JOHANN WOLFGANG GOETHE-UNIVERSITÄT
FRANKFURT AM MAIN

FACHBEREICH WIRTSCHAFTSWISSENSCHAFTEN

Andreas R. Hackethal, Marcel Tyrell

Complementarity and Financial Systems
- A Theoretical Approach -

No. 11
November 1998

WORKING PAPER SERIES: FINANCE & ACCOUNTING

Andreas R. Hackethal
Marcel Tyrell[†]

Complementarity and Financial Systems - A Theoretical Approach[*] -

No. 11
November 1998

Wilhelm Merton Professur für Ökonomie des Welthandels

Johann Wolfgang Goethe-Universität

Sophienstr. 44, 60487 Frankfurt am Main

First Version: July 1996
Current Version: November 1998

ISSN 1434-3401

[†] Wilhelm Merton Chair for International Banking and Finance, Johann Wolfgang Goethe-University, Sophienstr. 44, 60487 Frankfurt am Main

[*] We thank Reinhard H. Schmidt, Christian Laux, Thomas Hartmann-Wendels, the participants of the 1998 annual meeting of the German Economic Association and the participants of the Finance Colloquium held 1997 at Frankfurt University for helpful comments and discussions. We are grateful to the Deutsche Forschungsgemeinschaft for its financial support.

Complementarity and Financial Systems

- A Theoretical Approach -

No. 11

Abstract

Individual financial systems can be understood as very specific configurations of certain key elements. Often these configurations remain unchanged for decades. We hypothesize that there is a specific relationship between key elements, namely that of complementarity. Thus, complementarity seems to be an essential feature of financial systems.

Intuitively speaking, complementarity exists if the elements of a (financial) system reinforce each other in terms of contributing to the functioning of the system. It is the purpose of this paper to provide an analytical clarification of the concept of complementarity. This is done by modeling financial systems as combinations of four elements: firm-specific human capital of an entrepreneur, the ability of a bank to restructure the borrower's firm in the case of distress, the possibility to appropriate private benefits from running the firm, and the bankruptcy law. A specific configuration of these elements constitutes one financial system.

The bankruptcy law and the potential private benefits are treated as exogenous. They determine the bargaining power of the contracting parties in the case that recontracting occurs. In a two-stage game, the optimal values for the other elements are determined by the agents individually - by investing in human capital and restructuring skills, respectively - and jointly by writing, executing and possibly renegotiating a financing contract for the firm. The paper discusses the equilibria for different types of bankruptcy law and demonstrates that equilibria exhibit the sought-after feature of complementarity. Three particularly significant equilibria correspond to stylized accounts of the British, German and the US-American financial system, respectively.

JEL-Classification: G20, G21, G30, G33

Keywords: Banks, Financial Systems, Complementarity, Bankruptcy Law

1 Introduction

1.1 The problem

Financial systems are complex institutional arrangements. Their mere description is a difficult task for researchers as there is no consensus concerning the questions which elements should be considered as important and thus included in the description of a financial system, and how the various elements interact and how this should be reflected in the description.

Evidently, this is an important shortcoming, as only an understanding of the interplay of its elements can help us in understanding the structure and functions of financial systems in general and in assessing the proper functioning of a given financial system.

Even a brief look at existing financial systems shows that they are very specific configurations of core elements. The fact that these specific configurations often remain unchanged over decades suggests that they constitute an essential feature of any financial system. But what could account for this stability? Our hypothesis is that it is the feature of complementarity of the (key) elements of such a system.[1] The elements of a system are called complementary with respect to each other if they interact in such a way that increasing the value of one element leads to nonnegative marginal returns from increasing the value of other elements. A system with complementary elements typically has more than one equilibrium in the sense of a local maximum. These equilibria are characterized by "extreme" values of the relevant variables: distinct sets of values of the system's elements "fit together" well and constitute "good" solutions for the problem under consideration. We discuss the concept of complementarity more fully in section 2.5.4 below. In our opinion, complementarity is the intrinsic reason for the systemic character of financial systems, for the perceived differences among financial systems in the real world and for their persistence over time.

It is the objective of this paper to clarify this concept of complementarity and to illustrate its relevance for the analysis and the design of financial systems. We do this by building a game-theoretic model of a stylized financial system. The model covers a time span of two periods and includes an entrepreneur and a bank. As he does not have the necessary funds, the entrepreneur seeks financing for a potentially worthwhile investment project from a bank. The project can be initiated at the beginning of the first period and provides an uncertain payoff at the end of the second period. The payoff depends on the level of the firm-specific human capital investment of the entrepreneur during the first period. After the first period, a signal concerning the payoff is observed by the entrepreneur, the bank and, yet with a lower precision, by third parties such as a bankruptcy court. The value of this signal can have two consequences, one being a risk-increasing change of the investment project, and the other one a possible recontracting covering, among other things, a change of the right to decide about the investment project. How the bank can, and might want to, act in the case of a renegotiation depends on the level of restructuring capability which she has built up during the first period. Both the optimal human capital investment decision of the entrepreneur and

[1] For general analyses of complementarity refer to Milgrom/Roberts (1995), regarding financial systems refer to Franks/Mayer (1995) and Schmidt/Tyrell (1997). Schmidt/Spindler (1998) explore the implications of complementarity on the path dependency of financial systems.

the decision of the bank to acquire restructuring capabilities depend on the quality of the project, the character of the bankruptcy law and certain other parameters. These factors are exogenous to the model, whereas the levels of human capital and restructuring capabilities as well as the outcome of a possible renegotiation and of the continuation of the project are determined by the interplay of the strategies pursued by the entrepreneur and the bank.

Various problems complicate the relationship between the entrepreneur and the bank:

(1) At the end of the first period, both agents observe a signal which enables them to *perfectly* anticipate the cash flows generated by the project in a later period. However, third parties, such as bankruptcy courts, can only discriminate between a ”high” and a ”low” value of the signal. We define ”high” as guaranteeing a sufficient cash flow for paying back the loan. Thus ”low” values of the signal indicate ”financial distress”. As a consequence, any clause of the initial contract referring to events such as renegotiations and a transfer of control over the assets of the firm after the first period can only be made contingent upon the incident of financial distress. The initial contract must also be incomplete with respect to the amounts invested in specific human capital and restructuring skills, respectively, as both are assumed to be nonverifiable.

(2) After having observed the signal, the entrepreneur can alter the risk profile of the project in a way which gives him the opportunity to divert cash flows away from the project into his own pockets. The risky action reduces the anticipated verifiable part of the final payoff that can be claimed by the bank according to the contract, and thus creates a moral hazard problem.

(3) Renegotiations ensuing bankruptcy procedures may lead to an inefficient liquidation of the firm’s assets giving the bank all the proceeds and making the entrepreneur’s specific human capital worthless, which in turn constitutes a social loss.

(4) The level of acquired firm-specific human capital and the final payoff of the project are positively correlated, ascribing a second, i.e. socially desired, effect to specific human capital.

Thus the model incorporates aspects of incomplete contracts, moral hazard, agency costs and specific human capital. Their interplay determines the complexity of the decisions of the agents at both the beginning and the end of the first period. We model the financing problem from the perspective of the entrepreneur. He selects his profit maximizing strategy subject to the participation and incentive compatibility constraints of the bank.

Where are the financial systems aspects and the feature of complementarity in the model? It seems straightforward to interpret an equilibrium configuration comprising a specific bankruptcy regime, particular opportunities to appropriate private benefits and certain levels of firm-specific human capital and restructuring capabilities of banks, respectively, as representing a particular financial system. As will be shown when we determine possible equilibria resulting from the optimal strategies of the agents in conjunction with the external factors, the equilibrium values which the endogenous variables take on will exhibit complementarity, i.e. mutually determine and reinforce their "effectiveness", and they are, in turn, complementary to exogenous factors. An entrepreneur facing a creditor-friendly bankruptcy law will tend to turn to a bank capable of restructuring and invest the maximum amount into his specific human capital, while he will get his loan from an arm’s-length-type

bank and build up only the minimum amount of specific human capital necessary, should he be confronted with a debtor-friendly law. Further results of our analysis are that the first (second) equilibrium becomes more stable, the higher (lower) the upper bound for the cash flows that can be privately diverted by the entrepreneur, the higher (lower) the private costs of a loss of control to the entrepreneur, and the lower (higher) the proceeds from liquidation.

As far as the modeling technique is concerned, we apply the perfect-equilibrium concept from game theory and, because the objective function includes discrete arguments, we borrow some concepts from lattice theory.

The paper proceeds as follows. The next section reviews the relevant literature. In part 2, we will first characterize the project, the agents, their choice variables, and the bankruptcy regime and then analyze the optimal strategies for the entrepreneur and the bank(s). Part 3 discusses similarities between our model and stylized facts of the financial systems of Germany, Great Britain and the United States. Part 4 shall prove the relevance of the model and concludes.

1.2 Review of the literature

Our model relates to various issues currently discussed in the finance- and in the economics and law literature. As the models of Aghion/Bolton (1992) and Hart (1995) our model rests on the important notion that financial contracts do not only assign claims on cash flows but do also allocate conditional control rights over a firm's assets.[2] Proceeding from this insight we analyze the effect of different bankruptcy schemes on attributes of contract and potentially ensuing control right allocations.

The model itself bears some resemblance to the approach chosen in Berglöf (1994).[3] The author derives the optimal allocation of control rights for a financing relationship, that is characterized by conflicts of interest between an entrepreneur and a venture capitalist. By investing in firm-specific human capital the entrepreneur is able to increase the value of potential private benefits that he may extract from the firm's operations. Simultaneously he has to bear in mind that a sale of the firm by the venture capitalist may preclude him from extracting these very benefits. Ex ante, this tradeoff may under certain circumstances induce the entrepreneur not to invest into specific human capital at all. On the other hand the venture capitalist has to fear that the entrepreneur sells his shares in the firm to a third party which could then take measures that would dilute the value of the venture capitalist's shares. The analogy between Berglöf (1994) and our model becomes apparent if one hypothetically replaces the venture capitalist by a bank and the decision to sell the firm by the decision to liquidate it. There exist, however, important differences between the two models. Berglöf (1994) differentiates only between two possible project outcomes, i.e. a good one and a bad

[2] See also Berglöf/von Thadden (1994), Dewatripont/Tirole (1994) and Laux (1996).

[3] See also Holmström/Tirole (1997).

one. Compared to our model this considerably reduces the set of alternative contracts and the set of actions to be taken by the participants.[4]

Furthermore, the venture capitalist can only sell the firm. It is ruled out that he is able to increase his expected return ex ante by investing in firm-specific capabilities (”restructuring skills” in the terminology of our model). Finally – and this is the most important difference to our model – the implications of different bankruptcy laws are not considered in Berglöf (1994).

Bankruptcy law itself is the subject of an extensive empirical and theoretical literature. Relevant empirical sources will be discussed in the last part of the paper. Most of the theoretical work analyzes the *ex post* efficiency of particular bankruptcy schemes and thus does not examine the ex ante implications of bankruptcy law attributes on the decisions made by debtor firms and creditors, e.g. the decision to invest in firm-specific human capital, to mitigate information asymmetries or to conduct private renegotiations. Examples for this branch of the literature include Bebchuk (1988), Aghion/Hart/Moore (1992), Franks/Nyborg (1994) and White (1994). Exceptions are Gertner/Scharfstein (1991) and Detragiache (1994), who analyze explicitly the implications of the bankruptcy law on the creditors' decision whether to provide the funds for a specific project at all.[5] In marked contrast to our model, however, the authors lay their focus on coordination problems among multiple creditors. Bebchuk/Picker (1992) and Berkovitch/Israel/Zender (1993) analyze the implications on human capital investments, but do not regard the nature of the debtor-creditor relationship. The advantages of close relationships are analyzed in depth in the work of Diamond (1984,1991), Rajan (1992), Dewatripont/Maskin (1995) and von Thadden (1995). Again, bankruptcy law is not within the scope of their models.

Concerning its main argument, our work is most akin to Hauswald (1996) and Berkovitch/Israel (1995). They perceive financial systems as a set of various elements which have to ”fit” together in order to optimally fulfill their respective functions.

Hauswald (1996) examines efficiency related attributes of both universal banking systems and specialized banking systems where commercial banking is separated from investment banking. In his model of incomplete contracts all three types of banks may build up restructuring skills enabling them to restructure financially distressed firms and thereby to avoid inefficient liquidations. However, only universal banks may grant loans and at the same time hold equity stakes in the debtor firm. He finds that the only renegotiation-proof contract is a mixed-finance contract and as a consequence, only universal banks will typically have incentives to bear the cost of developing restructuring skills ex ante. In financial systems characterized by specialized banking, alternative devices to avoid inefficient liquidations will be employed, the most prominent being an active market for corporate takeovers.

The optimality of the mixed finance contract relies on the somewhat implausible assumption, that not only the universal bank, but also the other shareholders participate in the positive returns from restructuring. It should seem more realistic to assume that the bank recapture the

---

[4] It is questionable whether the results in Berglöf (1994) remain unchanged if more possible states are introduced into the model as the rule for allocating control rights contingent upon the project return would have to be quite different.

[5] For an examination of ex ante implications of the old German bankruptcy law, see Schmidt (1981).

entire return or at least that the sharing rule be determined by a particular bankruptcy law. In addition, empirical evidence for the prevalence of mixed finance contracts in universal banking systems is hard to find. Especially in the case of small and medium size enterprises do such contracts seem to be rare exceptions (see for example Edwards/Fischer (1994)). Specific human capital plays no role in Hauswald's model.

Berkovitch/Israel (1995) present an approach that can be interpreted as complementary to our own. They analyze a financing problem in which a debtor obtains private benefits from the continuation of his firm's operations but nothing if the firm is liquidated. Hence, he will never concede to a liquidation, even if this would constitute the ex post efficient outcome.[6] Moral hazard may thus lead to an underinvestment problem in the model. In analyzing its magnitude they distinguish between two regimes that differ with respect to the nature of the debtor-creditor relations. In one regime, the entrepreneur knows exactly how well the bank is informed about the quality of the project. In the other regime the relationship is "at arm's length", so that the entrepreneur cannot assess the quality of the bank's information under any circumstances. For each regime they then derive the optimal bankruptcy law, i.e. one that minimizes the magnitude of the respective underinvestment problem. They prove that a close relationship implies a creditor-friendly bankruptcy law, whereas an arm's length relationship is best governed by a debtor-friendly bankruptcy law. The rationale behind this result follows from the strategic value of the debtor's information about the bank. A well informed debtor will choose his optimal ex post strategy contingent upon the bank's information and can thus reduce the probability of a liquidation. A creditor-friendly bankruptcy law counterbalances this effect by advocating the bank's attempts to liquidate.

The main difference to our model is that Berkovitch/Israel treat the nature of the creditor-debtor relationship as exogenous and the characteristics of the bankruptcy law as endogenous. We pursue the opposite approach by treating the bankruptcy law as exogenous and the both the bank's decision to acquire restructuring skills and the entrepreneur's decision to invest in firm-specific human capital as endogenous.

2 The model

2.1 Sequence of events and information structure

The model extends over two periods and three points in time. At t=0 an entrepreneur[7] with zero wealth offers a financial contract to an investor. According to the contract the investor provides the funds I to invest into a positive-NPV-project at t=0 and the entrepreneur is obliged to make a repayment of D at t=2.

---

[6] Berkovitch/Israel assume that the private benefits do not disappear through a liquidation. Rather, the firm is sold as a going concern and the new manager-owner can seize the private benefits otherwise appropriated by the initial entrepreneur. This has the important implication that a liquidation prompted by the bank will always be efficient. Hence a source of inefficiencies covered by our model is ruled out in their model.

[7] In the remainder of the text we use the terms "entrepreneur", "firm" and "debtor" synonymously. For the rationale, please refer to section 2.2.1.

We assume that the entrepreneur can only offer a standard credit contract to the investor.[8] In fixing the nominal amount D of the credit, he implicitly determines the nominal rate of return to the investor (who is in the basic model called a bank).[9] We consider a risk neutral economy.

If the bank accepts the contract, the project is started immediately. Also at $t=0$, the entrepreneur (the firm) makes a decision concerning the investment in firm-specific human capital $H \in [0,h]$ and the bank decides whether to the invest the fix amount r into restructuring skills.

After one period, at $t=1$, a random signal $\tilde{x}$ can be observed by *both* the entrepreneur and the bank. The distribution of $\tilde{x}$ is common knowledge ex ante: $\tilde{x}$ is uniformly distributed on the interval $[0, \bar{x}]$ and serves as a perfect predictor of the achievable total pay off $\tilde{\pi} = \tilde{x} + \alpha H$ at $t=2$. $\tilde{\pi}$ thus comprises a random component and a component which will be described in detail in section 2.2.1. Accordingly, $\tilde{\pi}$ is a random variable uniformly distributed on the interval $[\alpha H, \bar{x} + \alpha H]$.

After observing x, both parties already know at $t=1$ whether the firm will be able to repay D in full or rather default on the loan and only pay a fraction of D. It is essential that the exact forecast of the total project payoff is *not verifiable*, such that third parties like courts do not know by *how much* the entrepreneur might default. However, we assume that from observing x a court can derive correctly whether the total payoff π will be sufficient to pay D to the bank or whether the firm winds up in financial distress.[10]

The occurrence of a signal predicting a total payoff that is smaller than the repayment amount D thus implies a verifiable breach of the original contract. As a result, the bank may *legally* claim control over the firm's assets.[11] We define financial distress as a situation in which the value of the project is not sufficient to cover the obligation toward the creditor(s)[12] and where two parties with conflicting interests but symmetric information enter renegotiations over the initial credit contract signed at $t=0$. In addition to the initiation of renegotiations based on the legal right of the bank, such a renegotiation can also be started if both parties agree that

---

[8] The restriction on the set of feasible contracts may seem to be an arbitrary assumption, as it should be principally be also possible to finance the project for instance with venture capital. However, we assume the optimality of credit contracts to stem from verification costs regarding the project's payoffs in $t=2$ as in Townsend (1979) or Gale/Hellwig (1985). For the sake of simplicity we did not model these verification costs explicitly.

[9] The optimality of a bank in this context could be derived from the model of Diamond (1984) in connection with costly state verification costs.

[10] A possible interpretation for this assumption is that outside parties are usually endowed with much less information concerning the quality of the project and its progress, so that they are only vaguely able to distinguish the two general states, i.e. financial distress and financial health. Evaluation mistakes are sufficiently rare, so that a consideration of an inadequate decision by a court does not effect the entrepreneur's choice of a payoff-maximizing contract ex ante.

[11] See Hart (1995, p.101): "*One of the most basic features of a debt contract is the idea that what triggers a shift in control is the non-payment of a debt.*"

[12] Wruck (1990), p.421, differentiates between a technical insolvency, which requires a negative net value of the equity position and insolvency in a cash-flow sense, which is given when a firm cannot fulfill its current financial obligations. In the simplified world of our model a firm with a negative value is certain to be unable to meeting its repayment obligations, so that our notion of insolvency covers both of the above definitions.

changing the contractual allocation of control increases the final payoffs, irrespective of whether the firm is in financial distress or not (see section 2.4).

As we will demonstrate below, and as intuition clearly suggests, the decision to start renegotiations, the possible options of the two agents in the negotiations, and their outcome strongly depend on the ability of the bank to restructure the firm and on the type of the bankruptcy law that is in force. A formalization of such interactions between private renegotiations and verifiable contingencies is typical for incomplete contract models.[13]

If at t=1 the entrepreneur emerges from the renegotiations as still being in control, he will select an action from the set $\{a_0, a_b, a_L\}$ at the beginning of the second period. In case the bank is assigned the control, the measures she can possible take depend on whether she has, at t=0, invested in her capabilities of restructuring the firm in case it falls into distress.

The entrepreneur's riskless action a_0 results in a sure payoff of $\pi=x+\alpha H$ at t=2. The risky action a_b can lead to two possible, and equally probable, values for the payoff. In one state the total payoff will be "high", amounting to $\pi=x+\alpha H+b$, but the entrepreneur will be in a position to appropriate all of b, so that only $\pi_{CASH}=x+\alpha H$ will remain for repaying the loan. In the other state, business deteriorates and both the total payoff π and its verifiable component π_{CASH} turn out "low". They decline to $\pi_{CASH} = \pi = x+\alpha H-b$. The risky action a_b thus constitutes a mean-preserving spread and can be interpreted as one, which induces the entrepreneur to concentrate all of his efforts on the appropriation of private benefits and hence to neglect other essential management activities, so that customers may turn away or costs may increase dramatically.

The third action a_L will lead to an immediate liquidation of the firm. The sale of the assets will yield the total payoff $L+\alpha H$. The entrepreneur and all employees will have to leave the firm and as a consequence will suffer from the deterioration of the value of their specific human capital, which they cannot employ in other firms. Their private costs will amount to H (refer to the next section for more details).

At t=2 the payoff π is realized and the project is terminated. π is only verifiable in its cash components $x+\alpha H$ and $x+\alpha H-b$, respectively, but not in its private benefits. The bank receives the smaller of her contractual cash flow rights D and the portion π_{CASH} of realized total payoffs. Table 1 summarizes the sequence of actions in our model.

t=0	*t=1*	*t=2*
▪ The firm offers a debt contract to the bank ▪ The firm decides whether to invest in firm-specific human capital ▪ The bank decides whether to invest in restructuring skills	▪ Signal $\tilde{x}$ occurs ▪ Control over the firms assets is allocated ▪ Action a_i is selected	▪ Payoff π is realized and distributed to the entrepreneur and the bank

Table 1: Time line of events

[13] See for instance Hart/Moore (1998).

2.2 The contract parties

2.2.1 The entrepreneur (the firm)

In order to capture as many implications of investments into firm-specific human capital as possible, we base our analysis on a relatively comprehensive notion of "entrepreneur". We do not define "entrepreneur" in the narrow sense of the manager-owner[14] of a firm but rather extend the notion onto most of the firm's employees. We thereby implicitly assume that the firm's strategic decisions are made only after employees have been consulted and an agreement between management and employees has been achieved (amounting to some from of codetermination) or, alternatively, that the manager and the employees have common interests, e.g. because they are members of the same family. We shall mention that this comprehensive notion is not necessary for the model to work but simply allows for a more intuitive treatment of firm-specific human capital and thus for a richer interpretation of the results.

At t=0 the entrepreneur (the firm) decides on his (its) investment in human capital. The investment amount h, that should be optimally invested depends on the production technology inherent to the project in question. He can invest the amount h into two different categories of human capital. One alternative is to acquire general skills (or to train his employees these skills) that can be directly employed by other firms with comparable production technologies. Should the entrepreneur (or an employee) leave the firm, his chances of immediately finding an adequate employment with another firm are then assumed to be high. The second alternative is to acquire skills which are highly specific to the project and thus to the firm itself. Building up firm-specific human capital has two implications. Firstly, it allows the firm to configure machines better, implement better processes, refine product and service ideas, etc. As a consequence of the specific investment, both the final payoff of the project and the firm's liquidation value[15] will increase by αH. The publicly observable parameter α circumscribes the sensitivity of the production technology with respect to the firm-specificity of the firm's human capital and H denotes the portion of h that had been invested in firm-specific human capital ($H \in [0,h]$). Secondly, we assume that the human capital of the manager (and his employees) is so specific to his (their) firm that it cannot be directly employed by other firms, which may require a very different specific skillset. Should the manager (the employees) be forced out of his (their) distressed firm he (they) will find it extremely difficult to get adequate employment somewhere else.[16] Search costs, opportunity costs from

---

[14] As the project is fully financed by external debt-capital, "owner" is equivalent to "residual claimant" in our context.

[15] We assume that potential buyers of the liquidation assets are able to observe the quality of machine configuration and product ideas (patents) and are hence willing to pay a higher price if those assets had been employed by employees with firm- or asset-specific human capital. A convenient implication of this assumption is that the mathematical expressions in the subsequent sections are considerably simplified. However, the results of the model would remain qualitatively unchanged if we assumed the liquidation payoff to be equal to L.

[16] In case of a liquidation of his firm, the owner-manager will loose his reputation as a successful entrepreneur and will not be able to start a new project immediately.

temporary unemployment and wage discounts in subsequent occupations are assumed to add up to an amount equal to the initial investment in firm-specific human capital H.[17]

In determining the optimal investment amount H ex ante, the firm thus faces a tradeoff: Investing in firm-specific human capital will strictly increase the final payoff of the project by αH but may also lead to a private loss H should the firm be liquidated at t=1.[18] The ex ante probability of such a liquidation and thus the *expected* size of the loss will depend on the bank's incentives to liquidate, which in turn crucially depend on her capabilities to restructure a distressed firm and on the nature of the bankruptcy law that is force. These determinants will be discussed in the following two sections.

As a consequence of the assumptions concerning the set of feasible financial contracts and the investment in specific human capital our model applies primarily to small and medium size enterprises. We may neglect conflicts of interest between owners, managers and employees as they typically occur in larger firms.

2.2.2 The bank

At t=0 the bank has to determine whether or not to invest an amount r into her capability to restructure the financially distressed firm after t=1.[19] If she does invest, she becomes a bank of type R=r, which has the necessary entrepreneur- and firm-specific information to prevent the debtor from extracting the nonverifiable private benefits b and thereby diluting the value of the firm for the bank, if he should select action a_b at t=1. The capability to restructure can thus be interpreted as an indication of a *close* relationship between the debtor and the creditor, through which a lot of information are exchanged. We assume that this capability is not observable by third parties and not transferable onto other creditors.

On the other hand, even after investing r, the bank does not have enough information to implement the riskless action a_0 all by herself and thereby to substitute the entrepreneur's and his employees' expertise completely. Therefore if she wants to continue the firm even though she may have the right to discontinue and liquidate it, the bank will depend on the entrepreneur to a certain extent. As a consequence of this dependence, the entrepreneur will remain in office and will not incur a private loss. Neither will the employees be inflicted by a deterioration of the value of their firm-specific human capital. Thus, they are merely no longer able to extract the private benefits b from the firm. Hence, it is only the sharing rule

---

[17] For empirical evidence on private costs to employees please refer to FN. 54. See also Gilson (1989), who points to "*significant personal costs to corporate managers"* because of (1) *a loss of future income*, (2) *loss of firm-specific human capital*, (3) *loss of power, prestige, or other nonpecuniary benefits* and (4) *adverse reputation effects.* Chang/Wang (1995) present a theoretical model on the relationship between investments in value enhancing specific human capital and potential private losses to employees.

[18] In a complete-contract setting, the entrepreneur would invest H=h, if $h\cdot(x_L^*/\bar{x})<\alpha\cdot h$ is satisfied, where $(x_L^*/\bar{x})$ denotes the first-best ex ante liquidation probability. In this case, the positive marginal return from firm-specific human capital outweighs its expected costs to the firm.

[19] We assume that gathering information about a specific firm is costly and that these costs are fixed cost. This concurs with assumptions made in the standard literature on the informational efficiency of capital markets (e.g. Grossman/Stiglitz (1980)). As suggested by intuition, investing r is only observable to the debtor-firm but not to any third party.

applied to the final payoff that is altered. The amount b remains in the firm and will be a part of what the bank gets if the firm is unable to fulfill its contractual obligation.

In case the bank does not invest in restructuring skills (R=0), she will not be able to gather the firm-specific information necessary to restructure the distressed firm at t=1. However, the information at hand will be sufficient to interpret the value of the signal $\tilde{x}$ correctly and thus provide an important advantage over outsiders. Should a signal smaller than D-αH occur, she may only choose one out of two actions: either remain passive and let the entrepreneur extract private benefits or attempt a liquidation.

We assume perfect competition in the capital markets and may thus restrict our analysis to one representative transaction between a bank and a firm. At t=0 the firm makes a take-it-or-leave-it offer to the bank with respect to the nominal amount I of the loan and the nominal repayment amount D. As a profit-maximizing entity, the firm will choose an amount D which will lead to an expected profit of exactly zero for the bank, if she makes the "right" decision concerning the investment in her own capability to restructure the firm. In case of a deviation her expected payoff from the transaction will turn negative. The bank's participation- and incentive compatibility[20] constraints hence require that the sum of the initial investments I and R equal her *expected* payoff at t=2. Finally, when formulating the offer, the debtor has to satisfy his own incentive compatibility constraint with respect to the optimal investment H into firm-specific human capital[21].

2.3 The bankruptcy law

"*Bankruptcy represents a legal framework for recontracting when various interested parties cannot reach an accord following a firm's default on a debt contract*" (Weiss (1990)). In today's developed economies, these legal frameworks represent very complex arrangements of legal procedures implying different allocations of rights. As it would be a formidable task to account for all potential characteristics of these procedures in a comparative economic model, we need to simplify dramatically. However, we shall attempt to capture in our snapshot three essential aspects with their ex ante implications that nearly all bankruptcy laws have in common: Firstly, as liquidation is the basic procedure of every bankruptcy law, we shall define which parties may file for such a procedure and which rights are assigned to each party therein. Secondly, we shall account for the empirical fact that most bankruptcy procedures impose nontrivial direct costs on the participants and in particular on the debtholders. Thirdly, for those instances in which the creditor does not prefer to liquidate the firm, we shall define some form of bargaining over a restructuring (refer to section 3.1 for empirical evidence on the bankruptcy laws of the USA, Great Britain, and Germany). Concerning the implications of the three aspects, our model should allow for deviations from

---

[20] For a proof of incentive compatibility, please refer to Appendix 1.

[21] A typical loan contract in our model may be formulated as follows: "At t=0 the bank has to pay the amount I to the firm and in exchange obtains a repayment D at t=2." A definition for financial distress directly follows: If a signal $x<D-\alpha H$ occurs, both parties know with absolute certainty that the firm will not be able to honor the contract at t=2. Because it is exactly this characteristic of the signal which is verifiable, third parties are aware of the firm's breach of contract.

an absolute priority rule, i.e. for outcomes in which parties holding junior claims (e.g. the residual claimants) receive payments although the senior creditor has not been repaid in full, and for the possibility that a distressed firm may continue operating in the same line of business.

The **restructuring procedure** can only be filed by the bank. She has to commit herself vis-à-vis the courts to restructure the firm – thereby guaranteeing its continuation - and will then obtain the control over the firm's assets with probability one. In transferring the control over a distressed firm's assets to the creditor the courts act perfectly rational in our model. The transfer will leave the expected total payoff unchanged and will only change the distribution of payoffs. Essentially, the courts enable the bank to obtain the maximum-possible portion of her contractual claims. However, as the act of filing requires a commitment from the bank to continue the firm, the procedure precludes a bank from a subsequent liquidation. Any attempt to liquidate the firm would be observed by the courts and because the potential negative effects on the value of specific human capital are publicly known, the alternative liquidation/reorganization procedure would be immediately initiated by the courts. Hence, only banks that have developed restructuring skills will find it worthwhile to file for the restructuring procedure at t=1.

Because banks of type R=r obtain the control with probability one, the parties may also agree on a restructuring without involving the courts at t=1. A private workout through which the bank gets in a position to restructure the firm will thus have identical implications on the payoffs at t=2.

Both parties can file for the **liquidation/reorganization procedure** as soon as the firm is observed to be in financial distress. However, it is ruled out that the debtor preempt a bank willing to restructure. Hence, courts are assumed to prioritize the restructuring procedure over the second procedure, which is again consistent with rational behavior in our context.

In order to account for potential deviations from an absolute priority rule as well as for the possibility that failing firms might nevertheless continue their operations, we assume that courts empower the bank (or a court-appointed trustee) to liquidate the firm only with probability $p \leq 1$. The value of p is assumed to be public knowledge ex ante. With probability $(1-p)$ the control remains with the entrepreneur, who will subsequently select the risky action a_b and attempt to extract private benefits b. The difference between the contractual repayment amount D and the expected payoff for the bank $x+\alpha H-\frac{1}{2}b$ can then be interpreted as a violation of priority (equivalent to a debt relief in our model) determined by some debtor-formulated plan for reorganization. Hence, a bankruptcy law that implies a value for p that is smaller than 1 provides the entrepreneur with clearly defined opportunities to protect his assets - at least partially - from creditor access.

Since the courts neither observe the exact realization of the signal $\tilde{x}$ nor the liquidation value $L+\alpha H$ of the firm they cannot infer at t=1 whether a liquidation or a continuation would be the economically efficient outcome of the liquidation/reorganization procedure. As a consequence of this ex post lack of information the determination of p must be, contrary to the first clause of the insolvency code, exogenous to our model. The parameter p can thus be interpreted as a proxy for the legal orientation or tradition of an economy. The higher the

value for p, the more creditor-oriented is the bankruptcy law in force. To draw an analogy to the US-American bankruptcy law, p would be the probability that a "chapter 7"-type liquidation procedure is initiated and *(1-p)* would be the probability for a "chapter 11"-type procedure.

We further assume that the liquidation/reorganization procedure entails some deadweight loss c, encompassing legal and other administrative fees associated with bankruptcy filing and opportunity costs from a reduction of the firm's competitiveness as the attention of the entrepreneur is focused on the bankruptcy. It is assumed that the incumbent owner-manager remains in control during the legal proceedings and that his financial wealth will at t=1 still amount to zero. As a consequence, we shall neglect his share in c and presume that c will be entirely borne by the bank, either directly at t=1 or indirectly through a decline of the firm value at t=2. It is important to note that c will arise irrespective of the control allocation determined by the bankruptcy courts.

2.4 Private Renegotiations

In this section we examine whether it may be beneficial for both, the bank and the entrepreneur, to enter *private* renegotiations on a new sharing rule after having observed the signal $\tilde{x}$ at t=1. The agreement on a new sharing rule must always imply a transfer payment from the bank to the entrepreneur or equivalently, a reduction of the nominal credit amount to be repaid at t=2. It cannot lead to a transfer payment from the entrepreneur, as he is still wealth constrained at t=1 by assumption.

2.4.1 Renegotiations in the signal interval $[D-\alpha H, \bar{x}]$

If a signal greater than $D-\alpha H$ occurs, the firm is observed to be financially healthy. The only question that has to answered is whether the entrepreneur will prefer action a_b over action a_0.

The entrepreneur's decision obviously depends on his expected payoffs from each alternative. If the signal is sufficiently high, that is, if he can expect to receive some payoff after repaying the loan in full, the entrepreneur will bear downside potential when selecting the risky action a_b. However, if the signal is smaller than a crucial value x^a, the bank bears this downside potential, whereas the entrepreneur will benefit from the upside potential. x^a solves the equation: $x^a+\alpha H-D = ½(x^a+\alpha H-D+b) + ½\ max\ [x^a+\alpha H-D-b, 0]$. We obtain: $x^a = D+b-\alpha H$ or equivalently $\pi^a=D+b$.

Hence, if the signal value implies a payoff π_E from choosing a_0 that is smaller than b, the entrepreneur acts perfectly rational in selecting action a_b. In this case, he will obtain both the verifiable payoff $x+\alpha H-D$ and the private benefits b with a probability of ½. With an equal probability, the total payoff turns out "low" and the opportunity losses b will have to be primarily borne by the bank. As the action a_i is nonverifiable and thus noncontractible, it is not possible for the entrepreneur to commit himself ex ante to act in the bank's interest.[22]

---

[22] Because the value of the signal is nonverifiable, the parties are not able to write a contract on the choice of action a_i. This aspect distinguishes our approach from the one chosen by Aghion/Bolton (1992), where the control over the firm's assets shifts contingent upon a signal's value. Berglöf (1994) applies a mechanism that is quite similar to the one presented here.

Selecting a_b does of course reduce the expected payoff π_B to the bank. Whereas the riskless action a_0 implies the payoff $\min[D,\pi]$, the bank can then only reckon with the amount $\min[D,\pi_{CASH}]$. Our model thus encompasses a moral hazard problem for signal values x smaller than $D+b-\alpha H$.

The question arises whether private renegotiations can solve this moral hazard problem. In order to induce the entrepreneur to choose a_0, the bank would have to offer a transfer payment s. Any payment s has to be contingent upon the verifiable total payoff at t=2. Otherwise, the entrepreneur would capture s and nevertheless select a_b, as this action is not observable by third parties.

As a consequence, the entrepreneur would receive the payment s with probability ½, even if he had selected the risky action a_b. The reason is simple: With probability ½ the action a_b will yield the same verifiable payoff as a_0. From the entrepreneur's perspective, s therefore has to satisfy the condition $\pi-D+s \geq \frac{1}{2}(b+\pi-D+s) \Leftrightarrow s \geq (D+b)-\pi$. The bank, on the other hand, is only willing to pay that amount if $D-[(D+b)-\pi] \geq \frac{1}{2}(D+\pi-b) \Leftrightarrow \pi \geq D+b$ holds.

We conclude that a bank will never consider a transfer payment as a means of avoiding the risky action in the signal interval $x \in [D-\alpha H,\ D-\alpha H+b]$. The entrepreneur will hence always select a_b. If a signal greater than $D-\alpha H+b$ occurs, a bank would actually prefer to pay s. However, since the entrepreneur's threat to select a_b is not credible, transfer payments are not necessary and will thus not occur in the interval $x \in [D-\alpha H+b,\ \bar{x}]$, either.

Yet another result that can be obtained for this interval is that the selection of the action a_i is neither influenced by the type of the bankruptcy law nor by the bank's ex ante decision concerning R.

Table 2 summarizes the results of this section:

Signal	***D-αH***	***D-αH+b***	$\bar{x}$
Action	a_b	a_0	
Total Payoff π	$x+\alpha H+\frac{1}{2}(b-b)$	$x+\alpha H$	
Payoff Bank π_B	$\frac{1}{2}(x+\alpha H+D-b)$	D	
Comments	no transfer payment, debtor remains in control	no transfer payment	

Table 2: Payoffs in the signal interval $[D-\alpha H,\ \bar{x}]$

2.4.2 Renegotiations in the signal interval [0,*D-αH*]

The firm is observed to be financially distressed if a signal $x<D-\alpha H$ occurs. The bankruptcy law that is in force will thus serve as the *outside option* for the two parties and its attributes – represented by the two parameters p and c – become crucial determinants of the distribution of bargaining power in t=1. In this section we analyze whether and to what extent the two parties are able to achieve a *private* workout on how to proceed, i.e. which action a_i to select.

Let us again start by examining whether it is worthwhile for the bank to offer a transfer payment to the entrepreneur in order to make him select a_0. From the last section we know that the entrepreneur strictly prefers the risky action whenever $x+\alpha H<D+b$ is true, because

he can appropriate the private benefit b with a probability of ½. A transfer payment that would induce the debtor to act in the bank's interest thus had to solve $s=½(b+s) \Leftrightarrow s=b$. As this amount clearly exceeds the bank's marginal payoff ½b that would result from selecting a_0 instead of a_b, we are able to establish that bribing a financially distressed entrepreneur to select a_0 does not constitute a viable option for the bank.

Secondly, we have to clarify whether a bank of type $R=r$ would bribe the entrepreneur to transfer the control in order to restructure the firm. The answer to this question is again negative. A bank *willing* to restructure is always granted the control by the courts, as this will strictly increase the chances that the loan is repaid in full. Hence, no transfer payment is required.

Finally, we shall elaborate on the question whether our model encompasses constellations in which a bank pays an amount s to the entrepreneur so that he, in turn, would concede to an immediate liquidation. It should be clear that the entrepreneur will never liquidate voluntarily, i.e. without any compensation, as this would lead to a sure loss of H and would preclude him from extracting private benefits. The debtor thus faces a "[...]*tradeoff between firm value and his personal well-being at the expense of the firm's claimholders*".[23]

If the prevailing bankruptcy law is not too creditor-oriented, the bank has in principle incentives to offer a transfer payment that is smaller than the sum of the legal costs c and the anticipated dilution of the firm's value should the entrepreneur remain in control. Again, the impossibility of a binding *private* commitment precludes such an alternative. Irrespective of the payment amount, the debtor cannot credibly commit himself to refrain from seeking court protection after having received the payment, as filing for the liquidation/reorganization procedure would lead to an incremental payoff amounting to $(1-p)(H+½b)$.

We conclude that transfer payments will not occur for signals smaller than $D-\alpha H$. Rather, given that a liquidation attempt is not worthwhile, a bank of type $R=0$ will always remain passive and will thereby implicitly accept a partial debt relief as the entrepreneur is given the opportunity to seize private benefits. A bank of type $R=r$ will always conduct a restructuring of the firm. We shall interpret this results as the potential outcomes of a private workout between a distressed firm and its creditor in our model.

2.5 Derivation of equilibrium strategies

In this section we will utilize the results of the previous sections to derive the two parties' payoffs as a function of the two choice variables H (investment into firm-specific human capital) and R (investment into restructuring skills), and the vector θ comprising all parameters values. The optimization problem reads as follows:

$$(1) \qquad \max \frac{1}{\bar{x}} \int_0^{\bar{x}} \pi_E(D, \hat{H}, \hat{R}, \theta, x) dx$$

[23] See Wruck (1990), p. 440.

$$(2) \qquad I + \hat{R} = \frac{1}{\bar{x}} \int_0^{\bar{x}} \pi_B(D, \hat{H}, \hat{R}, \theta, x)dx$$

$$(3) \qquad \hat{R} \operatorname{argmax} \frac{1}{\bar{x}} \int_0^{\bar{x}} \pi_B(D, \hat{H}, R, \theta, x)dx$$

$$(4) \qquad \hat{H} \operatorname{argmax} \frac{1}{\bar{x}} \int_0^{\bar{x}} \pi_E(D, H, \hat{R}, \theta, x)dx$$

π_E symbolizes the entrepreneur's ex post payoff and π_B that of the bank. The distribution of the total payoff π depends on the allocation of control that prevails at the beginning of the second period, which itself is a function of the signal x. As a consequence, each party can ex ante determine her expected payoff by summing over the weighted payoffs that she will be able to capture in each of the possible states. In order to solve for the equilibrium strategy vector (R^*, H^*) we thus need to find the boundaries of the signal intervals and the sharing rules that get applied within these boundaries.

A "direct" search for the pair of strategies that maximizes the project's total payoff would in a first step require to find the repayment amount D that solves the bank's participation constraint (2) and in a second step require to enter the resulting term into the entrepreneur's profit-function (1). The values for R and H that maximize function (1) would then represent the equilibrium strategies. This approach, however, leads to overly extensive expressions that do not allow for a closed form solution and can only be solved numerically.[24] For that reason, we shall pursue an alternative, "indirect", approach, that brings with it the helpful implication that the nominal debt amount D does not have to be considered explicitly. Instead of comparing the project returns implied by particular strategy vectors we will focus on the *deviations* of these very returns from the first-best return implied by complete contracts. The particular strategy-vector that leads to the smallest deviation and at the same time satisfies the incentive compatibility constraint will then be the one that yields the highest expected return.

The reason why this "indirect" approach enables us to avoid an explicit treatment of the contractual repayment amount D is straightforward: In our model, inefficiencies are the result of ex ante liquidation probabilities that differ from the first-best. Different repayment amounts, however, do not imply different liquidation probabilities. D merely determines the ex ante probability that the entrepreneur will select the risky action a_i at t=1 (the crucial signal value x_a was shown to be a function of D). However, as selecting a_i will only modify the sharing rule, the total ex post payoffs and hence the ex ante return will remain unchanged. In comparing the inefficiencies brought about by different strategy vectors, we can thus confine our analysis to those signal intervals, in which a liquidation may occur and whose boundaries are unaffected by D.[25]

---

[24] See Hackethal/Tyrell (1997), who present a numerical solution for an extended model.

[25] The exact value of D is only relevant in those circumstances, where the profitability of the project, measured by the ratio of $\bar{x}$ and I, is very low. Should the bank require a repayment amount D that exceeds the largest potential ex post payoff $\bar{x} + \alpha H$, financing constraints will be binding. In Appendix 2, we demonstrate that the severity of such constraints depend on the bank's type R.

A second implication from the irrelevance of D concerns the selection of payoff functions that we shall compare. In maximizing his expected return from the project, the entrepreneur will ex ante offer a repayment amount D that implies an expected profit of zero to the bank and that simultaneously satisfies her incentive compatibility constraint with respect to R (refer to Appendix 1 for a proof). The strategy vector that maximizes the entrepreneur's profit must then also maximize the total profit of the project. As a consequence of this identity, we will henceforth only examine the payoff functions of the entrepreneur and neglect those of the bank.

We continue by examining the *first-best*-case, in which the exact value of the signal is assumed to be verifiable. What is the maximal value of the signal that will still lead to an efficient liquidation of the firm? As the expected payoffs from continuing the firm's operations and from a liquidation are $x+\alpha \cdot H$ and $L+\alpha \cdot H-H$, respectively, both parties will ex ante always agree to liquidate, if the signal turns out be smaller than $L-H$. The ex ante probability of a liquidation in a world of *complete* contracts hence amounts to $(L-H)/\bar{x}$. Table 3 indicates the actions that the entrepreneur will select depending on the realization of the signal $\tilde{x}$. There is only one equilibrium in this setting, namely ($H=h$, $R=0$).[26]

Signal	***0***	***x*=L-h***	$\bar{x}$
Action	a_L	a_0	
Total payoff π	$L+\alpha H-H$	$x+\alpha \cdot H$	

Table 3: First-best signal intervals and actions

As mentioned above the attributes of the first-best outcome will in the subsequent sections serve as a "benchmark" for examining the efficiency related properties of second-best strategy vectors.

Because the deterministic portion $\alpha \cdot H$ of the total pay-off π does arise irrespective of the action selected at $t=1$, it has no further implications on the interval boundaries.[27] We will thus neglect this term in deriving the boundaries and will only reconsider it when discussing anticipated total payoffs.

2.5.1 Banks that are able to restructure the firm in financial distress

In this section we analyze the case, in which the bank has invested into her capability to restructure the firm in financial distress ($R=r$, H). As noted earlier, for signals indicating financial health of the firm, the entrepreneur's choice of an action a_i does not depend on the bank's choice regarding r, so that the bank's strategy will not have an influence on the payoffs in the interval $[D-\alpha \cdot H, \bar{x}]$. However, if the firm falls into financial distress, the bank has, in principle, always incentives to seize control over the firm's assets because her

[26] Implicitly, we thus assume that $\alpha \cdot h > h \cdot (L-h)/\bar{x} \Leftrightarrow \alpha > (L-h)/\bar{x}$ is true. Hence, investing in specific human capital is in principle desirable from a society's perspective in our model.

[27] We only have to consider this term when comparing total payoffs $\pi=x+\alpha H$ to the contractual repayment amount D, which does not feature the payoff αH explicitly (see section 2.4 and Appendix 1).

marginal payoff from restructuring amounts to $\frac{1}{2}b$. In these situations her ability to restructure becomes critical. Apart from restructuring she may also select a second alternative, i.e. *liquidating* the firm. Hence, we need to find the critical signal value, below which a bank capable of restructuring attempts to liquidate the firm.

Restructuring will yield the payoff $\pi_B=\pi=x+\alpha H$. As assumed, seeking a liquidation will be successful with probability p and then lead to the full liquidation payoff $\pi_B=L+\alpha H$. With probability $(1-p)$, however, the entrepreneur will remain in control, select the risky action a_b and reduce the bank's expected payoff to $x+\alpha H-\frac{1}{2}b$. As was also assumed, filing for a liquidation/reorganization procedure will inevitably cause a dead-weight loss c for the bank. Thus, the critical signal value $x_L^{R=r}$ can be obtained from solving $x_L^{R=r} = pL+(1-p)(x_L^{R=r}-\frac{1}{2}b)-c \Leftrightarrow x_L^{R=r}=L-((1-p)\frac{1}{2}b+c)/p$. If the parameter values L, p, b, and c imply a positive value for $x_L^{R=r}$, we have to distinguish two intervals.

Signal	***0***	$x_L^{R=r}=L-((1-p)\frac{1}{2}b+c)/p$	***D-αH***
Action	Prob($a=a_L$)=p Prob($a=a_b$)=(1-p)		a_b
Total Payoff*	$p(L-H)+(1-p)x-c+\alpha H$		$x+\alpha H$
Payoff Bank	$p\cdot L+(1-p)(x-\frac{1}{2}b)-c+\alpha H$		$x+\alpha H$
Comment	bank prefers liquidation		bank prefers restructuring

Table 4: Payoffs from (r,H) and $x_L^{R=r}>0$

In all other cases, in which $p<(2c+b)/(2L+b)$ holds and hence $x_L^{R=r}$ is either zero or negative, it would never be optimal for the bank to attempt a liquidation. In these circumstances, we can thus confine our analysis to one interval in which the bank will restructure the firm, "save" the firm-specific human capital and obtain a payoff π_B equal to $x+\alpha H$.

In referring to these interval boundaries and to the actions selected in between we will later be able to derive the inefficiencies induced by the strategy combinations (r,h) and (r,0), respectively.

2.5.2 Banks that are not able to restructure the firm in financial distress

Remember, that a bank of type $R=0$ lacks the firm-specific information necessary to prevent the entrepreneur from diverting private benefits in period two. As a consequence, when financial distress is observed the bank may only choose between either remaining passive, thus tolerating the expropriation of private benefits, or attempting a liquidation which will entail the cost c and will have a success probability equal to p. We proceed in analogy to the previous section and compare the bank's payoffs from the two alternatives. We obtain $pL+(1-p)(x_L-\frac{1}{2}b)=(x_L^{R=0}-\frac{1}{2}b) \Rightarrow x_L^{R=0}=L+\frac{1}{2}b-c/p$. If the parameter values lead to $x_L^{R=0}>0$ we obtain the following interval boundaries.

Signal	***0***	$x^{R=0}{}_L=L+½b-c/p$	***D-αH***
Action	Prob($a=a_L$)=p Prob($a=a_b$)=(1-p)		a_b
Payoff Bank	$p\cdot L+(1-p)(x+\alpha H-½b)-c$		$x+\alpha H-½b$
Comment	bank prefers liquidation		bank remains passive

Table 5: Payoffs from (0,*H*) and $x_L{}^{R=0}>0$

The analysis is again simplified if the parameter values lead to a negative boundary $x_L{}^{R=0}$. For that to be the case the inequality $p<2c/(2L+b)$ must hold.

If one compares these results with the ones that were obtained for a bank of type $R=r$, two conclusions can be drawn immediately: Firstly, as $x_L{}^{R=r}<x_L{}^{R=0}$ will always hold, financing arrangements that involve a bank with restructuring skills c.p. lead to a lower ex ante liquidation probability. Secondly, because $(2c+b)/(2L+b)$ is greater than $2c/(2L+b)$, a bank of type $R=0$ will attempt a liquidation for smaller values of p than a bank of type $R=r$. Combined, these results imply that the bank's restructuring skills serve as an ex ante protection of firm-specific human capital.

In Appendix 2 we will build on this insight and show that, given the bank's incentive-compatibility constraint is satisfied, investing r will lead to a reduction of the contractual repayment amount D and may thus avoid credit rationing.

A purely technical consequence of the necessity to differentiate between specific parameter constellations is that we have to separately examine the payoff functions on three complementary subdomains. We obtain the three cases defined below.[28]

Case 1	$p\geq(2c+b)/(2L+b)$	$x_L{}^{R=r}>0$	$x_L{}^{R=0}>0$
Case 2	$2c/(2L+b)<p<(2c+b)/(2L+b)$	$x_L{}^{R=r}\leq 0$	$x_L{}^{R=0}>0$
Case 3	$p\leq 2c/(2L+b)$	$x_L{}^{R=r}<0$	$x_L{}^{R=0}\leq 0$

Table 6: Definition of cases 1, 2, and 3

2.5.3 The payoff-function

In this section we will examine the inefficiencies implied by the four strategy vectors (r,h), $(r,0)$, $(0,h)$ and $(0,0)$ relative to the first-best case of complete contracts. We will also show that we can indeed confine our analysis to the two extreme choices $H=0$ and $H=h$, because all other values for H turn out to be suboptimal.

Through an ad-hoc comparison of the four strategy vectors to the first-best strategy $(0,h)$, we can already establish that vectors with $R=r$ entail inefficiencies amounting to at least r and vectors with $H=0$ definitely entail inefficiencies from underinvesting in firm-specific human capital. All other potential efficiency losses are primarily caused by suboptimal interval boundaries and hence suboptimal ex ante liquidation probabilities.

[28] We express the three conditions in terms of the parameter p, as this allows us to refer to the cases as circumscribing constellations that involve a particular category of bankruptcy laws.

The first-best case involves only one critical signal value, namely $x^*=L-h$. Signals larger than or equal to x^* imply a total payoff equal to $x+\alpha h$, whereas signals smaller than x^* lead to a total payoff equal to $L+\alpha h-h$. The *expected* first-best total payoff thus amounts to:

$$(5) \qquad \Pi^* = \frac{1}{\bar{x}}\left[(L-h)(L-h) + (\bar{x}-(L-h))\frac{1}{2}(\bar{x}+(L-h)) \right] + \alpha h$$

The terms inside the square brackets in (5) represent the average payoffs in the two intervals weighted by the length of the respective interval. As the payoff-function is linear in x for $x>x^*$, the expected payoff from continuing the firm is calculated by averaging over the respective payoffs on the upper and lower boundaries of this interval.

As was shown in the previous sections, the existence of incomplete contracts assigns an important role to the parameters c and p in determining the value of the critical signals. From Tables 3 to 5 we can infer that all second-best critical signal values are strictly smaller than $L+b/2$. Because all strategy vectors yield identical payoffs for signals greater than $L+b/2$, we can use this insight to simplify our analysis considerably, namely by confining our analysis to the interval $[0,\ L+b/2]$. Applied to function (5) this translates into replacing the parameter $\bar{x}$ inside the parentheses by the term $L+b/2$.

The two payoff functions for $R=r$ and $R=0$ are constructed analogously to function (5). Their expressions for case 1 follow below:

$$(6)\ \Pi^{R=r} = \frac{1}{\bar{x}}\left[x_L^{R=r}\left((L-H)p + \frac{1}{2}x_L^{R=r}(1-p) - c \right) + \left(L + \frac{b}{2} - x_L^{R=r} \right)\frac{1}{2}\left(L + \frac{b}{2} + x_L^{R=r} \right) \right] + \alpha H - r$$

$$(7)\ \Pi^{R=0} = \frac{1}{\bar{x}}\left[x_L^{R=0}\left((L-H)p + \frac{1}{2}x_L^{R=0}(1-p) - c \right) + \left(L + \frac{1}{2}b - x_L^{R=0} \right)\frac{1}{2}\left(L + \frac{1}{2}b + x_L^{R=0} \right) \right] + \alpha H$$

The payoff functions for the cases 2 and 3 can be easily derived from (6) and (7) through replacing $x_L^{R=0}$ and/or $x_L^{R=r}$ by zero. For case 3, where p carries a relatively small value, it becomes immediately apparent that the two strategy vectors (r,H) are c.p. strictly dominated by the respective strategy vectors $(0,H)$: The payoff functions are identical except for the nonnegative cost r, which is caused by the bank's strategy $R=r$.

As noted earlier, we will solve the financing problem by comparing the efficiency losses that are incurred depending on the strategies chosen. For that purpose we shall now translate the two payoff functions from above into inefficiency functions, which we will denote by $\phi^{R,H}$. This is done by subtracting each of the second-best payoff functions (6) and (7) from the first-best payoff function (5). After simplifying we obtain for case 1:

$$(8)\ \phi^{R=r} = \frac{1}{\bar{x}}\left[(L-h)^2 + \frac{1}{8}b^2\left(\frac{(1-p)^2}{p} \right) + H\left(pL - (1-p)\frac{1}{2}b - c \right) - \frac{1}{2}L^2 p + Lc - \frac{1}{2}\frac{c^2}{p} \right] + r + \alpha(h-H)$$

$$(9)\ \phi^{R=0} = \frac{1}{\bar{x}}\left[(L-h)^2 + \frac{1}{8}b^2 p + H\left(pL + \frac{1}{2}bp - c \right) - \frac{1}{2}L^2 p + Lc - \frac{1}{2}\frac{c^2}{p} \right] + \alpha(h-H)\,.$$

Both functions are linear in H, so that their global minima can only lie exactly on the border of H's domain. Hence, either $H=0$ or $H=h$ will minimize the efficiency losses. At $t=0$ a

rational entrepreneur will thus either invest the maximal amount possible into firm-specific human capital or solely build up non-specific human capital. As a consequence of the linearity, only four strategy vectors need to be compared, i.e. those four vectors that were mentioned at the beginning of this section.

2.5.4 The Concept of Complementarity

It is not the primary goal of this paper to find parameter values and strategy vectors that maximize social welfare and then derive normative statements as to how the concerned elements of a financial system – especially the bankruptcy law in force - should be optimally configured. Rather, we want to prove that there exist complementary relationships among the endogenous variables as well as between these variables and the parameters. A natural extension of our model would be to make some of the parameters endogenous, e.g. by introducing a third party (a legislative body), that at t= -1 chooses her strategy regarding e.g. the orientation of the bankruptcy law (p, c) or the reporting requirements for financial information (thus affecting the entrepreneur's opportunities (b) to appropriate private benefits). Such an extended model could then contribute to the current debate as to what specific configuration of a financial system is the most efficient.

The goal of this paper is much more modest, though, as we believe, also of great importance. We establish how firms and investors will optimally solve a financing problem given a specific legal environment. More importantly, we show that because the relationship between the variables and the parameters is characterized by complementarity a "middle-of-the-road" strategy of the third party regarding the legal environment will not lead to the optimal outcome. That is, in establishing or modifying single elements of that environment the properties of other elements have to be considered. Modifying one element into a specific "direction" means that changing the other elements into the same "direction" will improve the overall solution to the financing problem. Rather than highlighting the optimal properties of elements that constitute an ideal financial system, we identify one optimal property of all "good" financial systems, namely that its elements "fit together".

The notion of complementarity as it will be used in this context dates back to the work of Edgeworth. He defines two activities as complements, if and only if increasing the level of any one activity leads to a higher marginal return from increasing the level of the other. In the case of continuously differentiable functions this corresponds to positive mixed-partial derivatives of the objective function.

However, if one analyzes functions with discrete variables a generalization of Edgeworth's concept is needed. As will become clear in this section, a branch of mathematics known as lattice theory lends itself perfectly for this purpose. Its application allows us to abandon the conditions concerning the divisibility of choice variables and the smoothness of payoff functions.

Formally a lattice $(\mathsf{A}, \geq)$ is defined as a set A of vectors with a partial order $\geq$. The set must contain both the supremum and the infimum of all possible pairs of its elements. That is, for

any elements x and y, the set must contain a smallest element under the order that is larger than x and y as well as a largest element that is smaller than both.[29]

The Euclidean plane R^2 satisfies this condition, as does the set G in Exhibit 2, which itself represents a sublattice of R^2. Both the infimum $\inf(a,b)=(x_1,y_1)$ and the supremum $\sup(a,b)=(x_2,y_2)$ of the elements $a=(x_1,y_2)$ and $b=(x_2,y_1)$ belong to the set G.[30] So do the infimum and supremum of any other pair of elements in G. Hence, the boundaries of a lattice must not involve any "downward-sloping" portions. For this very reason the set H does not constitute a lattice. It contains the elements a and b, but does not include their infimum. If H delineated the strategy space of some decision maker its particular shape would imply that even though the decision maker can set the activity levels of x and y in order to arrive at the strategies a and b, he is precluded from combining the lower activity levels in order to achieve the strategy $\inf(a,b)$. More generally, increasing (decreasing) one variable must not rule out the possibility of increasing (decreasing) or keeping constant any of the other variables.

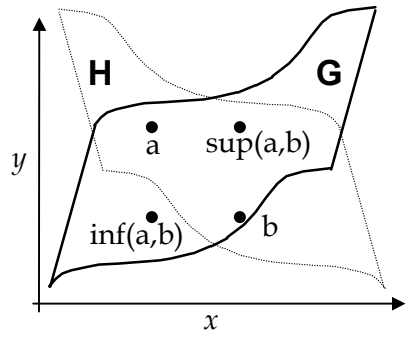

Exhibit 1: The sublattice G

Applied to our model, we establish that the set S consisting of all vectors of choice variables (R,H) and all vectors θ with components θ_i equal to the values of the parameters b, h, p, I, α, $1/L$, $1/r$, $1/c$, $1/\bar{x}$ *does* constitute a lattice.[31] Increasing (decreasing) any one parameter or variable, i.e. any component of the vectors in S, does not necessitate the reduction (increase) of any other parameter or variable. Rather, the values of the parameters can be selected independently and no restrictions apply to the determination of the optimal values of the two choice variables. Increasing the initial investment I for instance does neither, in principle, preclude the entrepreneur from investing in specific human capital nor does it add constrains on the domain of the parameter b, i.e. the private benefits that can potentially be extracted by the entrepreneur once the project was started. The requirement that S be a lattice serves as a precondition for the analysis of complementarities among the model's parameters and choice variables.

In general, arguments of a function $f(\cdot)$ are complements and the function is called *supermodular* if the following condition holds:

$$f(\sup(a,b)) - f(a) \geq f(b) - f(\inf(a,b)).$$

The inequality can be interpreted as follows: Increasing the component x of a vector (x,y) if at the same time the component y is assigned a high value has an effect on the value of the function $f(\cdot)$ that must not be smaller than the effect from increasing x if y is set low.[32] Exhibit

---

[29] The methodological remarks on complementarity are to a large part adopted from Milgrom/Roberts (1995). Literature on extensions of the theory and on recent applications can be found there. For an extensive treatment of lattice theory and supermodularity see Topkis (1998).

[30] $\sup(a,b)$ and $\inf(a,b)$ can also be expressed by $a \wedge b$ and $a \vee b$, respectively.

[31] As we will later demonstrate, the maximizers for R and H are nondecreasing in the inverse values of r, c, L and $\bar{x}$ on specific sublattices of S. In order to establish complementarity between the vectors (R, H) and θ, the latter must contain the inverse values of these four parameters.

[32] As can be easily verified, complementarity is a symmetric concept. The marginal return from increasing y is also larger (or at least equally large) if x is assigned a higher value.

2 depicts a function that fulfills this condition. Moving from the activity levels of x and y implied by the infimum of the vectors a and b to the levels implied by vector b yields a smaller marginal return - which in this case is even negative - than a move from vector a to the supremum of a and b.

What are the implications of complementarity and supermodularity, respectively? It was shown that changing the values of complementary arguments into the same direction always weakly dominates a modification in opposite directions. A decision maker, who does not know the exact expression of his objective function but does know that his objective function is supermodular is thereby able to constrain his strategy space considerably without having to fear that he will accidentally expel the optimal strategy vector.[33] To clarify this point, let us assume that the decision maker starts in point c=(1,1) in Exhibit 2. His strategy set contains exactly 24 alternatives, excluding the status quo. Knowing that $f(x,y)$ is supermodular, he can ignore 6 of them because they imply modifying x and y in opposite directions and thus would not increase his return. If b=(3,0) was his starting point, the number of potentially successful alternatives would be reduced even further; it would be halved to 12. Hence, one general implication of complementarity is that if none of the vectors lying on one of the relevant orthants leads to a higher return than the status quo no other vector on the entire lattice will. Complementarity thus provides clear and simple guidance to a decision maker.

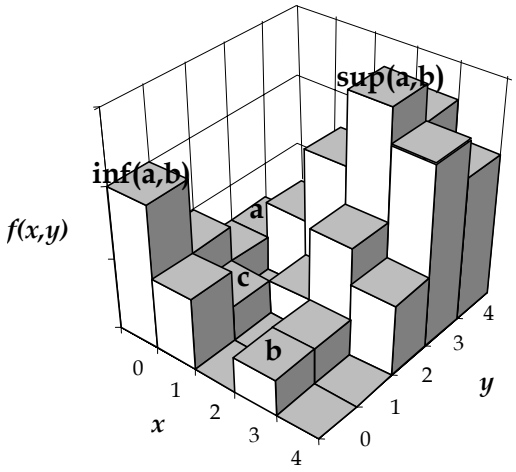

Exhibit 2: A supermodular function: $f(x,y)$

A second implication of complementarity concerns strategic games with multiple players. If, for instance, the objective functions of two players are supermodular with respect to their own strategies and the marginal returns are nondecreasing in the rival's strategy, then the best-response correspondences exhibit positive slopes and there exists at least one pure-strategy Nash-equilibrium. The players' strategies are then called *strategic complements*.[34] If multiple Nash-equilibria occur, the set of all Nash-equilibrium strategies always contain a smallest and a greatest strategy vector under the order ≥.

A little example shall shed some more light on this: Let us assume that two players R and H participate in a *strictly supermodular* game. R can choose his strategy to be either 0 or r and H can choose between 0 and h, where both r and h are greater than zero. The strategy vectors $(0,h)$ and $(r,0)$ can then never be the only two elements of the Nash-equilibrium set. Furthermore, as the best-response correspondences are increasing, the equilibrium-set can

[33] For a discussion of possible deviations from the global maximum, see Milgrom/Roberts (1995), p.185. However, inefficiencies can only occur if complementarities are zero and an unfavorable starting point is chosen.

[34] See Fudenberg/Tirole (1991), p.489.

never contain the following pairs of strategy vectors $\{(0,h);(0,0)\}$, $\{(r,0);(r,h)\}$, $\{(0,h);(r,h)\}$ and $\{(0,0),(r,0)\}$, respectively. Otherwise, one player would have to be indifferent regarding his choice which, in turn, would not be compatible with increasing response correspondences. A second consequence of this property is that the equilibrium set will never contain more than two elements. Hence, only the five sets $\{(0,0)\}$, $\{(0,h)\}$, $\{(r,0)\}$, $\{(r,h)\}$, and $\{(0,0);(r,h)\}$ remain as potential Nash-equilibrium sets and supermodularity implies that only the two strategy vectors in which both players choose either the upper bound or the lower bound of their strategy sets can coexist in the Nash-equilibrium set.

A third helpful implication arises if the objective function is supermodular with respect to the vectors of choice variables and to the vectors of parameters θ. In that case, the Nash-equilibrium set can itself be treated as a nondecreasing function in θ.[35] The implications on our simple example are straightforward: When starting from the equilibrium set $\{(0,0)\}$, any stepwise increase of the parameter values can only lead through the paths of equilibrium sets depicted in Exhibit 3. If $\{(0,0);(r,h)\}$ is the status quo, we can infer from the supermodularity property that any increase in θ will never expel the vector (r,h) from the equilibrium set. However, if the increase is sufficiently large the players will no longer choose the zero-strategies. More generally, the choice variables tend to increase or decrease simultaneously in a coherent fashion in response to environmental changes.

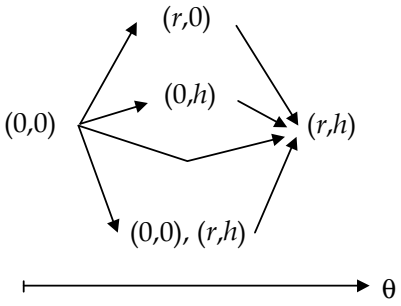

Exhibit 3: Equilibrium sets as a function of θ

A final remark concerns the strength of complementarity between choice variables. In our example the probability with which $(r,0)$ and $(0,h)$ become elements of the equilibrium set is inversely related to the players' marginal returns from simultaneously choosing the non zero-strategies. The larger these marginal returns and thus the stronger the complementarities, the smaller will be the necessary increase in θ to shift the equilibrium set from $\{(0,0)\}$ directly to $\{(r,h)\}$.

In summarizing, far reaching statements concerning the existence and the structure of equilibrium strategies can be made if the objective function in question is supermodular. Complementary choice variables imply that at least one pure-strategy Nash-equilibrium exists. Complementarity between choice variables and parameters implies that a monotone modification of the parameters leads to predictable modifications of the set of Nash-equilibria.

2.5.5 Complementarity between the choice variables *H* and *R*

In order to prove that the two choice variables R and H are strategic complements in our model, we need to show that the objective function $\Pi(\cdot)$ is supermodular with respect to these

[35] According to Milgrom/Roberts (1995, FN.3), it is sufficient to prove that there exists a complementary relationship between all the choice variables and each single parameter. Then, the relationship among the parameters does not have to be analyzed any further.

variables. The relevant sublattice consists of the four vectors: (r, h; θ), (r, 0; θ), (0, h; θ), and (0, 0; θ), where θ denotes the vector of parameters.

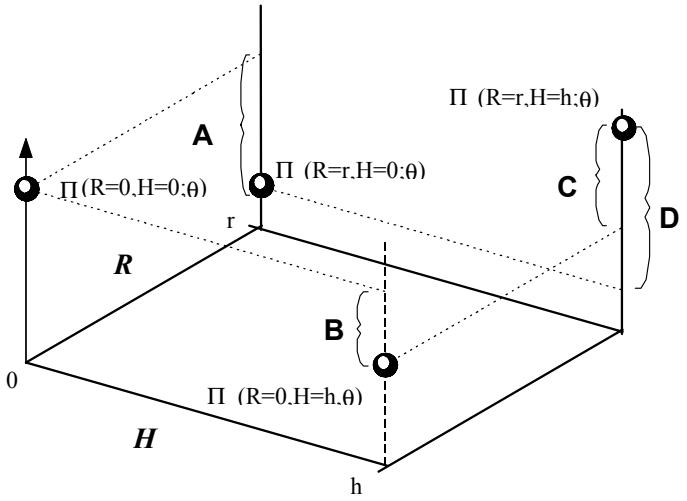

Exhibit 4: Supermodularity of the objective function Π(·)

For the supermodularity condition to be satisfied, a shift from R=0 to R=r must lead to a higher marginal return if H is set to h than if H is set to zero. Exhibit 4 visualizes this condition: The marginal return depicted by distance C must be larger than the distance A, which is negative in the example above. Since complementarity is a symmetric concept, this must translate into distance B being smaller (again, the marginal return and hence B is negative in our example) than distance D: Investing in specific human capital thus yields a higher marginal return if the bank simultaneously decides to acquire restructuring skills.

The general proof of complementarity between R and H proceeds along the same lines: The difference $\kappa^{R,H}(\cdot)=(\Pi^{r,h}-\Pi^{0,h})-(\Pi^{r,0}-\Pi^{0,0})$, or equivalently $\kappa^{R,H}(\cdot)=(\phi^{r,0}-\phi^{0,0})-(\phi^{r,h}-\phi^{0,h})$, must be nonnegative. Depending on the constellation of parameter values (cases j=1,2,3) we have to analyze three different sets S_j. The following expressions are obtained for $\kappa_j^{R,H}(\cdot)$:

(10) Case 1 (S_1) $\quad p > \dfrac{2c+b}{2L+b}$: $\quad \kappa_1^{R,H}(\bar{x},b,h) = \dfrac{1}{\bar{x}}\dfrac{1}{2}bh$

(11) Case 2 (S_2) $\quad \dfrac{2c}{2L+b} < p \le \dfrac{2c+b}{2L+b}$: $\quad \kappa_2^{R,H}(\bar{x},b,c,h,p) = \dfrac{1}{\bar{x}}h\left(\dfrac{1}{2}pb + pL - c\right)$

(12) Case 3 (S_3) $\quad p \le \dfrac{2c}{2L+b}$: $\quad \kappa_3^{R,H} = 0$

It is obvious from (10) and (11) that R and H are strategic complements on the sublattices implied by cases 1 and 2.[36] If θ falls into case 3 a situation occurs in which the distances A and C in Exhibit 4 would be identical: Investing in specific human capital does not affect the incentives to build up restructuring skills. This result still satisfies the conditions of weak complementarity and should come at no surprise. In case 3, the bank will never attempt a liquidation, so that the firm's specific human capital will under no circumstances become

[36] All parameters are defined to be nonnegative. Simple algebra shows that if the conditions implied by case 2 are satisfied by the parameters, the negative sign of the parameter c can never lead to a negative value of $\kappa_2^{R,H}$.

worthless. Hence, the banks' reorganization skills, which in other cases serve as a socially desirable device to protect specific human capital, will only affect the ex post sharing rule.

We conclude that an investment in human capital provides nonnegative incentives to invest in restructuring skills. In the cases 1 and 2, those incentives increase in b, h and $1/\bar{x}$. In case 2 they also increase in p and $1/c$. Better opportunities to extract private benefits, technologies that qualify for higher inputs of specific human capital, less profitable investment projects and stronger creditor rights provided by the bankruptcy law in force thus tend to increase the degree of complementarity between R and H.

As was mentioned in the previous section, a higher degree of complementarity corresponds to a lower probability for the strategy vectors $(0,h)$ and $(r,0)$ to qualify as equilibrium strategies.

2.5.6 Complementarity between the choice variable R and the parameters θ

After we have shown that the choice variables R and H are strategic complements and that the degree of their complementarity is a monotone function of parameter values we shall now demonstrate that the relation between the choice variable R and the parameters θ is also characterized by complementarity.

For this purpose we have to analyze the two sublattices for $H=0$ and $H=h$ separately. A second modification to our approach from the previous section is due to the fact that the objective function is continuously differentiable in all the parameters. Hence, the function κ_j^{R,θ_i} can be expressed as a partial derivative of the marginal return from investing in R: $\kappa_j^{R,\theta_i}(\cdot)=\partial(\Pi^{r,H}-\Pi^{0,H})/\partial\theta_i \Leftrightarrow \kappa_j^{R,\theta_i}(\cdot)=\partial(\phi^{0,H}-\phi^{r,H})/\partial\theta_i$, where θ_i symbolizes a specific parameter and H can take on either the value zero or h. If κ_j^{R,θ_i} is positive we can infer that increasing the value of parameter i will increase the marginal return from investing in restructuring skills. Again we visualize this condition. Exhibit 5 depicts a complementary relation between R and b.

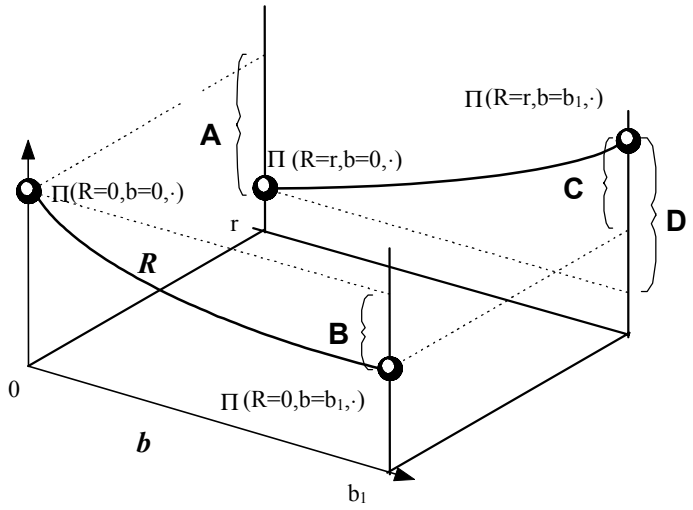

Exhibit 5: Complementarity between R and b

We proceed by examining the marginal return function for the three cases. Case 3 is again trivial, because liquidation will not occur and restructuring skills do not bring about any efficiency gains.

(13) Case 1 (S_1): $\Pi_1^{r,H} - \Pi_1^{0,H} = \frac{1}{\bar{x}}\left(\frac{1}{2}bH + \frac{1}{4}b^2 - \frac{1}{8}\frac{b^2}{p}\right) - r$

(14) Case 2 (S_2): $\Pi_2^{r,H} - \Pi_2^{0,H} = \frac{1}{\bar{x}}\frac{1}{2}\left[p\left(2LH - L^2 - bH + \frac{1}{4}b^2\right) + 2c(L-H) - \frac{c^2}{p}\right] - r$

(15) Case 3 (S_3): $\Pi_3^{r,H} - \Pi_3^{0,H} = -r$

The first obvious result concerns the relationship between the bank's decision to invest in restructuring skills (R) and the costs (r) that she will thereby incur. It should come at no surprise that $\kappa_j^{R,1/r}$ is positive for j=1,2, and 3, so that the incentives to invest decrease with the related costs. R and $1/r$ are thus complements.

$\kappa_j^{R,h}(\cdot)$ and $\kappa_j^{R,1/\bar{x}}(\cdot)$ are also nonnegative on the entire lattice S. A higher upper bound h for the investment in human capital and a lower profitability $1/\bar{x}$ of the project therefore never decrease the incentives to invest in R.

The effects of b, p and c, however, are not unambiguous on the domains S_1 and S_2 of the objective function. Whereas $\kappa_2^{R,b}(\cdot)$ is always nonnegative, the sign of $\kappa_1^{R,b}(\cdot)$ depends on the values of the parameters h and b and of the choice variable H. R and b are complements if the inequality $p>½b/(h+b)$ holds. Thus $p>½$ provides a sufficient condition to establish complementarity between b and R on S_1.

$\kappa_1^{R,p}(\cdot)$ and $\kappa_1^{R,1/c}(\cdot)=0$ are both nonnegative. However, the signs of $\kappa_2^{R,1/c}(\cdot)$ and $\kappa_2^{R,p}(\cdot)$ depend on the values of the arguments H, h, b, L, so that complementarity between R on the one hand and the parameters that circumscribe the bankruptcy law on the other hand can be established on the entire domain S_1 but only on specific sublattices of S_2. The same applies to $1/L$, the inverse of the basic payoff from a liquidation: Only if $L>c/2p$ is satisfied on S_2, a reduction in the liquidation value will increase the incentives to invest in R.

In conclusion, complementarity between the choice variable R and the parameters θ cannot be observed on the entire lattice S. However, we have also demonstrated that there exist sublattices of S where the objective function is indeed supermodular with respect to R and the components of θ. A simplified and somewhat heuristic approach to derive such a sublattice is to express the various conditions on the parameters from above in terms of one particular parameter and then formulate sufficient constraints on it. A natural candidate for this purpose is p which was already chosen to distinguish the cases 1 to 3 and hence to delineate the corresponding domains S_1, S_2, and S_3. Requiring p to exceed $(2c+b)/(2L+b)$ and hence restricting the analysis on sublattices of S_1 leads to complementarity between the choice variable R and all parameters except b. A sufficient condition to extend complementarity onto b is provided by $p>½$. Requiring p to satisfy both conditions then yields sublattice on which the objective function is supermodular with respect to all its arguments R and θ. We denote such sublattices by $S^{R,\theta}$.

Are the parameter constraints implied by $S^{R,\theta}$ plausible? We believe that they are: A bankruptcy law that - in case a debtor defaults on a loan - confers the control over the debtors' assets to the creditor with an ex ante probability of less than ½ is hard to imagine. Given $p>½$, the other condition is no longer binding if L exceeds $2c+½b$. That the ex ante liquidation

value exceeds twice the cost of the legal proceedings plus half of the potential private benefits should also stand the test of most real-world applications.

For situations that are characterized by parameter constellations implied by $\mathsf{S}^{R,\theta}$ we can thus establish that a bank's incentives to invest in restructuring skills increase (or at least do not decrease) with better opportunities to extract private benefits (b), technologies that allow for a higher input of specific human capital (h), projects with lower expected payoffs ($1/\bar{x}$) and the creditor orientation (p,$1/c$) of the bankruptcy law in force.

2.5.7 Complementarity between the choice variable H and the parameters θ

Again, we have to subdivide the lattice S into two sublattices. $\mathsf{S}_{R=r}$ is relevant if R is set to r and $\mathsf{S}_{R=0}$ is relevant if R is set to zero, respectively. In a second analogy to the last section, the expression of $\kappa^{H,i}(\cdot)$ differs with respect to the parameter constellation. The only slight modification concerns the definition of the three cases in Table 6. Remember that we had to discriminate between three cases because the crucial signal value that will induce a bank to switch between a debtor-friendly behavior and a liquidation attempt differs with respect to the bank's ex ante strategy. Now that we separately test for supermodularity on the sublattices $\mathsf{S}_{R=r}$ and $\mathsf{S}_{R=0}$, a subdivision in three cases is no longer required. Rather, if we compare the payoffs from the strategies $H=h$ and $H=0$ on either $\mathsf{S}_{R=r}$ or $\mathsf{S}_{R=0}$, we only have to consider the efficiency losses that are brought about by $x_L^{R=r}$ and $x_L^{R=0}$, respectively. Hence the number of cases to be distinguished decreases from 3 to 2. As the remaining two cases cover sublattices that are different from those delineated by the original cases, we shall denote them by case I and case II:

(16) Case I ($[\mathsf{S}_{R=r} \wedge \mathsf{S}_1] \vee [\mathsf{S}_{R=0} \wedge (\mathsf{S}_1 \vee \mathsf{S}_2)]$):

$$\Pi_I^{R,h} - \Pi_I^{R,0} = h\left[\alpha + \frac{1}{\bar{x}}\left(c + sign(R)\,½b\right) - \frac{1}{\bar{x}}\,p\left(L + ½b\right)\right]$$

(17) Case II ($[\mathsf{S}_{R=r} \wedge (\mathsf{S}_2 \vee \mathsf{S}_3)] \vee [\mathsf{S}_{R=0} \wedge \mathsf{S}_2]$):

$$\Pi_{II}^{R,h} - \Pi_{II}^{R,0} = \alpha h$$

The analysis of case II is trivial and the results concerning complementarities are straightforward. The value of p is so small that it would not be worthwhile for a bank to make a liquidation attempt and, as a consequence, the debtor does not have to fear that the specific human capital will become worthless. He has maximum incentives to select the strategy $H=h$. Hence, H is a complement to both α and h, irrespective of R.

The much more interesting case is case I, which, if $p>½$ is also satisfied, covers $\mathsf{S}^{R,\theta}$, i.e. sublattices of S on which R and θ are complements.

To begin with, it is important to note, that the marginal return from switching from $H=0$ to $H=h$ is positive only if the last term inside the parentheses ($p(L+½b)/\bar{x}$) does not exceed the sum of the first two terms (α and $(c+\text{sign}(R)½b)/\bar{x}$). As a consequence, increasing the values of the parameters p and $1/c$ will lead to an opposite effect on H as increasing those of α and $1/L$. h and b, though, do not have such unambiguous effects on the marginal return. That is, h

does only affect its *absolute* value, but not its sign. $\kappa_I^{H,b}(\cdot)$ is nonnegative if the bank has invested in restructuring skills, but turns negative, if the bank has not. Note that on $S^{R,\theta}$ the bank's decision to invest in *R* is itself positively affected by an increase in *b*. The parameter *b*, that prescribes the intensity of the moral-hazard problem within our model, thus carries a pivotal role in the determination of the optimal choices of the two players. To shed some more light on this role, let us assume that a particular parameter constellation (satisfying $p>½$) leads to (*R*=0,*H*=0) as the only equilibrium strategy. The parameter *b* could in such a situation be crudely interpreted as too small to induce the bank to invest in *R*. Increasing c.p. *b* will have positive implications on *R* and negative implications on *H* until, eventually, *b* will be large enough to cause the bank to switch her strategy. At this particular point, the marginal return from investing *H*=*h* will be raised by $½bh/\bar{x}$ and any further increases in *b* will have a positive effect on the firm's incentives as both choice variables are now complements of *b*.

Let us return to the unambiguous effects of *p*, 1/*c*, 1/*L* and α: Both, $\kappa_I^{H,p}$ and $\kappa_I^{H,1/c}$ are strictly negative. Intuition suggests that this actually has to be the case: Increasing *p* and/or 1/*c* and thus augmenting the creditor-orientation of the bankruptcy law leads to a higher ex ante probability that the bank, be it of type *R*=*r* or *R*=0, will attempt a liquidation of the firm ex post. In addition, increasing *p* increases the ex post probability that the firm will then actually be liquidated. Both effects make it more likely ex ante that the specific human capital of the firm will become worthless and hence decrease its incentives to develop it at *t*=0.

However, and this reveals the essence of complementarity between *R* and *H*, the *direct* negative effect of *p*'s increase on *H* may be superseded by the *indirect* positive effect through *p*'s effect on *R*. This can be easily shown by assessing the effects of a stepwise increase of the value of *p* in Exhibit 6. Let us again assume that the status quo is characterized by the unique equilibrium (0,0). Increasing *p* c.p. will eventually (at point *p'* in Exhibit 6) lead to *R*=*r*, given that the cost *r* is not excessively high. As was already mentioned, the *indirect* positive effect on the marginal return from switching to *H*=*h* would amount to $½bh/\bar{x}$ at that particular point. The *direct* negative effect on the marginal return amounts to $\Delta p(L+½b)h/\bar{x}$. Hence, if the preceding positive step in *p* is sufficiently small, the *total* effect on the firm's incentives will be positive. Assume now, that the total effect was large enough to actually induce the firm to select *H*=*h*. Any further increase in *p* - and this stands in contrast to the conditional effect from an increase in *b* - will still have a direct negative impact on the marginal return from investing *h*. Thus, there may exist a sufficiently large value for *p* (point *p''* in Exhibit 6), above which the entrepreneur would return to his original strategy of operating the firm with non-specific human capital (*H*=0).

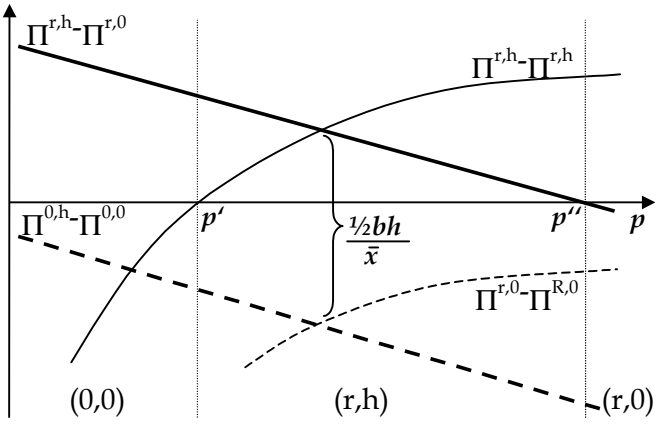

Exhibit 6: Marginal returns as a function of *p*

Finally, $\kappa_I^{H,1/L}$ and $\kappa_I^{H,\alpha}$ are both strictly positive, so that a lower liquidation value and/or a higher sensitivity of the project's payoff toward specific human capital will ex ante have a positive effect on the choice variable *H*.

2.5.8 Complementarities in the basic model – a summary

As the preceding analyses have shown, there exist sublattices of S, on which the objective function is supermodular with respect to the two choice variables and all parameters except *p* and 1/*c*. The parameter *p* is special, in that it has a positive effect on *R*, but a negative effect on *H*. However, complementarity between *R* and *H* can supersede this negative effect, so that a larger value for *p* can indeed bring about a switch from *H*=0 to *H*=*h*. For sublattices S* where these relations hold, we can then establish that larger values for *h*, *b*, and $1/\bar{x}$ unambiguously increase the attractiveness of investing in specific human capital and restructuring skills. By the same token, lower values of these parameters induce both the bank and the firm not to invest.

Intuitively speaking, creditor-oriented bankruptcy laws principally imply a higher probability of liquidation and thus increase the debtor's potential costs from losing control over the firm's assets. A well suited device to mitigate these inefficiencies is to formulate an incentive-compatible contract that induces the bank to acquire restructuring skills. Better opportunities to extract private benefits increase the bank's ex post payoff from restructuring and thus make this device even more valuable.

Exactly the opposite is true for debtor-oriented bankruptcy laws. Because of the low probability with which the bank is permitted to liquidate, she cannot be induced ex ante to invest in restructuring skills. As a consequence, the entrepreneur may find it not worthwhile to invest in specific human capital. Better opportunities to extract private benefits are detrimental in these circumstances because they drive up both the required repayment value of the loan and the ex ante liquidation probability.

Thirdly, very debtor-oriented bankruptcy laws will in principle induce the entrepreneur to invest in specific human capital, as a liquidation becomes highly unlikely. But, because a bank with restructuring skills might then require a debt-contract with a very high contractual repayment value, the entrepreneur runs the risk that his project is no longer "good" enough to satisfy her participation constraint (see Appendix 2 for an assessment of financing constraints).

In the next section we introduce an alternative device for protecting investments in specific human capital. By admitting multiple creditors to finance the project the debtor can divide the total debt into a junior and a senior debt portion and thereby reduce the ex ante liquidation probability.

2.6 Multiple creditors

An interesting extension to our model can be obtained if we relax the assumption that the firm offers a credit contract to only one single bank. An alternative setting would be one in which a single bank holds senior debt and a homogeneous group comprising a large number of other investors, be it bondholders or participants in a credit syndicate, holds junior claims.

We assume that each of the junior creditors holds a portion of the total debt amount that is sufficiently small so that free rider problems will preclude an investment in non-transferable restructuring skills (see Myers (1977), Bulow/Shoven (1978), Gertner/Scharfstein (1990)). Translated into our model this is equivalent to requiring that the ex post marginal return from restructuring that can be achieved by any of those creditors after repaying the senior debt portion is too small as to compensate for the initial investment r. Alternatively, we could assume that the firm is not willing to make sensitive information available to a larger group of outsiders and thus does not allow holders of junior debt to develop restructuring skills. As a consequence of either assumption, holders of junior debt can only choose between either remaining passive (implying a_b) or seeking liquidation (a_L) when the firm is wound up in financial distress.

We furthermore assume, that the dispersed holders of junior debt obtain less information on the firm's operations than the single senior creditor. This asymmetric distribution of information will prevail irrespective of the type R of the single creditor. Like courts, at t=1 the holders of junior debt can only observe whether the firm is in financial distress or not. This assumption could also be justified by recourse to free rider problems.[37]

We proceed in three steps. First, we show that the introduction of junior creditors will unambiguously decrease the incentives for the single senior creditor to acquire restructuring skills. We then prove that there exist optimal portions of senior and junior debt so that the liquidation probability can be reduced relative to a situation in which a single bank *without* restructuring skills finances the entire project. Depending on the parameter constellation, this reduction may lead to efficiency gains. Finally, we discuss the implications of this model extension on our findings regarding complementarity.

2.6.1 Reduced incentives to invest in restructuring skills

At t=0, the single bank holding the senior debt – henceforth denoted by B_1 – compares the expected marginal return from investing in restructuring skills with the related cost r. Whereas in the basic model with an exclusive debtor-creditor relation, a bank of type R=r will restructure the firm as soon as a signal smaller than D-αH (but greater than $x_L^{R=r}$) occurs, the incentives to do so are changed by the introduction of junior debt. Although a restructuring will still prevent the entrepreneur from extracting private benefits, the marginal return of ½b

---

[37] We could have introduced a hypothetical cost that is small enough to leave the results of our basic model unchanged (i.e. a single bank would always try to obtain an informational advantage with regard to the precise signal value) but that is sufficiently large to prevent a large number of small creditors from seeking information.

may not be fully captured by B_1. This is because her contractual claims on the firm amount only to D_1, which must be smaller than the claim D in the basic model.

A simple numerical example shall make the point clear: Let us assume that the nominal values of both the senior (D_1) and the junior (D_2) debt portions are equal to 30, so that the total amount of debt outstanding amounts to 60. The parameter b is set to 10. At t=1, a signal occurs which implies an expected total payoff of 50. All creditors will then conclude that the entrepreneur will inevitable select the risky action. Remember that even though holders of junior debt do not observe the exact signal value they do arrive at this conclusion as they realize that the firm is in financial distress ($x+\alpha H=\pi<D=D_1+D_2$). If all creditors remain passive, i.e. neither liquidate nor restructure, than the risky action will turn out to be successful with probability ½, and yield a total return of 60, from which the debtor can capture 10 as a private benefit. B_1 receives her full repayment amount D_1=30 and B_2 receives the remainder of 20. With the same probability, the risky action fails and only yields a return of 40. Again, B_1 is repaid in full. It is the holders of junior debt who suffer by receiving only 10, thus attributing an expected payoff of 15 to the risky action at t=1. Should B_1 restructure, her own expected payoff will remain unchanged. The marginal return of 5 would be fully passed on to B_2. Only if the signal is smaller than 40 will B_1 profit at least partly from restructuring, and only if the signal is smaller than 30 will she obtain the entire marginal return.

In conclusion, the lower expected return from restructuring will strictly decrease the ex ante attractiveness of restructuring. Compared with a situation in which she is the only creditor, this will lead B_1 to request a higher contractual repayment amount ex ante. In turn, we can establish that an entrepreneur who, in order to ”protect” his specific human capital, seeks a bank willing to invest in restructuring skills will never approach multiple banks but will make an exclusive and incentive-compatible take-it-or-leave-it offer to just one single bank.

As a consequence of this finding we will restrict our analysis in the remainder of this part to financial relationships where only banks without restructuring skills are involved. Furthermore, in order to proceed with our main argument, we can deduce that the exclusivity of financial relationships and investments in restructuring skills can be viewed as complementary to each other.

2.6.2 Reduction of the ex ante liquidation probability

The reasoning in this section proceeds from, and is thereby based on, two different, yet connected aspects of the financing problem in question. The first aspect follows from the assumption made above, namely that at t=1 the holders of junior debt can only differentiate between signals that imply financial health of the firm and those that imply financial distress. If they observe a financially healthy firm they – like an exclusive creditor - do not have any legal means at hand to force the entrepreneur into renegotiations and thus (have to) remain passive. However, if financial distress is signaled they (in sharp contrast to an informed exclusive creditor) have to decide between the two actions ”attempt liquidation” or ”remain passive” without knowing the precise value of the signal $\tilde{\pi}$. As rational agents they of course

compare the expected returns from the two alternatives and thereby also have to anticipate the action taken by B_1. At this point we make use of the second aspect mentioned above. Since B_1 can only claim the portion D_1 of the total debt amount outstanding D, her payoff function and also the critical signal value x_L^{B1} that will induce her to attempt a liquidation is different from that of an exclusive creditor. In this section we will show that the entrepreneur is able – through optimizing the contractual repayment amount D_1 and thereby also predetermining the amount D_2 – to reduce the ex ante liquidation probability and thus to increase the overall efficiency. We will not analyze this optimization problem in a general framework here. To bring across our point it suffices to proceed again somewhat heuristically.

What will be the critical signal value that would induce B_1 to switch from remaining passive to seeking liquidation? As was already mentioned, signals that imply a return larger than D_1+b will not prompt B_1 to react as she is repaid in full. Lower signals, however, will not only lead to an expected repayment that is smaller than was contracted at $t=0$ but that is also - and this stands in marked contrast to the situation in which she is the only creditor - smaller than the expected verifiable portion of the total payoff. The reason is simple and has already been provided in the numerical example above: In case the risky action is successful, holders of junior debt will capture a part of the return. As a consequence of that sharply "kinked" payoff function of B_1, a liquidation attempt is relatively more appealing to her than it is for an exclusive creditor B.

B_1 will base her decision whether to attempt a liquidation on the following consideration: With probability p she may liquidate and, if $L+\alpha H$ is larger than the D_1+c, will receive the amount D_1 in full. B_2 then obtains the remainder of the liquidation value. With probability $(1-p)$ the entrepreneur remains in control and B_1 will receive the same payoff as if she had remained passive, except that she has to bear the cost c if the risky action fails. If the risky action turns out to be successful she will be repaid D_1 and the cost c has to be borne by the holders of junior debt. x_L^{B1} thus has to satisfy the following condition:

$$pD_1 + (1-p)[\tfrac{1}{2}(x_L^{B1}-b-c)+\tfrac{1}{2}D_1] = \tfrac{1}{2}(x_L^{B1}-b) + \tfrac{1}{2}D_1 \Leftrightarrow x_L^{B1} = D_1+b-c/p+c.$$

It is important to note, that if D_1 is chosen by the entrepreneur to be sufficiently small, i.e. $D_1<L+\alpha H-c$, the senior debtor B_1's decision will not depend on the liquidation value.

Let us now return to the tradeoff faced by the holders of junior debt. Assume for a moment that they were able to observe the exact signal value. Then the critical signal value x_L^{B2} could be derived along the same lines as x_L^{B1} has been above:

$$p(L+\alpha H-c-D_1)+(1-p)\tfrac{1}{2}[x_L^{B2}+\alpha H-D_1-c]= \tfrac{1}{2}(x_L^{B2}+\alpha H-D_1) \Leftrightarrow x_L^{B2} = 2L-D_1-c/p+c.$$

As less-informed creditors, however, they have to weigh the foregone returns from not liquidating in the interval $[x_L^{B1}, x_L^{B2}]$ against the potential opportunity cost from liquidating "too early" in the interval $[x_L^{B2}, D-\alpha H]$. If D_1 is set to $L-\tfrac{1}{2}b$ by the entrepreneur, the length of the first interval is zero and B_2 will generally remain passive. As can easily be shown, an extremely profitable project would be required to preclude the entrepreneur from simultaneously stipulating D_1 sufficiently low (to minimize the liquidation incentives of B_1) and stipulating D_2 sufficiently high (to prevent the holders of junior debt from always seeking a liquidation in financial distress). However, in these very circumstances, and for this

particular reason, the entrepreneur will prefer a credit contract with one single investor. Hence, we have established that the initiative for a liquidation will never come from B_2.

In a final step, we now compare the critical signal value x_L^{B1} from this section with the critical signal value $x_L^{R=0}$ that applies to the case of an exclusive creditor without restructuring skills. In section 2.5.2 we found that $x_L^{R=0}$ is equal to $L+½b-c/p$. If we arbitrarily set D_1 to $L-½b$, x_L^{B1} will equal $x_L^{R=0}+c$ and will thus lead to a higher ex ante liquidation probability than in the case of one single creditor. However, the key point in this section is that the entrepreneur may optimize his payoff and hence his total return by choosing an appropriate value for D_1. As x_L^{B1} is a linear function of D_1, by reducing D_1 below $L-½b-c$ he may achieve a lower ex ante liquidation probability than implied by $x_L^{R=0}$, irrespective of the value of p. In reducing D_1 further the project's return will increase until the liquidation probability converges to that implied by x^* of the first-best case. The smallest efficiency loss to be achieved with multiple creditors, however, still crucially depends on the parameter values and in particular on those of p and the dead weight cost c. It is interesting to note that high values of p allow the entrepreneur to fine-tune the liquidation probability towards the first best. As p converges to 1, x_L^{B1} simplifies to D_1+b+c. If permitted by the parameter constellation, the entrepreneur will then rationally set D_1 at $L-h-b-c$ and thereby achieve $x_L^{B1}=x^*$.

We should add that we have so far neglected any extra cost that may arise from searching for and contracting with multiple investors. In reality this extra cost might be prohibitively high, so that the multiple-investor strategy is not a viable option for solving the financing problem. This holds in particular for small and medium size firms.

2.7 Summary of the results

In the preceding three sections we have discussed the implications of relaxing the assumption regarding the exclusivity of the debtor-creditor relation. On the one hand, the involvement of multiple creditors lowers the incentives of any individual creditor to invest in restructuring skills. On the other hand we have demonstrated that, given asymmetric information between the holder of senior debt and the holders of junior debt, this involvement may actually lead to efficiency gains if the entrepreneur can decrease the liquidation probability below the level in an exclusive relationship by setting an optimal repayment value D_1.[38] What makes this optimization possible is that in comparing a liquidation attempt to remaining passive, the holder of senior debt is no longer focussed on the liquidation value but rather on the contractual repayment value D_1. At the same time, holders of junior debt will generally remain passive ex post because the opportunity costs of liquidating "too early" exceed the expected losses from a "late" liquidation by the holder of senior debt.

With due caution we conclude that there exists another equilibrium in our model that implies a complementary relationship between the multiplicity of creditors, high incentives *not* to invest in restructuring skills and the parameter p. As the entrepreneur is able to reduce the ex

[38] The result, that an asymmetric distribution of information among different agents may increase social welfare is also obtained by Aghion/Bolton (1997) and Crémer (1995).

ante liquidation probability considerably, the decision to invest into specific human capital and the value *h* itself turn out to be also complementary elements.

An overall assessment of our results leads us to the following three primary solutions to the financing problem in question:

(1) In a financial system that encompasses a creditor-friendly bankruptcy law (high value for *p*) and in which banks can easily build up restructuring skills (high value for 1/*r*), firms have strong incentives to invest in firm-specific human capital because they can be (partly) assured that they are not deprived of its worth by ”too-early” liquidations. Good opportunities to extract private benefits reinforce these effects.

(2) If, however, banks face high costs of adopting restructuring skills and the firm has (easy, i.e. at low cost) access to capital markets or to multiple creditors, a creditor-friendly bankruptcy law – in combination with low bankruptcy – may in general lead to an equilibrium in which the firm is able to optimize the ex ante liquidation probability through stipulating the mix of senior and junior debt. A necessary condition for this is that the information concerning the quality of the project is asymmetrically distributed between the two groups of debt holders. In case this asymmetry is leveled out, the liquidation probability will immediately jump to a level that is equal to, or even higher than, the level in an exclusive debtor-creditor relation in which the creditor has no restructuring skills.

(3) Finally, if the bankruptcy law is debtor-friendly, if restructuring skills are costly to acquire, if private benefits are difficult to appropriate and if technologies do not allow for a high input of specific human capital, firms will face low incentives to invest in specific human capital and will hence prefer an arm’s-length relationship with one single bank.

As has become obvious, the bankruptcy law represents a central component of our model. We have demonstrated that its attributes have important implications for other elements of a financial system. In the following part of this paper we present some stylized facts of three real financial systems. They indicate that the results of our model bear considerable relevance for the analysis and evaluation of a financial system. We start with a brief overview over the bankruptcy laws in the United States, Great Britain and Germany and subsequently rank them in terms of their creditor-orientation. A discussion of other relevant characteristics of the three financial systems follows.

3 Bankruptcy law and credit relationships in the USA, Germany and Great Britain

3.1 The bankruptcy law

Concise descriptions of the bankruptcy laws in the three observed countries can be found in two recently published articles by Franks/Nyborg/Torous (1996) and Kaiser (1996). In their work, Franks/Nyborg/Torous focus on the different degrees to which the bankruptcy laws protect the interests of various involved parties (i.e. the creditors and debtors). The following table borrows extensively from their work and provides a useful summary of major differences of the laws:

Characteristics	*Great Britain "Receivership"*	*USA "Chapter 11"*	*Germany New Insolvency Code*
Who holds the controlling rights of the company during the procedure?	Creditors gain control, board of directors must resign, receiver acts in the interests of the creditors with floating charge	Often debtor in control, but in 50% of cases the incumbent management stays in control	Creditors gain control
Do debt claims have to be served during the procedure?	Yes	Nearly all payments are suspended ("automatic stay")	Automatic stay for unsecured credit, secured credit is suspended for at least three months
Can liabilities be restructured?	No	Yes, and this is even decisively influenced by the debtor	Yes, but all groups of creditors have to agree
What restrictions apply to the continued running of the company?	Secured lenders can liquidate any affected assets at any time	No important restrictions	Creditors` meeting must be in favor
Will the shareholders be serviced at the expense of the debtors?	Very unlikely to happen	Occurs very often	Possible, but only with the creditors' permission
How high are the direct costs of the procedure?	Low, due to the short duration of the process and no involvement of the courts	High, because of the length of the procedure and the extensive involvement of the courts	Medium, although the courts are heavily involved the creditors are able to shorten the procedure if they wish

Table 7: Characteristics of the bankruptcy laws in the USA, Great Britain and Germany

In order to be able to interpret the above table accurately it is necessary to add a further remark on alternative bankruptcy procedures that parties can potentially file for in the three countries. In Great Britain, there generally exist five different types of procedures to choose from. Direct liquidation, company voluntary arrangements (CVA), arrangement under the Companies Act 1985 and, since 1986, administrative receivership all exist alongside the receivership procedure. Due to the fact that in 1990 approx. 95% of all cases fell under the receivership or direct liquidation categories[39], we will restrict ourselves to an examination of

[39] See Rajak (1994).

these two types. In the case of direct liquidation (75% of cases), the focus is solely on the interests of the creditors and the control rights are assigned first and foremost to those with claims on assets of the company in the form of a *fixed charge*.[40] In many cases the company is liquidated within the first few days or weeks after the procedure has been opened, and in nearly all cases the management loses its authority. Hence, only the receivership procedure could possibly imply at least some debtor-orientation.

In the USA ”chapter 7” exists as an alternative to ”chapter 11” featured in Table 7 above. The former carries similar effects with it to those associated with the British liquidation proceedings or the currently valid German compulsory liquidation (*Konkursordnung*), whose aims are the fast and efficient liquidation of a financially distressed debtor firm. An empirical indication of the relative importance of the two procedures can be gained by examining the proceedings in progress in the Central District of California Bankruptcy Court in December 1993 of which approximately 12% fell under ”chapter 11”.[41] This may seem low, but compared with the fraction of German companies which were able to escape the compulsory liquidation procedure by using the alternative formal ”composition procedure” (*Vergleichsordnung*), this number actually appears be very high: Between 1985-1992 the fraction of German bankruptcy cases which went through court-supervised reorganization was only 0,39%, of which only 60% resulted in a successful reorganization.[42] The new German bankruptcy law (*Insolvenzrecht*), which will come into effect in 1999 and which was presented in the table, is considerably influenced by the existing bankruptcy law, but tends to level out the formerly strong differences between the various groups of creditors (i.e. unsecured and secured creditors).[43]

Table 7 thus a solid basis for an assessment of the creditor-orientation of the most important bankruptcy laws that are in force in the three countries at present or in the near future. A comparison of Great Britain and the USA reveals that their laws indeed possess remarkably different orientations. Whilst British creditors enjoy virtually unlimited control over the course of actions and can liquidate the company at any time, in the USA both the debtors and the courts play a major role. The former possess a number of rights, which enable them to delay the proceedings and therefore can be exercised to extend their period of office. Gilson (1989) estimates that approximately half of all boards of directors remain in office and that in the majority of the other cases, the new leadership is selected from within the affected company itself. Consequently, a sample survey of 111 publicly listed corporations which went into bankruptcy proceedings between 1979 and 1985 revealed that the mean duration of ”chapter 11” proceedings was nearly two years.[44] In addition, several studies consider the question whether the ”chapter 11” procedure leads to a division of future income or

---

[40] A fixed charge is a claim on specific, immovable assets of a firm, for example, land or buildings. A floating charge is a claim on less clearly defined, moveable assets such as stocks, inventories and work in progress.

[41] See Franks/Nyborg/Torous (1996).

[42] See Kaiser (1996).

[43] In the future interest and redemption payments to secured lenders will be interrupted for at least three months. Furthermore, a firm will no longer be permitted to give some creditor the status of a preferred creditor. Finally, some of the power of the administrator will be transferred to the creditors’ assembly.

[44] See Gilson (1990).

liquidation proceeds which is in line with the ex ante financing agreement, or whether deviations from the absolute priority rule (APR) are frequent and substantial. In two studies, Weiss (1990) and Franks/Torous (1989) show that in 80% and 50% of observed cases, junior creditors received payments despite the fact that the claims of the senior creditors could not be fully met. Eberhard/Moore/Roenfeldt (1990) find that the average violation of the APR due to payments to shareholders amounts to 7,6% of the total value paid to all claimants.

In contrast to the findings for the USA, Olsen (1996) finds no indication of a deviation from the APR for the British receivership procedure. Similarly, work by Geßner et al. (1978) and Landfermann (1994) on the German bankruptcy law reveals no significant deviation from the APR.

It is therefore a fairly safe conclusion to draw that the British bankruptcy procedure is clearly creditor-oriented, while the US is thoroughly debtor-oriented. The German bankruptcy law, while not empowering individual creditors to the same extent as the British law, is far less similar to the American ”chapter 11”. LaPorta et al. (1997) draw a very similar conclusion in their comparative study of different national laws. On a scale of zero to four, which measures the position of creditors in the case of an insolvency, Great Britain scores a four, Germany a three and the USA only a one.

An analogous comparison can be made by comparing the costs of bankruptcy procedures, however. However, concrete estimates are only available for the USA. Warner (1977), Altman (1984) and Weiss (1990) estimate the direct costs to be 3% to 6% of the company’s value one year prior to the proceedings. In addition to these direct costs there are indirect or opportunity costs. Senbet/Seward (1995, P. 945) define indirect costs as losses of welfare which *”[...]collectively represent the outcome of suboptimal actions taken by corporate stakeholders*”. Altman (1984) estimate these to be 15% for industrial and 8.7% for retail enterprises.

As the courts play a far smaller role and, on average, the proceedings are much shorter in Great Britain, it can be assumed that welfare losses are also lower, whereas Germany probably takes a position somewhere in between.

Up until this point we have neglected one important aspect when dealing with the stylized empirical facts of bankruptcy procedures, namely the relevant incentives to come to some kind of private agreement (i.e. outside the realms of bankruptcy proceedings). Generally, we can expect high proceedings costs to create a positive incentive to settle privately, due to the potential savings which might result. On the other hand, one might suggest that the various parties bargaining positions, as ascribed to them by the relevant bankruptcy laws, play an important role in whether and to what extent they strive for a private discussion and settlement and how willing they are to compromise. As shown above, under ”chapter 11” an American debtor is endowed with considerable rights, so that his bargaining power in a private workout tends to be greater than that of a British or German company, which has to reckon with impending liquidation should negotiations fail. Which alternative forms of action are available to the creditors also plays a decisive role in how attractive private workouts are and what their outcomes tend to be. Should the creditors be in the position to successfully

reorganize the company, resulting in higher income than could be gained through liquidation, then the chances of private workouts are greater.

How well are these assumptions supported by empirical evidence? Studies examining the comparative costs of formal and private proceedings show, without exception, that cost savings can be generated by avoiding the involvement of courts and shortening the proceedings. For Great Britain, Olsen (1996) estimates the total costs of a private settlement to be 3% of the firm's value, and in the USA these costs seems to be even lower, Gilson/John/Lang (1990) finding values between 0.32% and 0.65%. From this we can deduce that, at least in the USA, there are strong cost driven incentives in favor of private settlements. By their nature, the implications of various levels of bargaining power are more difficult to measure. However, the available empirical evidence suggests that the weighting of interests in the relevant bankruptcy law also shows up in private workouts in the various countries. Olsen (1996) investigates a sample of 35 British firms, which took part in private settlements, and finds that, on average, secured lenders waived 12% of their due payments, half of which went to unsecured lenders and the other to the owners. Franks/Torous (1994) find that for 82 US-American firms, both secured lenders (7%) and lenders without security (1%) reduced their debt claims, all of which fell to the owners. In comparison to a strict application of the APR, shareholders are the main beneficiaries of the "softness" of the US-bankruptcy law even in out-of-court settlements. Whilst no comparable figures exist for Germany, Kaiser (1996, p.78) notes that: *"[...]the main result of the extremely poor reorganization provisions in German bankruptcy law is that banks unilaterally determine the optimal treatment of distressed firms. If it is determined that a firm will be resuscitated, the house bank will organize an out-of-court workout to effect a reorganization [...] Thus, firms which wind up in insolvency proceedings have already been deemed nonviable by the banks.*" Thus, German banks seem to retain their strong position also in the case of private workouts.[45]

3.2 Restructuring incentives for creditors

How attractive private workouts are, also depends on whether an alternative to liquidation is available to the creditors or not, and if so, how easy it is to use it. Turning our attention first to the stylized facts about the USA, Kaiser (1996, p.77) comments: "*As a result of legal precedent in the US regarding lender liability, banks are discouraged from forming close working relationships with their clients. Banks become hesitant about providing advice to a company for fear of being held financially liable for any directions that may result in a loss in firm value*". The Glass-Steagall Act of 1933, which only allows banks to have equity holdings in non-financial companies as an exception to the rule, as well as a relatively easy access for debtor companies to funds from highly developed capital markets, make credible long-term ties to a bank more difficult. When accompanied by only limited control in the case of a reorganization, this provides a further reason why a close working relationship with the

[45] Refer to section 2.4.2 for an interesting analogy between the empirical evidence and the potential outcomes of private workouts implied by our model. Banks with restructuring skills obtain strictly higher payoffs.

debtor firm would not appear to be very useful. Most private settlements primarily lead to debt relief and reshuffling of liabilities and equity, while the creditors' possibilities remain restricted as far as exercising control is concerned.[46] Private settlements hence only appear advantageous to a bank as long as the costs of formal procedures are higher than the associated financial gains.

Considerable obstacles are also faced by any bank in Britain which is willing to restructure a company rather than liquidate it: Overall creditors possess an extremely strong bargaining position as their threat to liquidate the firm must be considered highly credible, and several legal and institutional features of the British system make a restructuring of a distressed firm seem unattractive. Firstly, all bankruptcy law procedures, along with their one-sided emphasis towards a particular group of creditors, stand in the way of a coordination of creditors' efforts. As a likely consequence of this inability to coordinate, hold-up-problems may arise in the sense that junior creditors do not restructure the company when the advantages will largely be captured by creditors secured by a fixed charge. On the other hand, the latter also only possess low incentives to restructure, because lenders secured by a floating charge can call in receivers who solely represent their own interests. Secondly there is the danger that a creditor who gives advice or plays some other active role in a borrower firm, may be held legally liable for any damage incurred by others.[47] This is due to the common law tradition which the British and the American law share.[48] Thirdly, newly injected capital to prolong the existence of a company is generally dealt with as junior capital, exposing it to a very high risk. Fourthly, free-rider problems between creditors, which rise in proportion to their number, and restricted commitment possibilities on the part of the companies[49] prevent restructuring banks from any certainty of long-term compensation for the efforts and risks they would have to undertake. Finally, until the end of the eighties, the British banking sector was characterized by a strict functional segmentation. This did not favor close financial relationships, because each bank only provided certain financial services. Therefore the frequently presented picture in the literature of an arm's length relationship between British banks and companies seems to fit the negative restructuring incentives sketched here.[50]

What conclusions may be drawn from the creditor-oriented bankruptcy law and the simultaneously negative incentives regarding restructurings? Similar to Kaiser (1996, p.78) we assume that "*[...]creditors are more willing to grant concessions to successfully conclude a workout in the US, than [in] Britain where their security is protected and the costs of reorganizing (or failing and then liquidating) within insolvency proceedings are lower".*

---

[46] See Franks/Nyborg/Torous (1996), P. 98: *"[...] evidence suggests that part of the gains accruing to equity holders comes from bargaining power rather than correcting the incentives to invest.*"

[47] See Dimsdale/Prevezer (1994), P. 34*: "Closer association between banks and borrowing companies could give rise to problems, since under the Insolvency Act of 1998 a bank could run the risk of being deemed to be a shadow director of a company experiencing trading difficulties. The bank could in these circumstances be liable to severe penalties".*

[48] For a description of legal traditions and their influence on financial systems see La Porta et al. (1997).

[49] The comparatively highly efficient capital markets with respect to other countries may, amongst other reasons, be held responsible for the existence of limited commitment possibilities. Both the "*market for corporate control*" and the expansion of capital market financing undermine long-term and intensive relationships.

[50] See Dimsdale/Prevezer (1994) and Charkham (1994).

Consequently, given a comparable debtor-creditor arrangement, we expect the probability of liquidation to be greater in Britain. From this perspective the British Insolvency Act of 1986 and the measures to deregulate the banking sector can be interpreted as an attempt by the government to reduce the likelihood of liquidation and simultaneously to provide incentives for forming closer ties between creditors and debtors. However, previous remarks have made clear that these objectives are undermined by the fear of being held financially liable and the considerable role of the capital markets.[51] It is therefore hardly surprising that the new administration-procedure has rarely been applied since its introduction in 1986.[52]

Turning finally to the German financial system, we are presented with virtually the exact opposite practice with respect to private workouts, despite a comparably creditor-friendly bankruptcy law to that of Britain. Franke (1983) estimates that approximately half of all potential bankruptcy proceedings are averted by private reorganizations. This is hardly surprising as for all five arguments lying behind the incentives presented against reorganization by British banks the opposite is true for the German system: The German bankruptcy law contains nothing comparable to receivership, where junior creditors who are only secured by a *floating charge* can protect their interests. Furthermore, in the German legal system, which takes its roots in the tradition of civil law, creditors can be held far less financially liable for any advice they give. Recently injected funds do not have to be considered as junior, but rather can have their status determined by the creditors. In addition, German banks are threatened with very little competition from capital markets once reorganization has successfully been completed, so that any funds put into the company during the run up to, and during the reorganization, can also be regained from the debtor in the long term. Finally, and this is probably the most compelling aspect, Germany possesses a long tradition of universal banking, which permits banks to hold shares in debtor companies and to use their role as house bank to carry out a broad range of other financial activities. This requires, and at the same time permits and even fosters, a close relationship between creditor and debtor, based on an intensive exchange of information which definitely improves the ability to reorganize the company. Through their partial ownership of the firm, the bank also becomes more interested in maximizing the value of a distressed firm and no longer in just maximizing the amount regained in outstanding debt claims. Other authors add ”*social prestige*” (Franks/Nyborg/Torous(1996)) or the ”*reputation as a supportive lead bank*” (Kaiser (1996)) as additional incentives for reorganization. This contribution to the argument appears to be plausible once we take into account the endeavors of the bank to maintain a profitable long-term house bank relationship with as many companies as possible. It is precisely this concentration of the debtors` liabilities to a single bank or at most a small group of banks, in which one - typically the house bank - dominates, what reduces holdup and free-rider problems.

---

[51] In a theoretical analysis Dinç (1996) advances the bank’s reputation not to liquidate as the central requirement for the establishment of close credit relationships. According to Dinç, the chances of attaining such a reputation fall as the role of capital markets and the intensity of competition in the banking sector increases.

[52] See Franks/Torous (1993).

We conclude that in the German system liquidation typically occurs if a reorganization does not provides sufficient reasons for a relatively well informed bank that the continuation of the debtor company will be profitable in the long-term.

In the conclusions section we use the empirical facts about the bankruptcy procedures and the considerations about the incentives for banks to reorganize in the three systems, to point out parallels to the equilibria in our model. Based on this foundation we then derive hypotheses about the effects connected with other components of the relevant financial systems, before finally considering the implications for the convergence of financial systems.

4 Conclusions

Naturally, we do not expect our model to provide a full account of something as complex as an entire financial system. Instead we restrict ourselves to credit financing and ignore any possible alternative solutions to the financing problem. Nevertheless, we believe to have shown which mechanisms may be responsible for the interrelated effects of bankruptcy law on the one hand and incentives for banks to restructure companies on the other. We did also shed some light on the additional influence of other components, such as the incentive to build up firm-specific human capital or the possibilities to appropriate private benefits of control. Hence, our model should be considered as an attempt to provide some reasons for the stability of financial systems and thereby for the coexistence of profoundly different types of financial systems.

The starting point of the model is the analysis of a particular financing problem, which includes as an important component the investment decision in firm-specific human capital. In the basic framework we discuss two mechanisms for solving this problem. On the one hand, a creditor orientated insolvency law provides banks with an incentive to invest in restructuring skills which gives rise to the bank not liquidating a company, but appropriating income from a reorganization instead.[53] On the other hand a debtor-oriented bankruptcy law *directly* reduces creditors' incentives to liquidate, thus protecting firm-specific human capital. However, the effectiveness of the latter mechanism decreases due to increasing specific human capital intensity in a project, whereas the former mechanism becomes more suitable.

In addition, a third alternative has already been presented in section 2.6. If a strongly creditor-oriented bankruptcy law is in place and if at the same time the adoption of restructuring skills causes prohibitively high fixed costs, the chances of liquidation can be reduced through the addition of a further group of junior and less well informed creditors. Through an appropriate

[53] Empirical evidence is available for the positive relationship between close bank to company ties and the chances of a companies` continuation under conditions of financial-distress. For example in a study of Japanese firms in financial distress Hoshi/Kashyap/Scharfstein (1990) find that companies that are closely tied to their (few) creditors sell and invest significantly more than those with loose ties. The authors hold lower information problems between borrowers and lenders, reduced free-rider problems as a result of the low number of parties involved, and increased incentives for active intervention on the side of the bank responsible for this result.

distribution of its overall debt exposure between different creditors a company is in a position to reduce the ex ante liquidation incentives of both groups and thereby to protect its specific human capital. If a firm is denied access to further creditors, or if there are no information asymmetries between creditor groups, then there is little incentive to build up firm-specific human capital.

At this point it may suffice to point out the similarities between the first solution and the stylized features of the German financial system, between the second solution and the US-American financial system, and between the third solution and the British financial system. If these parallels are deemed convincing, one can infer from our model that firm-specific human capital is more prevalent in Germany than in the two other countries because the combination of close ties between banks and firms and a creditor-oriented bankruptcy law encourages the formation of specific human capital. For the USA, we correspondingly hypothesize that credit financing only supports firm-specific investment in human capital up to a certain point. Nevertheless, the American system proves to be very efficient for projects in which specific human capital plays only a minor role but general human capital is more important.[54]

As far as the British system is concerned, we conclude that protection of firm-specific human capital can only be achieved through mechanisms which act as substitutes for a close banking relationship. We have identified as one possible candidate a relationship between one debtor and multiple creditors. In principle, this constellation should be feasible in a debtor-oriented system, like the one in the USA, but it would not provide such a strong incentive against liquidation because the liquidation probability is already low with a debtor-oriented bankruptcy law. As a consequence, removing the assumption of asymmetric information between groups of creditors in a US-style system causes no fundamental change in the efficiency level of this configuration. The liquidation incentives of junior creditors are virtually identical to those of an exclusive creditor as presented in the basic model. In the British system however, the probability of liquidation shoots up with respect to decreasing information asymmetries, because the bankruptcy law helps the junior creditors to push through a desired liquidation without hindrance.

From the perspective of our model, Franks/Nyborg/Torous (1996) demand for bankruptcy laws to create greater incentives for information sharing amongst creditors is to be judged with caution. The authors criticize the British bankruptcy law because the non-uniform

---

[54] There exists some empirical evidence on the different roles of firm-specific human capital in Germany and the USA: The German (and more generally, the continental European) labor market is characterized by (1) a higher overall unemployment rate, (2) lower fluctuation rates, and (3) a higher average wage discount that skilled employees have to bear after temporary unemployment than that of the USA (see Cohen et al. (1997), referring comments by Andersen and Bean, Cohen (1998), and Bean (1993)). Furthermore, new empirical research by Harhoff/Kane (1996) and Acemoglu (1996) indicates higher levels of investment in firm-specific human capital in Germany than in the US. Combined, these findings suggest the following: Higher levels of firm-specific human capital will typically lead to more rigid labor markets, as incumbent employees with firm-specific skills face a lower probability of getting fired and in case there are fired will not be able to employ their specific skills in other firms, demanding a different skillset. The length of the unemployment period and the size of the wage discount will thus be positively correlated to the specificity of a discharged employee's human capital (theoretical models on this relation can be found in Chang/Wang (1995,1996) and Acemoglu/Pischke (1998)). Our definition of the private liquidation cost H is based on this potential negative effect of specific human capital.

method in which individual groups of creditors are handled restricts the transfer of information between them. In our model however, it is precisely this apparent disadvantage that leads to the desired effect of hindering early company liquidation.

In a system configuration in which banks are able to restructure firms guaranteeing the protection of firm-specific human capital, as is probably best represented by the German system, the introduction of multilateral relationships would clearly have destabilizing effects. The anticipated benefits for each creditor, which results from a restructuring, will fall due to the marginal payoffs being spread amongst all creditors involved. However, these potential free-rider effects could possibly be mitigated by concluding implicit contracts between all the creditors involved. The main creditor would thereby commit himself to invest in restructuring skills whereas the other creditors would promise not to liquidate the firm ”too early”. In order to make all these commitments binding, any bank would have to be a main bank for some firms on which the other banks have minor claims, and have minor claims on those firms for which another party to the implicit contract acts as the main bank. A bank that breaches the implicit contract would then have to fear being penalized by the other banks.

What can be said about the empirical relevance of the other model parameters and their illustrated implications on the stability of financial systems?

First let us examine the parameter *b*, which serves as a measure of the opportunities for the entrepreneur to appropriate private benefits of control. We have shown that the complementarity between the investment in firm-specific human capital and the investment in restructuring skills grows proportionally to *b*. In addition, the marginal benefit from an investment in restructuring skills increases with this parameter. The direct consequence is that systems in which, as a rule, close ties exist between investors and borrowers have a comparative advantage in dealing with a high potential of appropriating private benefits of control. In reality this country specific potential is, by its very nature, very difficult to measure. Zingales (1994, 1995, 1997) has tried to achieve this by indirect means in a number of papers. For this purpose, he compares the dividend-adjusted share price differential of voting and non-voting stock of the same company over time. He assumes that the estimated price differential can primarily be put down to the different control rights associated with each share type, once again on the grounds that these control rights would be valuable because of the possibilities to appropriate private benefits. The surprising result of his studies is that the size of the price differential clearly varies between countries and is negatively correlated to the quality of accounting standards in terms of strict disclosure requirements.[55] Both Great Britain and the USA are ranked at the bottom end of the scale for control premia and at the top for the strictness of their statutory accounting requirements. No similar study has been found for Germany and we hope to close this gap in a further paper. Our initial quantitative results indicate fairly conclusively that the price differential in Germany must be

[55] See Zingales (1997), p. 14.

substantially higher than in the other two countries.[56] This would appear to support the argument by Zingales, as Germany's disclosure requirements and rules to protect small retail investors are generally considered to be lax in comparison to those of other countries.

Naturally, these conjectures also apply to companies that mainly cover their external financing requirement by loans. Based on the empirical evidence, we therefore draw the speculative conclusion that Germany's financial system tends to provide more potential for the appropriation of private benefits of control than is the case in the USA or Great Britain. According to our model, the respective potentials can be interpreted as stabilizing components of the system configurations.

Let us now turn to the incentives for investment in firm-specific human capital. These are not obviously country specific and thus empirical evidence on international differences is hard to find.[57] Nevertheless, a comparative advantage may be determined for those systems in which close bank ties are more frequently encountered. The higher the level of firm-specific human capital, the greater becomes the need in systems without such ties to strengthen the bargaining position of the borrowers in the bankruptcy procedure, or in other words, the more important the role of alternative protective mechanisms, such as provided by multilateral credit relationships in which there is asymmetric information. However, weakening the creditor's bargaining position could bring with it credit rationing. To use the terminology of our model, lenders are only willing to provide the necessary funds for projects if offered nominal repayment amounts – which must be higher for more debtor-oriented bankruptcy laws - that do not exceed the largest possible payoff (see also Appendix 2). A connection which is also deemed relevant by Kaiser (1996, p.74), who notes that: "[…]*the strength of the creditors' bargaining position in financial distress in Germany should result in less credit rationing, though there is no strong evidence that this is the case*".

We therefore conclude that so called insider-systems, in which firm-specific information is confidentially used by the bank and its borrower, tend to encourage the investment in firm-specific human capital in smaller companies more than so called outsider-systems, in which firm-specific information is passed on to outsiders through strict compulsory disclosure rules or is not passed on at all. In an interesting analogy to our argument Shleifer/Summers (1988) interpret a lack of incentives for investment in firm-specific human capital as an indirect cost of corporate takeovers.

Our model shows the importance of complementarity of certain key elements of any viable financial system. This allows us to conclude our paper with a somewhat speculative note on the convergence of financial systems. Because, as our model demonstrates, it is imperative for well-functioning systems that its complementary elements fit together, we doubt that the different financial systems within Europe would converge endogenously, i.e. driven by efficiency considerations alone, since at least in the two European countries examined in our

[56] In as yet unpublished work, we found the price differential for German corporations to exceed 30%. This result stands in stark contrast to the average price differentials measured for the UK (see Megginson (1990)) and the USA (see Zingales (1995)). Both amount to less than 10%.

[57] But see FN54.

paper, two vastly distinct, but consistent financial systems have developed over time. The two systems are each composed of elements which take on almost ”polar” sets of values. As these sets can be interpreted to constitute two equilibria implied by our model, we conjecture that any politically motivated attempt to modify single elements of these two systems, such as the bankruptcy law[58] or the disclosure requirements, will fail in the short-run. Our model predicts that such a modification would ensue welfare losses and because of that would prompt circumventing measures by agents trying to adapt to these changes. Complementarity thus rules out a smooth convergence. It implies that convergence can only be achieved by drastically modifying all or at least a sufficient number of elements of a system simultaneously. The most likely scenario for such a dramatic shift to occur is a crisis hitting this financial system. Such a crisis could be triggered either by an exogenous shock (e.g. globalization) or by far-reaching politically motivated changes which do not allow the agents to adapt adequately and thus would lead to an incoherent, dysfunctional system. An alternative second scenario, namely one in which change is brought about by a straight and fast ”leap” from one equilibrium to another, seems much more unlikely to occur, because this would require a coordinated approach by all agents including legislative bodies. As we deem the crisis-scenario more plausible, we conjecture that a convergence of financial systems would cause significant welfare losses to the economies that, intentionally or unintentionally, embark on a change.[59]

Such losses can be exemplified by means of our model: If a (German) bank has repeatedly invested into restructuring skills, it might be expected that learning effects would have decreased her fixed cost r over time. If those repeated investments applied to subsequent projects of one particular firm the information accumulated in the past would have further decreased r. In addition, such a bank, which might eventually be considered as the house bank of the firm, would have the opportunity to build up a reputation for successful corporate restructuring, generally making it easier for other firms to find a financing partner who could guarantee greater protection of their specific human capital. Were this system configuration now to be severely disturbed, e.g. through a fundamental amendment to the bankruptcy law and considerably stricter statutory disclosure requirements, this could result in substantial welfare losses, since as a result of reduced restructuring possibilities not only the collected information but also the reputation of being successful in restructuring would become worthless. Even worse, should (German) banks no longer be willing to invest in restructuring skills, new firms may renounce to build up specific human capital and employees of established firms may incur large private losses as the probability of early liquidations is sharply increased.

---

[58] A pan-European alignment of bankruptcy laws is for example advocated by Kaiser (1996).

[59] The German system in particular seems to be very susceptible to change. Amongst other reasons its still underdeveloped capital markets provide few alternative devices to reduce the probability of company liquidation. A similar argument on the possible convergence of corporate governance systems is developed in a related paper by Schmidt/Spindler (1998). They point out the prominent role of implicit contracts between all stakeholders of a firm as a characteristic feature of the German financial system. As implicit contracts are very susceptible to exogenous shocks, they conjecture that the overall stability of the German system is currently in danger.

A final conjecture concerns the possibility to create a ”middle of the road”-financial system that would combine the alleged merits of insider and outsider system. The reason is simple: A system comprising close ties between banks and firms, high incentives to build up specific human capital, easy access to capital markets and an active market for corporate control is not coherent and hence not stable. Persistent attempts to arrive at such a hypothetical configuration of a financial system might even lead to the crisis-scenario mentioned above.

References

Acemoglu, D. (1996): Investment in Skills, Market Imperfections and Growth, in A.Booth/D.Snower (eds.): Skill Gaps and Economic Activity, Cambridge, pp.41-63

Acemoglu, D./Pischke, J.-F. (1998): The Structure of Wages and Investment in General Training, CEPR-Working Paper No. 1833, London

Aghion, P./Bolton, P.(1992): An "Incomplete Contracts" Approach to Financial Contracting, Review of Economic Studies, Vol. 59, pp.473-494

Aghion, P./Hart, O./Moore, J.(1992): The Economics of Bankruptcy Reform, Journal of Law, Economics, and Organization, Vol. 8, pp.523-546

Aghion,P./Tirole, J.(1997): Formal and Real Authority, Journal of Political Economy, Vol. 105, pp.1-29

Altman, E.(1984): A Further Empirical Investigation of the Bankruptcy Cost Question, Journal of Finance, Vol. 39, pp.1067-1089

Ang, J.S./Megginson, W.L.(1989): Restricted Voting Shares, Ownership Structure, and the Market Value of Dual-Class Shares, Journal of Financial Research, Vol. 12, pp.301-318

Bean, C.(1994): European Unemployment: A Survey, Journal of Economic Literature, Vol. 32, pp.573-619

Bebchuk, A.L.(1988): A New Approach to Corporate Reorganizations, Harvard Law Review, Vol. 101, pp.775-804

Bebchuk, A.L./Picker, R.(1992): Bankruptcy Rules, Managerial Entrenchment, and Firm-Specific Human Capital, Working Paper, Harvard Law School

Berglöf, E.(1994): A Control Theory of Venture Capital Finance, Journal of Law, Economics and Organization, Vol. 10, pp.247-267

Berglöf, E./von Thadden, E. L.(1994): Short-term versus Long-term Interests: Capital Structure with Multiple Investors, Quarterly Journal of Economics, Vol. 109, pp.1055-1084

Berkovitch, E./Israel, R./Zender, J.(1993): The Design of Bankruptcy Law: A Case for Management Bias in Bankruptcy Reorganizations, Working Paper, University of Michigan

Berkovitch, E./Israel, R.(1995): Optimal Bankruptcy Laws Across Different Economic Regimes, Working Paper, University of Michigan

Bulow, J./Shoven, J.(1978): The Bankruptcy Decision, Bell Journal of Economics, Vol. 9, pp.437-456

Chang, C./Wang,Y.(1995): A Framework for Understanding Differences in Labor Turnover and Human Capital Investment, Journal of Economic Behavior and Organization, Vol. 28, pp.91-105

Chang, C./Wang,Y.(1996): Human Capital Investment under Asymmetric Information: The Pigovian Conjecture Revisited, Journal of Labor Economics, Vol. 14, pp.505-519

Charkham, J.P.(1994): Keeping Good Company: A Study of Corporate Governance in Five Countries, Oxford

Cohen, D.(1998): The Wealth of the World and the Poverty of Nations, Cambridge, Mass.

Cohen, D./Lefranc A./Saint-Paul G.(1997): French Unemployment: A Transatlantic Perspective, Economic Policy, No. 25, pp.265-291 (with the comments by T. Andersen and C. Bean)

Crémer, J.(1995): Arm`s Length Relationships, Quarterly Journal of Economics, Vol. 110, pp.275-295

Detragiache, E.(1994): Public versus Private Borrowing: A Theory with Implications for Bankruptcy Reform, Journal of Financial Intermediation, Vol. 3, pp.327-354

Dewatripont, M./Maskin, E.(1995): Credit and Efficiency in Centralized and Decentralized Economies, Review of Economic Studies, Vol. 62, pp.541-555

Dewatripont, M./Tirole, J.(1994): A Theory of Debt and Equity: Diversity of Securities and Manager-Shareholder Congruence, Quarterly Journal of Economics, Vol. 109, pp.1027-1054

Diamond, D.(1984): Financial Intermediation and Monitoring, Review of Economic Studies, Vol. 51, pp.393-414

Diamond, D.(1991):Monitoring and Reputation: The Choice between Bank Loans and Directly Placed Debt, Journal of Political Economy, Vol. 99, pp.689-721

Dimsdale, N./Prevezer, M.(1994): Capital Markets and Corporate Governance, Oxford

Dinç, S.(1996): Relationship Banking: Feasibility and Path Dependency, Mimeo, Stanford University

Eberhardt, A./Moore, W./Roenfeldt, R.(1990): Security Pricing and Deviations from the Absolute Priority Rule in Bankruptcy Proceedings, Journal of Finance, Vol. 45, pp.1457-1470

Edwards, J./Fischer, K.(1994): Banks, Finance and Investment in Germany, Cambridge

Franke, G.(1983): Ökonomische Überlegungen zur Gestaltung eines gerichtlichen Sanierungsverfahrens, Konkurs-, Treuhand- und Schiedsgerichtswesen, Vol. 44, pp.35-37

Franks, J./Mayer, C.(1995): Ownership and Control, in H. Siebert (ed.): Trends in Business Organization: Do Participation and Co-operation Increase Competitiveness?, Tübingen, pp.171-195

Franks, J./Nyborg, K.(1994): Control Rights, Debt Structure, and the Loss of Private Benefits: The Case of the UK Insolvency Code, CEPR Working Paper No. 47, London

Franks, J./Torous, W.(1989): An Empirical Investigation of U.S. Firms in Reorganization, Journal of Finance, Vol. 44, pp.747-767

Franks, J./Torous, W.(1993): A Comparison of the U.K and U.S Bankruptcy Codes, Journal of Applied Corporate Finance, Vol. 6, pp.95-103

Franks, J./Torous, W.(1994): A Comparison of Financial Recontracting in Distressed Exchanges and Chapter 11 Reorganizations, Journal of Financial Economics, Vol. 35, pp.349-370

Franks, J./Nyborg, K./Torous, W.N.(1996): A Comparison of US, UK, and German Insolvency Codes, Financial Management, Vol. 25, pp.86-101

Fudenberg, D./Tirole, J.(1991): Game Theory, Cambridge, Mass.

Gale, D./Hellwig, M.(1985): Incentive-Compatible Debt Contracts: the One-Period Problem, Review of Economic Studies, Vol. 52, pp.647-663

Gertner, R./Scharfstein, D.(1991): A Theory of Workouts and the Effects of Reorganization Law, Journal of Finance, Vol. 46, pp.1189-1222

Geßner, V. et al.(1978): Die Praxis der Konkursabwicklung in der Bundesrepublik Deutschland, Köln

Gilson, S.(1989): Management Turnover and Financial Distress, Review of Financial Studies, Vol. 2, pp.25-47

Gilson, S.(1990): Bankruptcy, Boards, Banks and Blockholders: Evidence on Changes in Corporate Ownership and Control when Firms Default, Journal of Financial Economics, Vol. 27, pp.315-353

Gilson, S./John, K./Lang, L.(1990): Troubled Debt Restructurings: An Empirical Study of Private Reorganization of Firms in Default, Journal of Financial Economics, Vol. 27, pp.315-353

Grossman, S./Stiglitz, J.E.(1980): On the Impossibility of Informationally Efficient Markets, American Economic Review, Vol. 70, pp.393-408

Hackethal, A.R./Tyrell, M.(1997): Konkursrecht, Reorganisationsfähigkeit von Banken und unternehmensspezifisches Humankapital - komplementäre Elemente eines Finanzsystems, Working Paper, Johann Wolfgang Goethe-Universität, Frankfurt/M.

Harhoff, D./Kane, T.(1997): Is the German Apprenticeship System a Panacea for the U.S. Labor Market, Journal of Population Economics, Vol. 10, pp.171-196

Hart, O.(1995): Firms, Contracts, and Financial Structure, New York

Hart, O./Moore, J.(1998): Foundations of Incomplete Contracts, NBER-Working Paper No. 6726, Cambridge, Mass.

Hauswald, R.(1996): Financial Contracting, Reorganization and Mixed Finance: A Theory of Banking Systems, Working Paper, University of Maryland

Holmström, B./Tirole, J. (1997): Financial Intermediation, Loanable Funds and the Real Sector, Quarterly Journal of Economics, Vol. 112, pp.663-691

Hoshi, T./Kashyap, A./Scharfstein, D.(1990): The Role of Banks in Reducing the Costs of Financial Distress in Japan, Journal of Financial Economics, Vol. 27, pp.67-88

John, K.(1993): Managing Financial Distress and Valuing Distressed Securities: A Survey and a Research Agenda, Financial Management, Vol. 22, pp.60-78

Kaiser, K.M.J.(1996): European Bankruptcy Laws: Implications for Corporations Facing Financial Distress, Financial Management, Vol. 25, pp.67-85

Landfermann, H.G.(1994): Bankruptcy Law: German Insolvency Law Reform, in Proceedings of the European Law Forum, Ljubljana, pp.65-82

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R.(1997): Legal Determinants of External Finance, Journal of Finance, Vol. 52, pp.1131-1150

Laux, C.(1996): Kapitalstruktur und Verhaltenssteuerung, Wiesbaden

Milgrom, P./Roberts, J.(1995): Complementarities and Fit - Strategy, Structure, and Organizational Change in Manufacturing, Journal of Accounting and Economics, Vol. 19, pp.179-208

Myers, S.(1977): The Determinants of Corporate Borrowing", Journal of Financial Economics, Vol. 5, pp.147-175

Olson, J.P.(1996): A Restructuring of Distressed Bank Debt: Some Empirical Evidence from England, mimeo, London Business School

Rajak, H.(1994): The Challenges of Commercial Reorganization in Insolvency: Empirical Evidence from England, in J.S. Ziegel (ed.): Current Developments in International and Comparative Corporate Insolvency Law, Oxford.

Rajan, R.(1992): Insiders and Outsiders: The Choice between Relationship and Arm's Length Debt, Journal of Finance, Vol. 47, pp.1367-1400

Schmidt, R.H.(1981): Die ökonomische Grundstruktur des Insolvenzrechts, Die Aktiengesellschaft, Vol. 26, pp.35-44

Schmidt, R.H./Spindler G. (1998): Path Dependence, Corporate Governance and Complementarity - A Comment on Bebchuk and Roe, Columbia Business Law Review, forthcoming

Schmidt, R.H./Tyrell, M.(1997): Financial Systems, Corporate Finance, and Corporate Governance, European Financial Management, Vol. 3, pp.159-187

Senbet, L./Seward, J.(1995): Financial Distress, Bankruptcy and Reorganization, in R. Jarrow et al. (eds.): Handbooks in Operations Research and Management Sciences, Vol. 9 (Finance), pp.921-961

Shleifer, A./Summers, L.H.(1988): Breach of Trust in Hostile Takeovers, in A. J. Auerbach (eds.): Corporate Takeovers: Causes and Consequences, National Bureau of Economic Research Project Series, Chicago, pp.33-56

von Thadden, E.L.(1995): Long Term Contracts, Short-Term Investment, and Monitoring, Review of Economic Studies, Vol. 62, pp.557-575

Topkis, D.M. (1998): Supermodularity and Complementarity, Princeton

Townsend, R.M.(1979): Optimal Contracts and Competitive Markets with Costly State Verification, Journal of Economic Theory, Vol. 21, pp.265-293

Warner, J.(1977): Bankruptcy, Absolute Priority, and the Pricing of Risky Debt Claims, Journal of Financial Economics, Vol. 4, pp.239-276

Weiss, L.(1990): Bankruptcy Resolution: Direct Costs and Violation of Priority of Claims, Journal of Financial Economics, Vol. 27, pp.285-314

White, M.(1994): The Costs of Corporate Bankruptcy: A U.S.-European Comparison, CES Working Paper No. 48, Munich University

Wruck, K. H.(1990): Financial Distress, Reorganization, and Organizational Efficiency, Journal of Financial Economics, Vol. 27, pp.419-444

Zingales, L.(1994): The Value of the Voting Right: a Study of the Milan Stock Exchange, Review of Financial Studies, Vol. 7, pp.125-148

Zingales, L.(1995): What Determines the Value of Corporate Votes?, Quarterly Journal of Economics, Vol. 110, pp.1047-1073

Zingales, L.(1997): Why it’s Worth Being in Control, Financial Times (June 9), ”Mastering Finance 5”, pp.13-14

Appendix 1: Incentive compatible debt contracts

In this appendix we derive a sufficient incentive compatibility constraint for the debt contract. If the resulting condition is satisfied by the amount of the initial investment *I*, the entrepreneur may, by appropriately stipulating the repayment value *D*, induce a bank to build up restructuring skills.

We hence examine whether it is actually optimal for the bank to invest *r* if this would maximize the entrepreneur's ex ante payoff from the project or whether she could increase her own ex ante payoff by saving *r* and foregoing the potential ex post marginal return from restructuring.[60]

In section 2.5.6 we have already derived the relevant condition from the entrepreneur's point of view. The debtor will prefer $R=r$ to $R=0$ if the difference $\Pi_j^{r,H}-\Pi_j^{0,H}$ is greater than zero, or equivalently if the expected marginal return exceeds the cost *r*:

(13) Case 1: $$\frac{1}{\bar{x}}\left(\frac{1}{2}bH+\frac{1}{4}b^2-\frac{1}{8}\frac{b^2}{p}\right)\geq r$$

(14) Case 2: $$\frac{1}{\bar{x}}\frac{1}{2}\left[p\left(2LH-L^2-bH+\frac{1}{4}b^2\right)+2c(L-H)-\frac{c^2}{p}\right]\geq r$$

Case 3 bears no relevance in this context. As liquidation will never occur restructuring skills do not imply any efficiency gain.

The question to be answered is the following: Do the same parameter constellations that satisfy the conditions above also satisfy the bank's conditions with respect to a positive marginal return from investing *r*? The following table comprises the subgame perfect bank returns depending on both the signal value and her decision regarding *R*.

Signal	***0***	$x_L^{R=r}=L-((1-p)\frac{1}{2}b+c)/p$	$x_L^{R=0}=L+\frac{1}{2}b-c/p$	***D-αH***
R=r				
Action	Prob($a=a_L$)=p Prob($a=a_b$)=(1-p)		a_b (Restructuring)	
Payoff Bank	$p\cdot L+(1-p)(x+\alpha H-\frac{1}{2}b)-c$		$x+\alpha H$	
R=0				
Action	Prob($a=a_L$)=p	Prob($a=a_b$)=(1-p)	a_b (Control remains with the firm)	
Payoff Bank	$p\cdot L+(1-p)(x+\alpha H-\frac{1}{2}b)-c$		$x+\alpha H-\frac{1}{2}b$	

Table 8: Comparison of bank returns in the interval [0, $D-\alpha H$]

In comparing the alternative payoffs in cases 1 and 2, respectively, we only have to examine two signal intervals, because in case 1 returns for $R=r$ and $R=0$ are identical for signals

[60] We assume that the entrepreneur's agreement is needed to enter into a close relationship characterized by an intensive exchange of information. As a consequence, the opposite situation, in which the entrepreneur would prefer an arm's length relationship but the bank itself would prefer to build up close ties is ruled out in our model.

smaller than $x_L^{R=r}$ and in case 2 the threshold $x_L^{R=r}$ vanishes. As a consequence, we can substitute $x_L^{R=r}$ by zero in the latter case.

Given a deliberately chosen value for a D the following expression results for the condition $\Pi_B^{R=r}-\Pi_B^{R=0}\geq r$:

$$(19)\quad \frac{1}{\bar{x}}\left[\left[(D-\alpha H)-x_L^{R=0}\right]\frac{1}{2}b+\left[x_L^{R=0}-x_L^{R=r}\right]\left(\frac{1}{2}\left(x_L^{R=0}+x_L^{R=r}\right)-\left[pL+(1-p)\frac{1}{2}\left(x_L^{R=0}-\frac{b}{2}+x_L^{R=r}-\frac{b}{2}\right)-c\right]\right)\right]\geq r$$

Substituting for $x_L^{R=0}$ and $x_L^{R=r}$ we obtain:

$$(20)\quad \text{Case 1:}\qquad \frac{1}{\bar{x}}\left[\tfrac{1}{4}b^2+\tfrac{1}{2}b(D-\alpha H-L)+\frac{1}{4p}\left(\tfrac{1}{2}b^2+2cb\right)\right]\geq r$$

$$(21)\quad \text{Case 2:}\qquad \frac{1}{\bar{x}}\left[-\tfrac{1}{8}(2L+b)^2p+\tfrac{1}{2}b(D-\alpha H+c)-Lc-\tfrac{1}{2}\frac{c^2}{p}\right]\geq r$$

One of the key findings of the basic model was that from the entrepreneur's perspective R and H are complements on sublattices delineated by the two cases. There, his marginal return from the bank's investment in restructuring skills increases in the level of his firm-specific human capital H. The two inequalities (20) and (21) indicate that exactly the opposite is true for the bank: Her marginal return from investing in restructuring skills decreases as H is increased.[61] This asymmetry simplifies our proof considerably, as it will be sufficient to verify whether incentive compatibility is satisfied for $H=h$. If the bank's marginal return from investing in r does exceeds that of the entrepreneur for $H=h$, than the same must be true for $H=0$. A higher marginal return for the bank implies that whenever the debtor prefers $R=r$ the bank will follow suit.

For that particular reason we only need to prove that the difference $[\Pi_B^{r,h}-\Pi_B^{0,h}]-[\Pi^{r,h}-\Pi^{0,h}]$ is nonnegative[62]. This will be the case if the following inequalities hold:

$$(22)\quad \text{Case 1:}\qquad D>L+(1+\alpha)H-\frac{1}{2}\frac{(b+2c)}{p}$$

$$(23)\quad \text{Case 2:}\qquad D>\left(L+\frac{1}{2}b-H+2L\frac{H}{b}\right)p+\alpha H-c\left(1+2\frac{H}{b}\right)$$

There exists a minimum value for D that will still guarantee the development of restructuring skills by the bank. As D is determined endogenously, its critical value is a function of all parameters. It was mentioned before that this function is very lengthy and thus does not lend itself for a closed-form proof. Again, we have to help ourselves by heuristically deriving sufficient conditions on a single parameter and then assess whether they might be binding in real-world settings.

---

[61] The average return of the project increases in H as αH is an additive component of $\Pi(\cdot)$. Hence, a higher value for H leads to a higher probability that D is repaid in full. In keeping the zero-profit condition for the bank satisfied the debtor will as a consequence reduce the contractual repayment amount. A lower D finally narrows the interval in which the bank will apply her restructuring skills.

[62] In section 2.5.6, the difference $\Pi^{r,h}-\Pi^{0,h}$ has been already derived for both cases.

For that purpose, let us make the plausible assumption that the initial investment I were larger than the maximum return from a liquidation $L+\alpha H$. Because the bank's expected payoff at $t=2$ always lies between D and $L+\alpha H$, it is imperative that D be larger than I. Otherwise her participation constraint would not be satisfied. Given that, we can substitute D in (22) and (23) by I and thereby obtain conditions that, once satisfied by I, must also be satisfied by the endogenous variable D.

To simplify, we can substitute the parameter p by the upper bounds of its respective domain and then obtain:

(24) Case 1: $$(1+\alpha)H + L - \frac{1}{2}b - c < I$$

(25) Case 2: $$\left(1+\alpha-2\frac{2c+b}{2L+b}\right)H + \frac{1}{2}b < I$$

As can be easily seen, both conditions are not overly restrictive. Rather, (24) almost coincides with the plausible assumption from above ($I > L+\alpha H$). In equilibria in which H is chosen to be zero condition (24) is even weaker. Condition (25) is always satisfied if I is greater than $(1+\alpha)H+\frac{1}{2}b$ which by itself should never be binding.

Appendix 2: Potential financing constraints from a bank's inability to build up restructuring skills

In this Appendix we will demonstrate that there exist parameter constellations in which a bank of type $R=r$ is (still) willing to grant a loan to the firm when a bank of type $R=0$ (already) refuses to do so. This amounts to stating that in these circumstances the latter would require a contractual repayment amount $D^{R=0}$ that is greater than the maximum amount permitted by the project's profitability $\bar{x}$ whereas the former would require an amount $D^{R=r}$ that is lower than this upper bound.[63]

From Appendix 1 we know that if inequality (25) holds for case 1 than the bank's *ex post* marginal return from acquiring restructuring skills (abbreviated by *MRB*) will strictly exceed the ex ante marginal return to the entrepreneur (abbreviated by *MRE*), even if they are both negative. The entrepreneur's decision whether to permit the bank to collect extensive information about his firm, depends solely on the sign of *MRE*. If it is negative, he will generally prefer an arm's-length relationship and preclude any bank from in-depth investigations. If it is positive, he will invite the bank to enter a close relationship and thereby fully appropriate *MRB* – which must be positive in this situation - by decreasing the repayment amount D and still satisfying the bank's participation constraint. As a consequence, given $MRB>0$, the debtor can always reduce D by allowing a bank to build up restructuring skills and thus to capture part of the debtor's potential private benefits as a reward. This does of course not necessarily increase *MRE* as the cost r now has to be borne by the entrepreneur and the positive effects from a smaller liquidation probability may not suffice.

Let us assume a situation in which *MRB* is positive and *MRE* is negative. The entrepreneur will prefer $R=0$ if at the same time the bank's participation constraint can be satisfied by D. If we further assume that the parameter constellation leads to $D^{R=0}>\bar{x}+\alpha H-b$, than a bank of type $R=0$ would be no longer willing to finance the project, although the expected return for the entrepreneur may still be positive. By offering the bank a close and exclusive relationship and thus sharing some of the potential private benefits with her, the entrepreneur may be able to reduce D below $\bar{x}+\alpha H-b$ and thus get the funds to start the project. Obviously, the effectiveness of this maneuver will crucially depend on the cost r and the size b of the potential private benefits. If r is too high, the switch from $R=0$ to $R=r$ will not only reduce D but may also make the entrepreneur's total expected return from the project turn negative. An increase in b will have a compensating effect, in that it increases the required $D^{R=0}$ relative to $D^{R=r}$ and thus allows for larger r's.

We can draw the following conclusion concerning incentive compatible debt contracts: If *MRB* is positive and *MRE* is negative, the entrepreneur may ameliorate potential financing constraints by simply allowing the bank to invest in restructuring skills.

One interesting implication of our result is that a particular financial system which differs from another financial system only with respect to a higher value of b and a lower value of r has comparative advantages in financing low-profitability projects.

---

[63] The maximum value that D can take on in our model is $\bar{x}-b+\alpha H$. This is because the moral hazard problem will lead to lower-than contracted bank payoffs for signals that are smaller than $D-\alpha H+b$ (see section 2.4.1). This leads to $D^{R=0}+b>\bar{x}+\alpha H\geq D^{R=r}+b$ as the relevant condition for financing constraints brought about by the lack of restructuring skills to be binding.