those projects that are found to be good. By extracting all rents through high interest rates, the monopoly will do well by doing good.

Of course, this striking result depends to a large extent on our assumption that the demand for credit is inelastic. Yet, even if the demand for credit were somewhat elastic, a certain amount of bank market power might be efficient in the presence of asymmetric information and noncontractible screening, because market power could give the banks the incentive they need to generate valuable information at a cost.

4 The Wider Picture

The argument offered in this paper has highlighted a potential drawback of collateral protection: protection may induce banks to be "lazy" and screen loan applicants insufficiently. It is worthwhile to step back and place this argument in perspective, considering how it fits into the existing debate on the costs and benefits of collateral and the degree of protection that should be afforded to creditor rights.

The main benefit of collateral in debt contracts is to temper moral hazard on the debtor's side. Debtors have the incentive to engage in opportunistic behavior at their creditors' expense, such as asset substitution, inadequate supply of effort and underinvestment, as shown by Myers (1977), Smith and Warner (1979), and Stultz and Johnson (1985), among others.

However, incentive problems may also arise on the creditors' side. On the one hand, as in our model, banks may lack sufficient incentives to screen and monitor their debtors at the efficient level. On the other hand, in the context of a dynamic model with multiple creditors, Rajan and Winton (1995) show that a bank's ability to demand *additional* collateral when the debtor's prospects deteriorate may raise the bank's ex ante incentives to monitor. Their argument proceeds as follows. Compared to other creditors, banks have a comparative advantage in monitoring the entrepreneur's project, and therefore to liquidate the project when things go badly. However, in order to have the incentive to invest in monitoring, banks must have the ability to take increased collateral when the borrower is in difficulty, as this confers effective priority to the bank at the liquidation stage. But this can be advantageous to the other creditors as well, since by requiring additional collateral the bank will indirectly "sound the alarm bell" and induce efficient liquidation which would not have taken place otherwise.

A borrower's willingness to post collateral can also convey useful information concerning his type in the context of adverse selection models: Bester (1985), Besanko and Thakor (1987a, b), and Chan and Tahkor (1987) show that this information can improve the allocation of credit in equilibrium, tempering the problems created by adverse selection (illustrated by Stiglitz and Weiss, 1981).

Back on our side of the ledger, others before us have warned against the potential shortcomings of creditors' reliance on collateral protection. Some have stressed that collateral exemptions mitigate the cost of failure and thereby raise entrepreneurial incentives to take risk and exert effort, without necessarily increasing the bankruptcy rate:

> Some states have generous household exemptions for insolvent debtors, others chintzy ones. In the former states, the risk of entrepreneurship is reduced because the cost of failure is less, but interest rates are higher because default is more likely and the creditor's position in the event of default is weaker. And note that higher interest rates make default all the more likely. Cutting the other way, however, is the fact that in the low-exemption states lenders' risk is less, which induces lenders to make more risky loans, i.e., loans likelier to end in bankruptcy. It is therefore unclear as a theoretical proposition whether there will be more bankruptcies in the high-exemption states or in the low-exemption ones. [Posner, 1992, p. 400]

One may object that failure cost mitigation is better left to private contracting and renegotiation in case of borrower's distress than to legal limitations on the amount of collateral which can be legally pledged. However, there are reasons to believe that private contracting can result in funding of excessively risky projects relatively to the socially efficient level, and collateral exemptions can correct this bias. In this paper we have provided one such reason (insufficient screening by banks), but there are others too. If entrepreneurs are over-optimistic about their probability of success, the possibility of posting collateral increases their ability to obtain funding for unworthy projects by insulating banks from their downside risk (see Manove and Padilla (1998)). Moreover, if borrowers are insured by social security or some other social "safety net", they have an incentive to invest in excessively risky projects and banks may have no incentive to restrain or monitor them when they are fully protected by collateral. Jackson (1986) has made this point very effectively:

> If there were no right of discharge, an individual who lost his assets to creditors might rely instead on social welfare programs. The existence of those programs might induce him to

> underestimate the true cost of his decisions to borrow. In contrast, discharge imposes much of the risk of ill-advised credit decisions, not on social insurance programs, but on creditors. The availability of unlimited non-waivable right of discharge in bankruptcy therefore encourages creditors to police extensions of credit and thus minimizes the moral hazard created to safety-net programs. Because creditors can monitor debtors and are free to grant or withhold credit, the discharge system contains a built-in checking mechanism. The importance of encouraging creditor monitoring in a society that provides other safety nets may help explain why the right of discharge is not waivable. [Jackson, 1986]

The debate about the pros and cons of collateral exemptions is part of the wider debate about the balance to be struck between the protection of creditor rights and the safeguard of debtor incentives. This debate is especially intense in connection with the possible reform of bankruptcy procedures in the United States.

One of the central issues in that debate has been the extent to which the priority of secured creditors should be preserved, or rather deviations from absolute priority should be allowed, as de facto happens in the context of the Chapter 11 procedure in the US. While some analysts staunchly defend absolute priority as a prerequisite to cheap and abundant funding to entrepreneurs, Bebchuk and Picker (1997, 1998) have pointed out that deviations from absolute priority raise the incentives of owner-managers to make investments in managerial human capital. Such deviations may also reduce managers' incentives to choose projects for which their input is essential as a means of entrenching themselves in their positions. Similarly, Berkovitch, Israel and Zender (1997) argue that optimal bankruptcy law must also take into account the incentives of managers to invest in firm-specific human capital (they propose an auction mechanism that is biased in favor of the management team.)

A similar trade-off is present in the question of whether or not debtors should be freed from their residual unpaid obligations at the end of a bankruptcy procedure. On the one hand, such debt discharge reduces the extent to which creditors can recoup their debt. But on the other, discharge eliminates the perverse effect on the debtor's incentives caused by the "debt overhang". In commenting on current proposals to restrict access to the relatively lenient US bankruptcy procedure, *The Economist* vividly portrays this trade-off:

> On the face of it, the economic case for giving debtors extensive protection is easily dismissed. Other things equal, the easier it is for a borrower to escape from its obligations to pay interest and, ultimately, repay a loan, the more likely it is that creditors will lose some of the money they lend, and so the less willing they will be to extend credit. Less plentiful credit means less economic activity. Against this should be set important benefits that can result from bankruptcy law, says Lawrence Ausubel ... When someone is too deeply in debt, he may have little incentive to work, or, at least, to do any work that is legal, as any income earned will have to go to creditors. Free him from his debts an his incentives to work (legally) are restored. In a sense, the right to go bust is an insurance policy against financial disaster." [*The Economist*, July 4th, 1998, p. 85]

This insurance aspect of lenient debtor treatment is particularly important in high-risk, innovative sectors, where entrepreneurial success cannot be easily obtained without a previous string of failures. In R&D-intensive industries, there is often considerable learning value to failures, so that in the presence of capital market imperfections, lenient treatment and immediate rehabilitation of defaulting borrowers can provide entrepreneurs with crucial "insurance" against business failure . In fact, the European Commission, in its April 1998 report *Risk Capital: A Key to Job Creation in Europe*, is proposing plans to make European bankruptcy laws more lenient (closer to the current US standard), precisely to encourage more innovative European entrepreneurship.

In conclusion, both the literature and the policy debate highlight that, while protecting creditor rights both via collateral and in bankruptcy procedures is essential for the availability of cheap credit, there are sound efficiency reasons to avoid pushing this protection too far, and instead strike a careful balance with the protection of debtors' rights. Our argument that unfettered reliance on collateral may lead banks to underinvest in screening and allocate social resource inefficiently should be seen as a further argument in this direction.

5 Conclusions

In this paper we have shown that when banks behave competitively, in the presence of asymmetric information the use of collateral in debt contracts may reduce the screening effort of banks below its socially efficient level, leading them to fund too many worthless investment projects. This inefficiency can be tempered or eliminated by use of collateral exemptions. In the wider perspective of the current controversy about the desirable degree of creditor-rights protection, our paper provides an additional argument to the reasons so far adduced for limiting creditor rights. In fact, the need to balance the protection of creditor rights, on the one hand, with the promotion of entrepreneurial activity and the maintenance of quality standards for investment projects, on the other, is an issue that is central to the current debate on bankruptcy law now taking place on both sides of the Atlantic.

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