

Schäfer, Dorothea

Article — Digitized Version

Universal Banking and Corporate Control

Schmalenbach Business Review

Suggested Citation: Schäfer, Dorothea (2002) : Universal Banking and Corporate Control, Schmalenbach Business Review, ISSN 1439-2917, Handelsblatt Fachmedien, Düsseldorf, Vol. 2002, Iss. Special Issue 1, pp. 79-105

This Version is available at:

<https://hdl.handle.net/10419/141826>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Universal Banking and Corporate Control

by

DOROTHEA SCHÄFER* †

Many researchers claim that the German universal banks' great influence in corporate control is harmful, since these banks are often both debt holders and equity owners of the firm. However, in this paper I argue differently. Analyzing the banks' role as investors, I find that, due to contractual incompleteness, investor control and the ownership of both equity and debt complement one another. Only if the investor's control is combined with mixed finance can the maximization of the firm's value be ensured. Moreover, if the initial investment is large enough, investor control is the only system that results in efficient decision making.

JEL-Classification: G33, G34

* SCHÄFER; Freie Universität Berlin, Boltzmannstr. 20, D-14195 Berlin, e-mail: dorosch@zedat.fu-berlin.de.

† I thank seminar participants at the *Freie Universität Berlin* and an anonymous referee for helpful comments and suggestions. Support by the *Deutsche Forschungsgemeinschaft* under the research program *Efficient Structure of Financial Markets and Institutions* is gratefully acknowledged.

1 Introduction

Many companies in Germany develop a close relationship with their bank. Within this relationship, the bank often holds a stake in the firm's equity and determines the corporate control (*Gorton/Schmid* 2000). I analyze the factors that induce banks to develop such a special kind of relationship. Within a framework of contractual incompleteness, I explore the way in which the size of the investment influences the optimal allocation of cash flow and control rights. I set aside the depository function and focus exclusively on the role of banks as investors in corporate debt and equity¹.

Banks represent the dominant source of external corporate finance in Germany (*Hackethal/Schmidt* 1999). Thus, it is natural to refer to banks as investors. However, I want to stress that the results also apply to any financial institution, or even private investor, that can combine mixed financing with a dominant role in corporate control. The results certainly apply to insurance companies or to investment funds that hold equity and corporate bonds, and to venture capital firms that use both financing instruments.

I use a moral hazard model to develop my arguments. A manager has a two-period project but owns no liquid funds, so outside investors finance the project. The final cash flow of the project depends on two factors: first, on the manager's effort in period one, and second, on the state of the world and the decision of the entity that owns the right of control at the beginning of period two. This decision determines the riskiness of the project's cash flows. Since the state of the world is not verifiable, the decision is not contractable. However, the allocation of the control right is contractable *ex ante*. The control right might be given to the investor (bank), or it could remain with the manager. The aim of this paper is to derive the combination of control and cash flow rights that optimizes both the project's risk and the manager's incentives to work.

The analysis allows to establish three major results. First, I find that optimally, if the project's initial outlay is sufficiently large, the investor (bank) will assume the control right and acquire both an equity- and a debt-like claim. Second, if the bank's investment, compared to the project's expected return, is small or medium-sized, it is better if the manager keeps control over the lifetime of the project. In this latter case, since the incentive effects of the outside investors' cash flow rights are irrelevant for the project decision, the owner of the outside equity claim may not be the same institution or person as the owner of the debt claim. Third, the findings are robust for the renegotiation of a credit contract if the credit financing provides the manager with the owner-

¹ Such an approach is common in the literature see also RAJAN (1992), JOHN/JOHN/SAUNDERS (1994) or LONGHOFFER/SANTOS (2000).

ship of control. This robustness is independent of the distribution of bargaining power. In contrast, if the bank holds the control right, robustness depends on the bank's bargaining power. Generally, ex post renegotiation of the credit contract is only inferior if the bank has a strong bargaining position and there is enough bargaining return. With this reservation, the superiority of the contract that specifies both control ownership and incentive compatible cash flow rights corresponds to the standard result in contract theory (Tirole 1986). This result claims that a contract that is renegotiation-proof yields at least a weakly higher pay-off than a contract that is not renegotiation-proof.

My approach is closely related to Kalay/Zender (1997), who explain the growing importance of warrants in the U.S. They derive an optimal mix of cash flow and control rights, but they concentrate on state-dependent control. This focus on contingent control is due to the fact that in the U.S. there was no state-independent bank control after the enactment of the *Glass-Steagall* Act of 1933 (Saunders/Walter 1994). Even though the *Glass-Steagall* Act was repealed in 1999, noncontingent bank control still does not play a significant role in the United States financial system. This is because the institutional arrangements that allow banks to exercise control through, for example, proxy votes or membership of the supervisory board, need time to develop (Bebhuck/Roe 1999). In the case of default, bankruptcy shifts control to banks. However, if bank control is desirable in nondefault situations, it must be effected via a special device that enables control to change in good states, too. Warrants are such a device².

In contrast, in the German universal banking system, the ex ante allocation of control rights to a bank is possible. I show that for large initial investments, noncontingent bank control and debt plus equity ownership by one single bank is the value-maximizing combination. Thus, the results support the complementarity approach of financial systems (Hackett/Schmidt 2000) and indicate that equity plus debt ownership on the one hand and bank control on the other hand are complementary parts of a bank-dominated financial system. From an empirical point of view, the findings suggest the following. First, warrants should be less important in the German financial system than in the U.S. system. Second, bank ownership of control should be common for firms that need large amounts of outside finance. Both suggestions meet indeed reality if the magnitude of the outside investment can be taken as a proxy for firm size. Warrants do not play an important role in corporate finance in Germany (Kruschwitz/Schöbel 1985, Wolf 1999), and banks are an important factor in the corporate control in many large firms. In addition, many empirical studies

2 Even during the GLASS-STEAGALL Act commercial banks were allowed to hold warrants (KOPCKE/ROSENGREN 1989).

claim that for large firms noncontingent bank control is efficient (for example *Cable* 1985, *Schmid* 1996 and *Gorton/Schmid* 2000)³.

Because control rights are central to the paper, the paper necessarily builds on the work of *Zender* (1991), *Aghion/Bolton* (1992), *DeWatripont/Tirole* (1994) and especially on *Rajan* (1992). *Zender* shows that the problem of underinvestment is eased if in bad states the ownership of the control right and the ownership of the cash flows shifts from the manager to the investor. *Aghion/Bolton* analyze how state contingent control ownership influences the renegotiation of the contract and the expected payoff for the investor. *DeWatripont/Tirole* consider the problem of how a firm's capital structure should be designed to provide an efficient shift of control in the bad states. *Rajan* investigates the trade-off between renegotiable bank debt and non-renegotiable arm's-length debt. He claims that a single bank may exploit the manager in ex post renegotiations about strategic actions, such as the continuation or liquidation of the project. This ex post exploitation in turn distorts the manager's incentives to work. I argue instead that such exploitation clearly depends on the magnitude of the venture. Moreover, there is a way a firm can avoid exploitation for large investments. The bank must be allowed to hold both a combination of debt and equity claims and the control right. If the bank does assume the control right, it means that the bank decides about strategic actions during the lifetime of the project.

The paper is organized as follows. In the next section I develop the basics of the model. Section 3 derives the first-best contract. Section 4 analyzes the possible distortion resulting from external finance. Section 5 compares renegotiation and noncontingent bank control. Finally, I conclude in section 6. All proofs appear in the Appendix.

2 The Model

Consider a risk-neutral manager with a profitable two-period project. The project requires an investment of I in $t=0$ and yields a stochastic return of $z \in \{x_h, y_h, y_l, 0\}$ in $t=2$. The distribution of z depends on the state of nature in $t=1$, and on the action of the owner of the control rights when that state is realized. I denote the state as s_k with $k \in \{g, b\}$ and the decision of the controlling party as $A \in \{x, y\}$. The action A is the choice between project variants that differ in risk. Given that $A=x$, the project yields the high cash flow x_h with probability p_k and zero with probability $1-p_k$. In contrast, the decision $A=y$

³ In contrast *Perlitz/Seeger* (1994) claim that bank control harms firms. *Franks/Mayer* (2000) find that bank control exerts a disciplinary function.

generates y_b with probability p_b , and y_l with probability $1 - p_b$. The cash flows are observable and verifiable. I assume

$$E[A = x | s_g] > E[A = y | s_g] > E[A = y | s_b] > E[A = x | s_b]. \quad (1)$$

Assumption (1) has an intuitive implication. In state s_g , the good state, the probability of success is higher than it is in the bad state, $p_g > p_b$. This property of the project gives the manager the incentive to work hard for achieving that state. The high probability p_g makes the riskier project x the better variant. Being in state s_g guaranties that total default in $t = 2$ is a relatively rare phenomenon, and taking on x yields a higher expected value than choosing y does. In contrast in state s_b , due to the low success probability in that state, playing safe by taking y is the optimal strategy. I assume that the state s_b is only observable, but not verifiable. Because of this assumption, nothing depends on the observability of the project choice in $t = 1$.

Although everybody can observe which variant is taken, there is no possibility of implementing a forcing contract. Since the state is not verifiable, financing contracts are necessarily incomplete. To simplify the notation, let us define

$$\Delta_g \equiv E[A = x | s_g] - E[A = y | s_g] \text{ and } \Delta_{gb} \equiv E[A = x | s_g] - E[A = y | s_b].$$

The manager's effort determines the probability $q \in (0,1)$ of actually achieving the good state s_g . Following *Kalay* and *Zender* (1997), I interpret q directly as the manager's effort decision and use the explicit cost function $C(q) = -\ln(1 - q)$. The function $C(q)$ is monotonically increasing and convex in q with

$$C(0) = 0, \quad C(1) = \infty. \quad (2)$$

To exclude in the following sections the trivial result that the first best solution is $q = 0$, I assume

$$E[A = x | s_g] - E[A = y | s_g] > 1. \quad (3)$$

Since the manager faces a wealth constraint, outside investors finance the project. The financing contract (R, ω, i) specifies both the cash flow rights ω and R and the control right i . The control right determines whether the manager or the outside investor decides the project choice A in $t = 1$. $i = m$ indicates that the manager determines A . If $i = f$, the bank decides whether x or y is realized. In line with reality (and also in line with most of the theoretical literature about financial contracts), I do not allow financial contracts to define ex ante state-contingent cash-flow rights. The investor may be compensated with a fixed repayment $R \geq 0$ and a fraction $\omega \geq 0$ of the residual cash flows. If $\omega = 0$ and $R > 0$, I call the contract a credit contract. $R = 0$ and $\omega > 0$ define an

equity contract. If the contract contains both types of cash-flow rights, $\omega > 0$ and $R > 0$, I refer to it as a mixed contract⁴.

The fixed claim R has a higher priority than the residual cash flow right ω . If the return in $t = 2$ happens to be smaller than R , the investor with the fixed claim takes over the project. The manager starts the project only if his return is positive. Thus, I assume $R < x_b$. I call the expected value of (ω, R, i) in $t = 0$ the financing capacity of the contract. Since many investors compete for the project, the manager offers a contract that allows the investors to just break even, that is, $E[(\omega, R, i)] = I$. If the financing capacity of the contract is smaller than the outlay I , the manager must forgo the project although it is profitable (Loughofer 1997). All parties have limited liability. The interest rate is normalized to zero. I do not exclude multiple-source financing, but assume that within every class, investors decide only according to the profits they expect to gain from their contracts. Figure 1 illustrates the game. The following timing of moves summarizes the basic structure of the model.

1. In $t = 0$ the manager offers (ω, R, i) .
2. The financier(s) pay(s) out I and the manager invests.
3. The manager chooses his effort.
4. The state of the world and the success probability of the different project variants $A \in \{x, y\}$ realize.
5. The owner of the control right decides about A .
6. The project's cash flow is realized and the investor(s) is (are) paid.

Note that stages 1 to 3 belong to $t = 0$, stages 4 to 5 belong to $t = 1$, and the last move occurs in $t = 2$.

3 The first-best effort decision

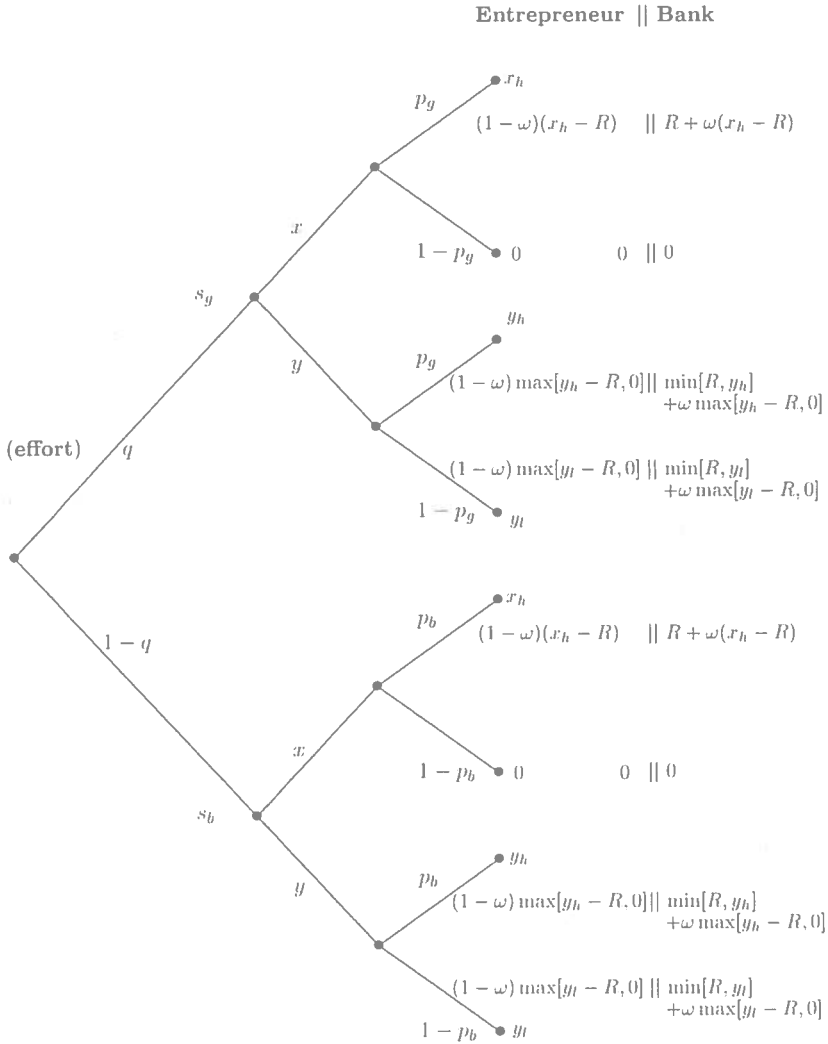
Suppose the manager himself finances the project. In this case, since any gain from an efficient project choice remains with the manager, the decision in $t = 1$ is certainly efficient. The manager selects x in state s_g and y in state s_b and obtains the expected profit

$$\Pi = q(E[x | s_g] - I) + (1 - q)(E[y | s_b] - I) - C(q).$$

Differentiation yields $\partial C(q)/\partial q = \Delta_{gb} \equiv E[x | s_g] - E[y | s_b]$. For an interior solution $q \in (0, 1)$ the logarithmic cost function requires $\Delta_{gb} > 1$, which is guaranteed by (1) and (3). Given $\Delta_{gb} > 1$ the convexity of the cost function and the

⁴ Note that with the reverse of (1), $E[A = x | s_g] < E[A = y | s_g] < E[A = y | s_b] < E[A = x | s_b]$, there would be no effort problem. The manager would do best by being lazy. Nevertheless, mixed finance would still have a role in ensuring efficient decision making.

Figure 1: The game



linearity of the payoff function in q ensure that there is a unique optimal effort level $q = q^* > 0$. Self-financing implies that the manager reaps any gain created by additional effort. Therefore, the manager's effort decision is not distorted and q^* is the first-best level. However, in the case of outside finance, the manager's incentives to work may change. With no liquid funds of his own, the allocation of cash flow and control rights is crucial to his effort decision.

4 Outside Financing

When there are outside investors, the financing capacity of the contract (ω, R, i) must cover the initial outlay, that is,

$$\omega E[\max\{z - R, 0\}] + E[\min\{R, z\}] = I. \quad (4)$$

Since p_k depends on the state, the effort q and the project choice A determine the distribution of z . The manager's profit function

$$\Pi_m = \max_{q \in (0,1)} (1 - \omega) E[\max\{z - R, 0\}] - C(q)$$

yields the first-order condition

$$\frac{\partial C(q)}{\partial q} = (1 - \omega) \frac{\partial E[\max\{z - R, 0\}]}{\partial q} > 1.$$

Two factors determine the manager's incentive to work and his profit. These factors are his own cash flow rights and the control regime. It is illuminating to separate the impact of the control regime from the impact of the cash flow rights. To this end, I analyze at first a complete contract. That is, in the next section I assume that the project choice is contractable ex ante.

4.1 Complete Contracts

Suppose the state s_k is verifiable. In this case, the contracting parties could specify A in the contract and the ownership of corporate control would be irrelevant to the project's value. With $A = x$ in s_g and $A = y$ in s_b , the first-order condition $\partial C(q)/\partial q = (1 - \omega) E[\max\{x - R, 0\} | s_g] - E[\max\{y - R, 0\} | s_b]$ determines the manager's effort. Solving yields

$$q(\omega, R) = 1 - \frac{1}{(E[\max\{x - R, 0\} | s_g] - E[\max\{y - R, 0\} | s_b])(1 - \omega)}, \quad (5)$$

where $\partial q/\partial \omega < 0$ and

$$\frac{\partial q}{\partial R} \begin{cases} > 0 & \text{if } R \leq y_l \\ < 0 & \text{if } R \leq y_h \end{cases} \quad (6)$$

Any decrease in ω will enhance the manager's cash flows in the good state more than in the bad state. Therefore, q must be decreasing in ω . However, because of

$$\text{sign} \frac{\partial q}{\partial R} = \text{sign} \frac{\partial (E[\max\{x - R, 0\} | s_g] - E[\max\{y - R, 0\} | s_b])}{\partial R}, \quad (7)$$

the relation between q and R is ambiguous. Suppose R is in the range $R \leq y_f$. Since default is impossible in s_b , any marginal increase of R reduces the manager's residual cash flows in that state by $(1 - \omega)\Delta R$. In the good state, the superior project is riskier and default in $t = 2$ is possible. The marginal reduction is $(1 - \omega)p_g \Delta R$. Since $(1 - \omega)\Delta R > (1 - \omega)p_g \Delta R$, in the range $R \leq y_f$, any increase in R strengthens the manager's incentive to work. However, the positive impact of a fixed claim on managerial effort disappears if default is also possible in the bad state. With $R > y_f$, any increase in R reduces the manager's profit in state s_g more than in state s_b , that is, $(1 - \omega)p_g \Delta R > (1 - \omega)p_b \Delta R$. Therefore, q and R are negatively related for $R > y_f$. To acquire enough outside finance, the manager must offer contracts that satisfy the participation constraint

$$I = q(\omega, R)(\omega E[\max\{x - R, 0\} | s_g] + E[\min\{R, x\} | s_g]) + (1 - q(\omega, R))(\omega E[\max\{y - R, 0\} | s_b] + E[\min\{R, y\} | s_b]). \quad (8)$$

Inserting (5) in (8) and solving for ω yields the function $\omega(I, R)$. Given that efficient decision making takes place in every state, this function represents all combinations of ω and R with equal financing capacity. I consider only contracts (ω, R, I) with weakly positive marginal returns for both cash flow components. That is, for every given R , the expression $\partial I / \partial \omega = 0$ establishes an upper boundary for $\omega(I, R)$. That function is called $\omega_{0f}(R)$. By denoting the financing capacity of the first-best contract as I^{fb} and its maximum as I_{\max}^{fb} , I arrive at

Proposition 1

If the project choice is contractable, there is a financing structure $(\omega \geq 0, R^ > 0)$ for any $I \leq I_{\max}^{fb}$ that induces the first-best managerial effort q^* .*

Obviously, outside finance does not necessarily distort managerial incentive. When choosing his effort, the manager only considers his own expected cash flows in $t = 1$. The contract (ω^*, R^*) defines an noncontingent expected cash flow of

$$\begin{aligned} I^{fb} &= \omega^* E[\max\{x - R^*, 0\} | s_g] + E[\min\{R^*, x\} | s_g] \\ &= \omega^* E[\max\{y - R^*, 0\} | s_b] + E[\min\{R^*, y\} | s_b]. \end{aligned}$$

Since $(\omega \geq 0, R^* > 0)$ guarantees that the manager obtains any gains from additional effort, the manager attains the first-best level. The financing capacity

of $(\omega^* \geq 0, R^* > 0)$ increases in R . The maximum level I_{\max}^b is defined by the credit contract $(\omega^* = 0, R_{\max}^*)$. For any $I > I_{\max}^b$, the manager cannot offer a contract that yields noncontingent expected income to the financier. That is, for large investments, the distortion of working incentives is unavoidable ($q < q'$) even if the project choice is contractable.

Note that with a contractable project decision, the owner of the equity claim ω^* may be not the same investor as the owner of the credit claim R^* . This result is due to the fact that the cash flow rights (ω^*, R^*) only provide the manager with optimal working incentives. However, if the project choice is not contractable ex ante, cash flow rights are both a mechanism for efficient decision making and a mechanism for inducing effort. In this case, mixed finance with debt and equity claims with a single owner has a role.

4.2 Incomplete Financing Contracts

If contracts are incomplete, the ownership of control is crucial. The maximization of the venture's value, and also the financing capacity of a given contract, depend on that ownership. If the manager owns the right to decide, then efficient decision making in $t = 1$ requires

$$\begin{aligned} (1 - \omega)E[\max\{x - R, 0\} | s_g] &\geq (1 - \omega)(E[\max\{y - R, 0\} | s_g] \\ (1 - \omega)E[\max\{x - R, 0\} | s_b] &\leq (1 - \omega)(E[\max\{y - R, 0\} | s_b]). \end{aligned} \quad (9)$$

Expression (9) defines the maximum incentive compatible fixed claim R_m . If $R > R_m \equiv (E[y | s_b] - E[x | s_b]) / (1 - p_b)$ the manager prefers the inferior project variant x in state s_b . Suppose now that the bank owns the control right. It decides efficiently in both states if, and only if,

$$\omega E[\max\{x - R, 0\} | s_g] + E[\min\{R, x\} | s_g] \geq \omega E[\max\{y - R, 0\} | s_g] + E[\min\{R, y\} | s_g] \quad (10)$$

$$\omega E[\max\{x - R, 0\} | s_b] + E[\min\{R, x\} | s_b] \leq \omega E[\max\{y - R, 0\} | s_b] + E[\min\{R, y\} | s_b]. \quad (11)$$

Rearranging the incentive compatibility constraint (10) gives

$$\omega \geq \omega_f(R) \equiv \frac{E[\min\{R, y\} | s_g] - E[\min\{R, x\} | s_g]}{E[\max\{x - R, 0\} | s_g] - E[\max\{y - R, 0\} | s_g]} \quad (12)$$

where

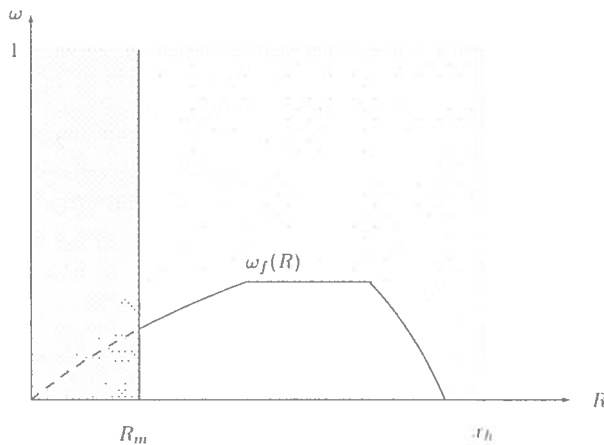
$$\frac{\partial \omega_f(R)}{\partial R} \begin{cases} > 0 & \text{if } R \leq y_l \\ = 0 & \text{if } R \in [y_l, y_h] \\ < 0 & \text{if } R \leq y_h. \end{cases} \quad (13)$$

Inserting $\omega_j(R)$ in (5) yields the managerial effort $q(\omega_j, R) \equiv q_j$. Lemma 1 describes the set of incentive compatible cash flow rights. I assume that if the decision maker is indifferent, he selects the alternative which is pareto-efficient.

Lemma 1

1. If the manager owns the control right, efficient project decision requires a contract with $R \leq R_m < y_1$. If the bank owns the right, it decides efficiently if, and only if, its equity claim is $w \geq w_j(R) > w^*(R)$.

Figure 2: Incentive compatible contracts



2. The incentive-compatible contract with investor control $(\omega_j(R), R, f)$ induces the effort q_j where $0 < q_j < q^*$.
3. Provided that $\Delta_N^2 > \Delta_{qb} > 1$, the incentive-compatible contract with investor control $(\omega_j(R), R, f)$ satisfies the efficiency constraint, that is, $\omega_j(R) < \omega_{bf}(R)$.

In the following sections, I assume that $\Delta_N^2 > \Delta_{qb} > 1$ is satisfied. This assumption ensures that any marginal increase in the cash flow rights of the contract $(\omega_j(R), R, f)$ improves the financing capacity of that contract type. Figure 2 illustrates the set of incentive compatible contracts. The shaded region $[0, R_m]$ shows contracts that guarantee efficient decision making if the manager owns the control right. The concave curve $\omega_j(R)$ represents the minimum incentive compatible equity claim as a function of R . If the bank has the right to decide, it selects the superior alternative in any state s_k if, and only if, it owns

a debt claim R and, in addition, an equity claim $\omega \geq \omega_f(R)$. The broken line of $\omega_f(R)$ to the left indicates that within $R \in [0, R_m]$, two types of incentive compatible contracts exist, $(\omega \geq \omega_f(R), R, f)$ and $(\omega, R \leq R_m, m)$.

With $R = 0$, the manager and the outside investor share the project's cash flows proportionately. Proportional sharing leads to efficient decision making no matter who decides about A . That is, the ownership of control is irrelevant if the manager chooses equity financing. However, this irrelevance disappears if R is positive. The higher R is, the more the manager develops a risk-loving attitude. Since this attitude must be restricted, manager control requires a sufficiently low fixed claim $R \leq R_m$. In contrast, the investor develops a growing aversion to risk. For efficient investor control, this risk aversion must be restricted. The restriction is achieved if the bank owns a sufficiently large proportion of the residual claims $\omega \geq \omega_f(R)$ in addition to its fixed claim R .

Efficient decision making is one element of the value-maximizing strategy. The other element is providing the manager with optimal working incentives. I turn now to this second element. As we shall see, the provision of optimal working incentives ensures that for every given initial investment, there is either a unique equilibrium contract or a restricted set of equilibrium contracts. To anticipate this result, we develop the following Lemma. Note that this Lemma applies only to incentive-compatible contracts.

Lemma 2

1. For any given financing capacity I , equity financing and debt financing are substitutes, that is, $d\omega(I, R)/dR < 0 \forall \omega \in [\omega(R), \omega_0(R)]$.
2. For any given financing capacity, the effort q increases monotonically in R for all $\omega(I, R) \geq \omega(R)$. Thus, the net present value of a given project with initial investment I increases in R for all $\omega(I, R) \geq \omega(R)$.

Ceteris paribus, the financing capacity of an incentive-compatible contract increases with R and it also increases with ω . Thus, for a given financing capacity I , credit claims and equity claims must be substitutes. However, the substitution is nonneutral in terms of managerial effort. If debt financing replaces equity financing, this substitution has an asymmetric impact on the manager's state-dependent return. His expected profit decreases in the bad state and increases in the good state. Such a change in profit expectations improves working incentives for any $\omega(I, R) \geq \omega(R)$. Provided that the contract is incentive compatible, the substitution of equity finance thus enhances the project's value⁵.

5 There may be extreme parameter constellations for which effort is higher with an inefficient project choice than with an efficient one. However, in this case, contracts that are specified to force that higher effort are never renegotiation-proof. Ex post ef-

4.3 Investment size and Hierarchy of Contracts

Having described the set of incentive compatible contracts and the effect of increased credit financing, I turn to the ultimate question: Which contract is the equilibrium contract for a given project? I will show that the optimal allocation of the control right and the cash flow rights depends directly on the manager's financing needs and thus on the size of the bank's investment. By defining $I_{\min} \equiv p_g / (p_g - p_b) (E[y | s_b] - E[x | s_b])$ I arrive at

Proposition 2

Given that the initial investment is small $I \leq I_{\min}$, the optimal contract is $(\omega^(R), R', m)$. This contract induces the first-best effort level q^* .*

Manager control is the superior regime if the manager needs only a small amount of outside finance. Moreover, such high net present value projects allow for a first-best contract $(\omega^*(R), R', m)$ although the manager faces a wealth constraint and project choice is not contractable. Two factors are responsible for this result. First, the cash flow rights $(\omega^*(R), R')$ define a noncontingent expected payoff for the investor. Such payoff expectations guarantee that the managerial working incentives are not distorted (see Section 4.1). Second, the manager decides efficiently, since $I \leq I_{\min}$ ensures that R' remains within the incentive compatibility constraint for manager control, $R' \leq R_m$.

However, if the venture needs higher initial investment $I > I_{\min}$, incentive compatibility and nondistortional cash flow rights are incompatible. Since $R' > R_m$ and $\omega^*(R) < \omega_f(R)$ for all $I > I_{\min}$, a contract $(\omega^*(R), R', i)$ induces the manager to prefer x in every state and it induces a bank to select y noncontingently. In this range, the optimal contracts must be second-best contracts. I use (5) and (8), and the equality $\omega(I, R_m) = \omega_f(R_m)$ to define a further critical investment level I_{med} . Lemma 2 and expression (13) ensure that I_{med} exists, and that it is unique⁶. Proposition 3 shows that managerial control remains the dominant regime even if the manager's financing needs are in a medium range.

Proposition 3

Given that $I \in (I_{\min}, I_{\text{med}}]$ the optimal contract is $(\omega(R_m), R_m, m)$ where $\omega \in (\omega^(R_m), \omega_f(R_m)]$.*

efficient decision making is superior and recontracting would take place. Since I focus on the optimal regime of control, I ignore such extreme constellations. That is, I concentrate on scenarios in which value maximization is compatible only with efficient decision making.

6 Since I_{med} is an extremely long expression, I do not present it in its explicit form.

For all $I \in [I_{\min}, I_{\text{med}}]$ there are two types of contracts that are incentive compatible, the mixed contract with investor control $(\omega_j(R), R, f)$ and the contract with managerial control $(\omega(R_m), R_m, m)$ (see Figure 3). However, in the range $R < y_1$, any increase in R improves the manager's working incentives $\partial q(\omega, R) / \partial R > 0$. Since a higher effort enhances the project's value, the superior contract must be the one with the highest R that still guarantees incentive compatibility. It follows from (13) and Lemma 2 that $(\omega(R_m), R_m, m)$ must be the superior candidate. As mentioned above, the claims $\omega(R_m)$ and R_m may be in different hands since the investor's preferences on the project choice are irrelevant under manager control. However, the irrelevance disappears if the project's initial outlay is large enough, $E[(\omega(R_m) \leq \omega_j, R_m, m)] < I$. To derive the optimal contracts for this range, I develop

Lemma 3

There are two distinct investment levels, I'_{\max} and I_{med} , such that $I_{\text{med}} < I'_{\max} < I_{\max}$.

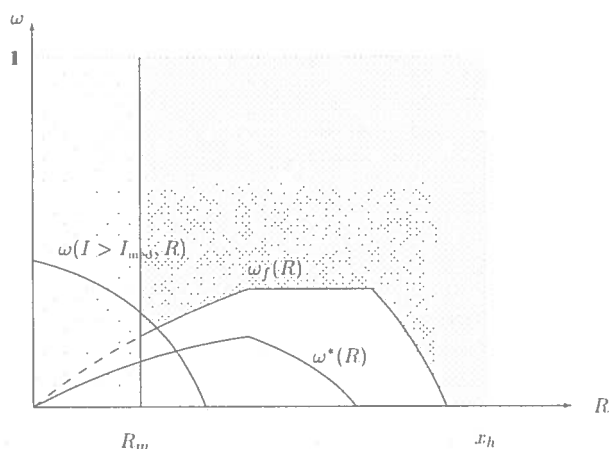
As we shall see, projects with large initial outlays ($I > I_{\text{med}}$) can only be optimally financed if the bank (investor) owns the control right. In the case of investor control, since the investor's preferences about action A matter, incentive compatibility of the investor's cash flow rights is crucial for value maximization. There is only one way to ensure efficient decision making, and that is by concentrating the cash flow rights in the hands of the bank.

Proposition 4

1. *Projects with $I \in (I_{\text{med}}, I'_{\max}]$ need bank control. Such projects are optimally financed if the mixed contract $(\omega_j(R), R, f)$ is signed, where the bank owns both $\omega_j(R)$ and R .*
2. *If $I \in (I'_{\max}, I_{\max}]$, bank control is the optimal regime. Any contract $(\omega(I, R) > \omega_j(R), R > y_1, f)$ with $\omega(I, R) \geq 0$ maximizes the project's value.*

Outside investments of size $I \in (I_{\text{med}}, I'_{\max}]$ allow the incentive-compatibility constraint of the manager to be satisfied only if the investor gets the high equity claim $\omega(R_m)$. The lower the proportion of the residual income in the investor's hands and the higher the proportion of the investor's fixed claim, the more the manager participates in the returns of the good state. As a consequence, the manager works harder to achieve the good state if credit financing is high and equity financing is low. However, such a financing structure is only compatible with efficient decision making if the investor has the right to decide. Thus with $I \in (I_{\text{med}}, I'_{\max}]$ the mixed contract $(\omega_j(R), R, f)$ is the only

Figure 3: Financing capacity and incentive compatibility



combination of cash flow and control rights that ensures the maximization of the project's value. Since credit financing has a less negative impact on managerial effort than equity financing, the bank's incentive-compatibility constraint $\omega(R) \geq \omega_f(R)$ must be binding.

Note that if contracts are not incentive compatible, two value-depressing effects arise. First, choosing an inferior project variant reduces the financing capacity of a given contract. Second, outside investors anticipate such a reduction ex ante and increase their contractual claims. This increase reduces the working incentives of the manager and lowers the project's value even further.

The financing of projects requiring a huge investment $I \in (I'_{\max}, I_{\max})$ gives the bank the position of a quasi-residual claimant. As a result, the bank's incentive compatibility constraint $\omega(R) \geq \omega_f(R)$ is no longer binding. Given that the contract provides for investor control, any cash flow rights $(\omega(I, R) > \omega_f(R), R \geq 0)$ guarantee efficient decision making. Even so, the manager avoids large equity claims $\omega(I, R) > \omega(I, y_b)$ because of their negative impact on his effort in the first period. The manager offers at least the credit claim $R = y_b$. With such a credit claim, the bank is the owner of the whole project in the bad state s_b . The bank's takeover of the project in the bad state implies that there is only one effort level q that is compatible with the participation constraint of the bank. In this case, it is irrelevant which feasible combination of debt and equity claim $(\omega(I, R) > \omega_f(R), R > y_b)$ with $\omega(I, R) \geq 0$ the contract specifies to attain this level.

5 Credit Contract and Renegotiation

The feasibility of noncontingent bank control would have minor importance if the following statement were true: The renegotiation of a credit contract at the time of the decision increases the venture's value more than does the ex ante signing of a renegotiation-proof contract. To examine the question of whether a credit contract with renegotiation may indeed be superior to a mixed contract with noncontingent bank control, I expand the model. For the moment, I suppose that incentive compatible contracts are not available and that there is renegotiation in the Rajan's (1992) sense. Since mixed finance with a single outside owner of both claims plays a role only for investments of size $I > I_{\text{med}}$, in this section I concentrate on this range of larger initial outlays. I denote the manager's and the bank's share of the renegotiation surplus as λ and $(1 - \lambda)$ respectively. In the case of manager control, renegotiation occurs in state s_b (see Table 1). If the bank possesses the right to decide, it will initiate renegotiation only in s_g . Let us consider manager control first. Denote q_n^i as the effort which the manager exerts if he knows that renegotiation will ensure efficient decision making. With $\lambda(E[y | s_b] - E[x | s_b])$ as the manager's share of renegotiation in s_b the effort

$$q_n^m = 1 - \frac{1}{E[\max\{x - R, 0\} | s_g] - (E[\max\{x - R, 0\} | s_b] + \lambda(E[y | s_b] - E[x | s_b]))} \quad (14)$$

maximizes the manager's expected profit. Given that the bank owns the control right,

$$q_n^f = 1 - \frac{1}{E[\max\{y - R, 0\} | s_g] + \lambda\Delta_g - E[\max\{y - R, 0\} | s_b]}$$

is optimal from the manager's point of view. The comparison of a renegotiation-proof mixed contract on the one hand and opportunistic recontracting on the other yields

Proposition 5

1. In the case of manager control, renegotiating the credit contract (R, m, λ) yields a smaller project's value than $(\omega_j(R), R, f)$ does for all $I > I_{\text{med}}$. This result is independent of the distribution of bargaining power.
2. If the bank owns the control right and renegotiation is sufficiently profitable, $2\Delta_g > \Delta_{gb}$, a critical level of bargaining power $\lambda \equiv \bar{\lambda}$ exists. For all $\lambda < \bar{\lambda}$ renegotiating (R, f, λ) yields a smaller value than choosing $(\omega_j(R), R, f)$ does.

Renegotiation ensures efficient decision making. Thus, the project's value is determined only by the managerial effort. The most common scenario with a credit contract is that the manager owns the right to decide. For this case we can show that ex post renegotiation does not yield a higher project value than the renegotiation-proof contract $(\omega(R_m), R_m, m)$. However, the magnitude of inferiority depends on the bargaining power of the contracting parties. If the manager's bargaining power is high, he is able to appropriate a big slice of the project variant y . With such prospects, the bad state is more profitable for the manager. Anticipating the outcome of renegotiation, he will work less hard to avoid the bad state. In addition, the bank's gain from renegotiation is small. Thus, the face value R must be relatively high to meet the manager's financing need. This high repayment obligation reinforces the negative impact on effort.

Table 1: States of renegotiation

regime/state	s_g	s_b
managerial control		renegotiation
bank control	renegotiation	

In contrast, if the manager's bargaining position is weak, his surplus from renegotiation is low but the bank's gain is high. The bad state becomes less attractive from the manager's point of view and the bank's gain allows a low R . As a result, the manager's effort increases. But for any given I , the manager will never work harder than he does if $(\omega(R_m), R_m, m)$ is signed. In fact, with $\lambda = 0$ there is no difference in effort between $(\omega(R_m), R_m, m)$ and $(R, m, \lambda = 0)$. This equivalence comes from the fact that with both contracts there is only one instrument available to match with higher financial needs. Increasing $\omega(R_m)$ or increasing R both harm the manager's effort incentives in the same way. The expected profit decreases more in the good state than it does in the bad state. The magnitude of the decrease is exactly the same for both contracts. However, for $I > I_{med}$, the renegotiation-proof contract with manager control is inferior to any renegotiation-proof contract with bank control. This hierarchy implies that it does not matter if the manager's bargaining power is low or high, effort is less profitable if renegotiation takes place than it is if parties sign the mixed contract with bank control.

In the case of credit financing with bank control, the general superiority of the renegotiation-proof contract $(\omega_f(R), R, f)$ depends on both on the bank's bargaining power and on the bargaining gain. With full bargaining power for the manager ($\lambda = 1$), the bank's payoff is the same in every state for all $I \leq y_f$. As a result, the manager will exert the first-best level $q'_H = q'$ which is certainly higher than q_f . But q'_H increases with λ . This increase implies that the manager's effort is at a lower level with $\lambda < 1$, but it still remains constant for every I that can be financed with $R \leq y_f$. With $\lambda = 0$ the manager obtains no bargaining gain from the renegotiation of the credit contract. Therefore his effort is independent of Δ_g and at its lowest level. In contrast, effort depends on the magnitude of Δ_g if a renegotiation-proof contract with bank control is in place. An increase clearly lowers the incentive-compatible share of equity ω_f and makes the manager working harder. Therefore, in the case of $\lambda = 0$, a high enough Δg implies $q_f > q'_H$. With $q_f < q'_H = q'$ for $\lambda = 1$ and $q_f > q'_H$ for $\lambda = 0$, there must be a threshold $\tilde{\lambda}$ such that the manager is indifferent between renegotiation and offering the renegotiation-proof contract with bank control. Since effort is constant for $R \leq y_f$, this indifference ensures that for $\lambda < \tilde{\lambda}$ and $I \leq y_f + q'_H (1 - \lambda)\Delta_g$ the manager's effort is not as high as if $(\omega(R), R, f)$ is in place. In addition, if the magnitude of I requires the face value $R > y_f$, any marginal increase of the initial outlay harms the manager's working incentive more in the case of ex post renegotiation than it does in the case of $(\omega_f(R), R, f)$ for every given λ . These facts lead to the following result. With ex post bargaining power closely connected to ownership of the control right, the incentive-compatible contract with bank control lessens the manager's working incentive for every $I > I_{\text{med}}$ less than does ex post renegotiation.

By taking the analysis of both control regimes together, I can draw the following conclusion. For common scenarios a mixed contract with investor control minimizes the costs of external finance. In case of ex post renegotiation, the hold up problem emerges. This kind of problem is best solved when a contract defines property rights ex ante, provided that the rights are feasible and ex post efficient.

6 Conclusion

In this paper I analyze the impact of contractual incompleteness on the optimal allocation of cash flow rights and control ownership. The findings apply

7 If the bargaining gain is small, I cannot establish that the renegotiation-proof contract is superior. But even in this case I can establish for all $\lambda \in [0, 1)$ that a contract which is renegotiation-proof is superior for both rather small and rather large initial investments.

to any investor or financial institution that invests in both corporate debt and corporate equity. Since banks are such investors, I suggest that the analysis also sheds some new light on the ongoing discussion about the power that German universal banks have in corporate control. During this debate, many authors claim that the German banks' great influence in corporate control is harmful, since banks are both debt holders and equity owners of the firm (for example Wenger 1992, Adams 1990). I show, however, that bank control and equity plus debt ownership may be considered as complementary parts of a bank dominated financial system.

Investor control is not in general the preferable regime for control. If the amount of outside financing is only small or medium-sized, value maximization requires manager control. But if the project's initial outlay is sufficiently large, only investor control combined with mixed finance does ensure the maximization of the firm's value. For banks, such a result suggests that proposals to restrict the banks' equity ownership, to abolish their right to exercise proxy votes, and to prohibit the banks' membership on the firm's supervisory board may point in the wrong direction (*Monopolkommission* 1998). It may be that a stricter regulation of this kind deteriorates investor protection and decreases the availability of outside finance.

Appendix

Proposition 1

Equalizing of Δ_{gb} and $\partial C(q)/\partial q$ yields the function $\omega(R)$ that forces the manager to work first-best,

$$\omega^*(R) = \frac{(E[\max\{x - R, 0\} | s_g] - E[\max\{y - R, 0\} | s_b]) - \Delta_{gb}}{(E[\max\{x - R, 0\} | s_g] - E[\max\{y - R, 0\} | s_b])}$$

Note that $\omega^*(R=0) = 0$ and $\omega^*(y_l) = (1 - p_g)y_l / ((1 - p_g)y_l + \Delta_{gb})$. Moreover

$$\frac{\partial \omega^*}{\partial R} \begin{cases} > 0 \quad \forall R \leq y_l \\ < 0 \quad \forall R \in [y_l, x_b]. \end{cases} \quad (15)$$

Rearranging of $\omega^*(R)$ gives $\omega^*(R)E[\max\{x - R, 0\} | s_g] + E[\min\{R, x\} | s_g] = \omega^*(R)E[\max\{y - R, 0\} | s_b] + E[\min\{R, y\} | s_b]$. This equality shows that the non-contingent claim I^b induces q^* . The derivation of I^b is

$$\frac{\partial I^{fb}}{\partial R} = \begin{cases} \frac{p_g(x_b - E[y | s_b])\Delta_{gb}}{(\Delta_{gb} + (1 - p_g)R)^2} > 0, & R \leq y_l \\ \frac{p_g p_b(x_b - y_b)\Delta_{gb}}{(\Delta_{gb} + (1 - p_b)y_l - (p_g - p_b)R)^2} > 0, & R \in [y_l, y_h] \\ 0 & R > y_h \end{cases} \quad (16)$$

(16) implies that the maximum feasible credit claim defines $I = I_{\max}^{fb}$. Setting $\omega^* = 0$ yields $I^{fb} = E[\min[R, x] | s_g] = E[\min[R, y] | s_b]$. I define R_{\max}^* as the credit claim that solves $E[\min[R, x] | s_g] = E[\min[R, y] | s_b]$. If $R_{\max}^* < y_b$ the noncontingent expected claim is $p_g R_{\max}^* = p_b R_{\max}^* + (1 - p_b)y_l$. If $R_{\max}^* > y_b$ it is $I^{fb} = p_g R_{\max}^* = E[y | s_b]$. After inserting R_{\max}^* in I^{fb} the limit $I = I_{\max}^{fb}$ results. Δ

Lemma 1

1. Equalizing the incentive compatibility constraints (9) and solving both equations for R yields $R_{gm} \equiv -\Delta_g / (1 - p_g)$ and R_m respectively. Note that $R_{gm} < 0 < R_m < y_l$. Because of (1) and $R_{gm} < 0$, the manager's incentive compatibility constraint is binding only in state s_b . Therefore, the manager decides efficiently for all $I > 0$ if $R \leq R_m$. Since the bank is in control, it follows from (10) and (11) that both $1 > \omega \geq \omega_j(R)$ and

$$\omega \equiv \omega_{bj}(R) \equiv \frac{E[\min[R, y] | s_b] - E[\min[R, x] | s_b]}{E[\max[x - R, 0] | s_b] - E[\max[y - R, 0] | s_b]} \quad (17)$$

must be satisfied to ensure the optimal project choice. I define $\omega_j(y_l) = \omega_j(y_h) \equiv \bar{\omega}_j$ where $\bar{\omega}_j < 1$. Note that $\omega_{bj}(R = y_l) = \omega_{bj}(R = y_h) = (1 - p_b)y_l / p_b(x_b - y_b) > 1$. Note also that $\partial \omega_{bj} / \partial R < 0 \forall R \in [R_m, y_l]$ and $\partial \omega_{bj} / \partial R > 0 \forall R > y_h$. Then limited liability and the limits $\lim_{R \rightarrow -R_m} \omega_{bj} = -\infty$ and $\lim_{R \rightarrow +R_m} \omega_{bj} = +\infty$ ensure that (17) is satisfied whenever $1 > \omega \geq \omega_j(R)$. This conclusion implies that bank control ensures efficient decision making in every state if the bank's equity stake is $\omega \geq \omega_j(R)$.

2. At first I prove that the incentive-compatible contract $(\omega_j(R), R, f)$ never induces $q = 0$. In a first step rearrange (5) and insert $q = 0$. Then it follows from $\partial q / \partial \omega < 0$ that $q \neq 0$ must be true for all contracts $(\omega_j(R), R, f)$ if

$$\frac{E[\max[x - R, 0] | s_g] - E[\max[y - R, 0] | s_b] - 1}{E[\max[x - R, 0] | s_g] - E[\max[y - R, 0] | s_b]} \quad (18)$$

$$> \frac{E[\min[R, y] | s_g] - E[\min[R, x] | s_g]}{E[\max[x - R, 0] | s_g] - E[\max[y - R, 0] | s_g]} \quad \forall R \in [0, x_b]$$

holds. Inserting $R = y_b$ shows that (18) is satisfied for $R = y_b$ if $E[\max[x - R, 0] | s_g] + E[\min[R, x] | s_g] - E[\min[y, R] | s_g] > 1$. This inequality holds by assumption, since $\Delta_g > 1$. (7) and (13) imply $\partial\omega(q=0, R) / \partial R < 0$ and $\partial\omega_f(R) / \partial R \leq 0 \forall R \in [y_l, x_b]$. Then $\omega(q=0, R) > \omega_f(R) \forall R \in [y_l, x_b]$ follows from $\omega_f(E[y | s_g] / p_g) = \omega(q=0, R = E[x | s_g] / p_g - 1) = 0$. Note that in the range $R \in [0, y_l]$ both functions, $\omega_f(R)$ and $\omega(q, R)$, increase in R . Moreover because of $\Delta_{gb} > 1$ the inequality $\omega(q=0, R=0) > 0$ must hold. Both results, together with $\omega(q=0, R) > \omega_f(R) \forall R \in [y_l, x_b]$, imply that the function $\omega(q=0, R)$ is above the function $\omega_f(R)$ for all $R \in [0, y_l]$. Since $\partial q / \partial \omega < 0$ the contract $(\omega_f(R), R, f)$ must induce $q_f > 0$.

Finally I need to show that $q_f < q^*$. Note that $\omega^*(0) = \omega_f(0) = 0$ and $\bar{\omega}_f(y_l) > \omega^*(y_l)$. Moreover inserting $R = E[y | s_g] / p_g > E[y | s_b] / p_g$ yields $\omega_f(R) = 0$. Then (13) and (15); and the derivative $\partial q / \partial \omega < 0$ imply $q_f < q^* \forall R \in [0, x_b]$.

3. Define $H \equiv (E[\max[x - R, 0] | s_g](E[\max[x - R, 0] | s_g] - E[\max[y - R, 0] | s_b]))^{1/2}$.

Then because of $\partial q / \partial \omega < 0$ the Lemma is proven if

$$\omega_{0f}(R) \equiv 1 - \frac{\sqrt{\Delta_{gb}}}{H} > \omega_f(R) \quad (19)$$

can be shown. Inserting $R=0$ in (19) and (12) yields $\omega_{0f}(R=0) > \omega_f(R=0)$. Given that $\Delta_g^2 > \Delta_{gb} > 1$ a parameter $\varepsilon > 0$ must exist such that $(\Delta_g - \varepsilon)^2 = \Delta_{gb}$. Suppose $R > y_b$ then inserting of $(\Delta_g - \varepsilon)^2$ in ω_{0f} gives $\omega_{0f}(R) = (p_g(x_b - R) - (\Delta_g - \varepsilon)) / (p_g(x_b - R)) = (E[y | s_g] - p_g R + \varepsilon) / (p_g(x_b - R))$. For any $\varepsilon \geq 0$ it holds that $\omega_{0f}(R) \geq (E[y | s_g] - p_g R) / (p_g(x_b - R)) = \omega_f(R) \forall R \geq y_b$. Moreover, $\omega_{0f}(R)$ and $\omega_f(R)$ are continuous functions in R . Provided that $\partial\omega_{0f} / \partial R < \partial\omega_f(R) / \partial R = 0 \forall R \in [y_l, y_b]$ continuity and the assumption $\Delta_g^2 > \Delta_{gb} > 1$ would ensure that $\omega_{0f}(R) > \omega_f(R) \forall R \in (0, x_b)$. Differentiation of (19) with respect to $R \in [y_l, y_b]$ yields

$$\frac{\sqrt{\Delta_{gb}}}{H^2} \frac{1}{2H} (-p_g(p_g x_b - p_b y_b - (p_g - p_b)R) - (p_g - p_b)p_g(x_b - R)) < 0$$

and therefore $\partial\omega_{0f} / \partial R < \partial\omega_f(R) / \partial R$ is true. With $\Delta_g^2 > \Delta_{gb} > 1$ the cash flow rights R and $\omega_f(R)$ contribute positively to the financing capacity of

the contract. Therefore, $\Delta_g^2 > \Delta_{gb} > 1$ ensures that any incentive-compatible contracts with bank control, $(\omega_f(R), R, f')$ is efficient. Δ

Lemma 2

1. I need to show that

$$\frac{d\omega(I, R)}{dR} = -\frac{\frac{\partial I}{\partial R}}{\frac{\partial I}{\partial \omega}} < 0 \quad \forall \quad \omega < \omega_{0f}(R)$$

holds. Negative marginal contributions to the financing capacity do not exist

$$\begin{aligned} \frac{\partial I}{\partial \omega} &= E[\max\{x - R, 0\} | s_g] & (20) \\ & - \frac{1}{(1 - \omega(R))^2} \cdot \frac{E[x | s_g] - E[y | s_b]}{E[\max\{x - R, 0\} | s_g] - E[\max\{y - R, 0\} | s_b]} \geq 0. \end{aligned}$$

Thus, solving of $\partial I / \partial \omega = 0$ for ω defines for every R the maximum proportion of the residual claims $\omega_{0f}(R)$, which is efficient. (20) and

$$\frac{\partial^2 I}{\partial \omega^2} = -\frac{2}{(1 - \omega)^3} \frac{\Delta_{gb}}{E[\max\{x - R, 0\} | s_g] - E[\max\{y - R, 0\} | s_b]} < 0$$

ensure then $\partial I / \partial \omega > 0, \forall \omega < \omega_{0f}(R)$. To explore the impact of R on the financing capacity of a contract with $(\omega(R), R)$, I define

$$\kappa \equiv \frac{\partial(E[\max\{x - R, 0\} | s_g] - E[\max\{y - R, 0\} | s_b]) / \partial R}{(1 - \omega)(E[\max\{x - R, 0\} | s_g] - E[\max\{y - R, 0\} | s_b])^2}.$$

Then differentiation of (8) for R yields

$$\frac{\partial I}{\partial R} = \kappa(\Delta_{gb} + p_g(1 - \omega)\frac{1}{\kappa}). \quad (21)$$

Because of (7) the sign is positive in the range of $R < y_b$. Inserting of $\omega < \omega_{0f}(R)$ in (21) gives

$$\frac{\partial I(\omega_{0f}(R))}{\partial R} = \begin{cases} \kappa \Delta_{gb} \frac{-p_b p_g (x_b - y_b)}{p_g (x_b - R)(p_g - p_b)} > 0 & \forall R \in [y_l, y_b] \\ 0 & \forall R \in [y_b, y_h]. \end{cases} \quad (22)$$

Efficiency of contracts implies $\omega < \omega_{0j}(R)$. Furthermore, note that the second term in the brackets of (21) decreases in ω . Then (22) and (7) ensure that $\partial I / \partial R > 0$ for all $R \in (0, x_h)$. Together with $\partial I / \partial \omega \geq 0$ for all $\omega < \omega_{0j}(R)$ this implies $d\omega(I, R) / dR < 0$ for all $\omega < \omega_{0j}(R)$.

2. At first, I consider the range $[0, y_h]$. Define

$$D \equiv \omega E[\max\{x - R, 0\} | s_g] + E[\min\{R, x\} | s_g] \\ - (\omega E[\max\{y - R, 0\} | s_b] + E[\min\{R, y\} | s_b])$$

as the difference of the bank's expected profit in state s_g and state s_b . For all contracts $(\omega(R), R')$ this difference is zero, $D = 0$. Because the capacity function $\omega(I, R)$ decreases monotonically in R , the positive derivatives, $\partial D / \partial \omega > 0$ and $\partial D / \partial R > 0$, ensure that the managerial effort increases with R . For the range $R \geq y_h$, inserting $q(\omega, R)$ in (8) shows that all combinations of cash flow rights that ensure complete financing represent a unique q . That is, $\omega(I, R)$ and $\omega(q, R)$ coincide. Thus, the managerial effort increases only weakly in R in this range. Δ

Proposition 2

Note that $\omega^*(Rm) = \omega(I, R_m)$ for $I = I_{\min}$. Then the first-best financing structure follows from Proposition 1 in combination with Lemma 2 and the manager's efficient decision making for all $R < R_m$. Δ

Proposition 3

Because of Lemma 1, part 1, Lemma 2 and $\partial \omega_j(R) / \partial R > 0 \forall R < y_l$ two types of contracts must exist in the range $I_{\min} < I \leq I_{\text{med}}$ that ensure efficient decision making: $(\omega_j(R), R, f)$ and $(\omega(R_m), R_m, m)$. Since for both types $\omega(R) > \omega^*(R)$ holds, the superior contract is the one that induces the higher effort. The function $\omega(I, R)$ decreases in R (see Lemma 2). Thus, for a given financing capacity and $R < R_m$, the relation $\omega(I, R) = \omega_j(R) > \omega(I, R_m)$ must hold. Then Lemma 2 ensures that the contract with manager control $(\omega(R_m), R_m, m)$ is superior. Δ

Lemma 3

Given that $I'_{\min} \equiv 1 + E[x | s_g] - \Delta_g - \Delta_{gb} / \Delta_g$ the equality $(\omega_j(R) = \omega(I, R)$ is satisfied for all $R \geq y_h$. That is, $\omega_j(R), \omega(I, R)$ and $\omega(q, R)$ coincide if $R \geq y_h$. I_{\max} follows from $\omega_{0j}(R)$. Given that $\omega(I, R) = \omega(q, R)$ if $R \geq y_h$, the expression $I_{\min} \equiv 1 + E[x | s_g] - 2\sqrt{\Delta_{gb}}$ can be derived by equalizing $\omega_{0j}(R = y_h) = \omega(I, R =$

y_b) and solving for I . Assumption $\Delta g > \sqrt{\Delta_{gb}} > 1$ ensures that $I'_{\max} < I_{\max}$. To derive $I'_{\max} > I_{\text{med}}$ recall that $(\omega_j(R_m < y_l), R_m < y_l, m)$ is the optimal contract, given that the financing capacity I_{med} is needed. Recall also that $\omega_j(R_m) < \bar{\omega}_j$. Then the monotonicity of the financing capacity of a given incentive compatible contract in ω and in R ; and Lemma 2, part 1 establish the relation $I'_{\max} > I_{\text{med}}$. Δ

Proposition 4

1. I need to show that the incentive-compatible contract with bank control $(\omega_f(R), R, f)$ generates a higher effort than does its counterpart $(\omega(R_m), R_m, m)$ for all $I_{\text{med}} > I > I'_{\max}$. Note at first that in the range of $R_m < R < y_b$ the inequality $I_{\text{med}} > I > I'_{\max}$ follows directly from Lemma 2. Second, inserting $\omega_f(R)$ in $q(\omega, R)$ gives $q = 1 - 1/\Delta_g, \forall R > y_b$. By inserting I'_{\max} and q in (8) and rearranging, I arrive at

$$\omega(I, R) = \omega_f(R) \text{ if } I = I'_{\max} \text{ and } R > y_b. \quad (23)$$

In the range $R > y_b$ any combination $(\omega(I, R), R)$ represent the same effort q . This invariance of q implies that with bank control any incentive-compatible contract $(\omega_f(R), R, f), R > y_b$ that ensures the financing of I maximizes the project's value. $\omega(I, R) > \omega_f(R) \forall I > I'_{\max}$ follows from Lemma 2 and (23). Thus, for large investments $I > I'_{\max}$ any contract $(\omega(I, R) \geq 0, R > y_b, f)$ is a value-maximizing contract. It remains to be shown that for $I = I'_{\max}$ such a contract is feasible in the sense that it generates positive profits for the manager. Inserting of $\omega = 0, R = E[y | s_g] / p_R$ and $q = 1 - 1/\Delta_g$ in the manager's profit function yields $\Pi_m = \Delta_g - 1 + \ln 1/\Delta_g$. Since $\partial \Pi_m / \partial \Delta_g > 0$ this must be positive for all $\Delta_g > 1$.

2. The equality $\omega(I, R) = \omega(q, R)$ holds for $R \geq y_b$. Thus, inserting $\omega(I = I_{\max}, R = y_b)$ in (5) yields the corresponding effort level $q = 1 - 1/\sqrt{\Delta_{gb}}$. In the next step, I insert I_{\max} and $q = 1 - 1/\sqrt{\Delta_{gb}}$ in (8) and solve for ω . It follows from (19) for $R > y_b$ that $\omega(I = I_{\max}, R) = \omega_{0l}(R) > \omega_f$. Let ε be small⁸, then Lemma 2, part 1 implies for $I = I_{\max} - \varepsilon$ that $\omega_f < \omega(I, R) < \omega_{0l}$ must hold. Thus, bank control ensures incentive-compatibility for all cash flow rights $\omega(I, R), R$ which have the financing capacity $I = I_{\max} - \varepsilon$. Inserting of $q = 1 - 1/\sqrt{\Delta_{gb}}, \omega_{0l} = 0$ and $R = x_b - \sqrt{\Delta_{gb}} / p_g$ in the manager's profit function yields $\Pi_m = \sqrt{\Delta_{gb}} - 1 + \ln 1/\sqrt{\Delta_{gb}}$. Since $\partial \Pi_m / \partial \sqrt{\Delta_{gb}} > 0$ and $\sqrt{\Delta_{gb}} > 1$ the participation constraint of the manager is satisfied for all $I'_{\max} < I < I_{\max}$. Δ

⁸ Note that for $I = I_{\max}$ I have $\partial I / \partial \omega = 0$ and $\partial I / \partial R = 0$ for all $R > y_b$.

Proposition 5

1. I show that $(R, m, \lambda) \preceq (\omega(R_m), R_m, m)$ for every $\lambda \in [0, 1]$. Then the inferiority of $(\omega(R_m), R_m, m)$ to $(\omega_f(R), R, f)$ for all $I > I_{\text{med}}$ ensures that (R, m, λ) is also inferior to $(\omega_f(R), R, f)$ for all $I > I_{\text{med}}$. I turn first to the financing of projects with $(\omega(R_m), R_m, m)$. Inserting R_m into (5) and (8), solving (5) for ω , inserting the result into (8) and solving for q gives the effort as a function of the investment size $q(I)$. For convenience, I analyze the reverse function

$$I_m(q) = qE[x | s_g] + (1 - q)E[y | s_b] - \frac{qp_g + (1 - q)p_b}{(1 - q)(p_g - p_b)}.$$

Now denote $I_f(q)$ as the corresponding reverse function that results from $(\omega_f(R), R, f)$. We already know from the hierarchy of contracts that $I_f(q) = I_m(q)$ if $I = I_{\text{med}}$ and $I_f(q) \geq I_m(q)$ if $I \geq I_{\text{med}}$. Solving q_m^m for R and inserting $R(q)$ into $I_n(q) = qE[\min[R, x_b] | s_g] + (1 - q)(E[\min[R, x_b] | s_b] + (1 - \lambda)(E[y | s_b] - E[x | s_b]))$ gives $I_n(q) = I_m(q) - p_g\lambda / (p_g - p_b) \cdot (E[y | s_b] - E[x | s_b])$. Clearly, the effort implied by the credit contract with renegotiation decreases with λ for every I . With $\lambda = 0$ we have $I_m(q)$. Thus, in the case of manager control, the highest level of effort attainable with a renegotiation contract is $q(\omega(R_m), R_m, m)$ which is less than q_f for all $I > I_{\text{med}}$.

2. I turn now to the credit contract with bank control (R, f, λ) . Renegotiation of this contract is inferior if $q_n^f \leq q_f$ for all $I > I_{\text{med}}$. In the range of $R \leq y_l$ and $I \leq I_n^f(R, q, \lambda) \equiv R + q(1 - \lambda)\Delta_R$ the manager's effort function is $q_n^f = 1 - 1 / (E[y | s_g] + \lambda\Delta_R - E[y | s_b])$. It is invariant to $I \forall R \leq y_l$. Since $\partial q_n^f / \partial R < 0 \forall R \geq y_l$ the effort is at its maximum in this range $R \in (0, y_l]$ for every given λ . $\lambda = 1$ and $R \leq y_l$ imply $q_n^f = q^*$. From $\lambda = 0$ and $R \in [y_b, y_h)$ it follows that $I_n(q) = I_m(q)$. In the next step we derive $I_n^f(y_l, q) \equiv q\Delta_{Rb} + y_l - q / (1 - q)$ by solving q_n^f for λ and inserting the result in $I = y_l + q(1 - \lambda)\Delta_R$. Solving of $I_n^f(y_l, q) = I_m(q)$ yields an effort level which I denote as $q^*(\lambda = 0)$. Then the inequality $2\Delta_R > \Delta_{Rb}$ ensures $q(\omega_f(R_m), R_m) > q^*$. This inequality, $q(\omega_f(R_m), R_m) > q^*$, and $I_n^f(y_l, q) = I_m(q), \lambda = 0$ imply that for $\lambda = 0$ also $q_f(I) > q_n^f(I)$ must hold. Having $q_f > q_n^f$ for $\lambda = 0$ and $q_f < q_n^f = q^*$ for $\lambda = 1$ the derivative $\partial q_n^f / \partial \lambda > 0$ for all $R \leq y_l$ together with $(\partial I_n(q) / \partial q) / \partial \lambda = 0$ for all $R \in [y_l, y_h)$ and $\partial I_m(q) / \partial q > \partial I_f(q) / \partial q$ ensure that $\tilde{\lambda}$ exists and that renegotiation is inferior for all I if $\lambda < \tilde{\lambda}$. Δ

References

- ADAMS, MICHAEL (1990), Höchststimmrechte, Mehrfachstimmrechte und sonstige wunder-same Hindernisse auf dem Markt für Unternehmenskontrolle, in: Die Aktiengesellschaft, Jg. 35, pp. 63–78.
- AGHION, PHILIPPE/BOLTON, PATRICK (1992), An Incomplete Contracts Approach to Financial Contracting, in: Review of Economic Studies, Vol. 59, pp. 473–494.
- BERCHUK, LUCIAN A./ROE, MARK J. (1999), A Theory of Path Dependence in Corporate Governance and Ownership, Stanford Law Review, Vol. 52, pp. 127–170.
- CABLE, JOHN R. (1985), Capital Market Information and Industrial Performance: The Role of West German Banks, Economic Journal, Vol. 95, pp. 118–132.
- DEWATRIPONT, MATHIAS/TIOLE, JEAN (1994), A Theory of Debt and Equity: Diversity of Securities and Manager-Shareholder Congruence, in: The Quarterly Journal of Economics, Vol. 109, pp. 1027–1054.
- FRANKS, JULIAN/MAYER, COLIN (2000), Ownership and Control of German Corporations, Working Paper, London Business School, forthcoming in: Review of Financial Studies.
- GORTON, GARY/SCHMID, FRANK A. (2000), Universal Banking and the Performance of German Firms, in: Journal of Financial Economics, Vol. 58, pp. 29–80.
- HACKETHAL, ANDREAS/SCHMIDT, REINHARD H. (1999), Financing Patterns: Measurement Concepts and Empirical Results, Working Paper, Universität Frankfurt/M.
- HACKETHAL, ANDREAS/SCHMIDT, REINHARD H. (2000), Finanzsystem und Komplementarität, in: Kredit und Kapital, Beiheft 15 "Neue finanzielle Arrangements: Märkte im Umbruch", pp. 53–102.
- JOHN, KOSE/JOHN, THERESE A./SAUNDERS, ANTHONY (1994), Universal Banking and Firm Risk Taking, in: Journal of Banking and Finance, Vol. 18, pp. 307–323.
- KALAY, AVNER/ZENDER, JAMIE F. (1997), Bankruptcy, Warrants, and State-Contingent Changes in the Ownership of Control, in: Journal of Financial Intermediation, Vol. 6, pp. 347–379.
- KOPCKE, RICHARD W./ROSENGREN, ERIC S. (1989), Regulation of Debt and Equity, in: Kopcke, Richard W./Rosengren, Eric S. (Ed.), Are the distinction between Debt and Equity Disappearing? Federal Reserve Bank of Boston, Conference Series 33, pp. 173–206.
- KRUSCHWITZ, LUTZ/SCHÖBEL, RAINER (1985), Die Bewertung von Options- und Wandelanleihen mit Hilfe der Optionspreistheorie, Working Paper, Technische Universität Berlin.
- LONGHOFFER, STANLEY D./SANTOS, JOAO A.C. (2000), The Importance of Bank Seniority for Relationship Lending, in: Journal of Financial Intermediation, Vol. 9, pp. 57–89.
- LONGHOFFER, STANLEY D. (1997), Absolute Priority Rule Violations, Credit Rationing, and Efficiency, in: Journal of Financial Intermediation, Vol. 6, pp. 249–267.
- MONOPOLKOMMISSION (1998), Ordnungspolitische Leitlinien für ein funktionsfähiges Finanzsystem, Sondergutachten 26, Baden-Baden.
- PERLITZ, MANFRED/SIGER, FRANK (1994), The Role of Universal Banks in German Corporate Governance, in: Business and the Contemporary World, Vol. 6, pp. 49–66.
- RAJAN, RAGHURAM G. (1992), Insiders and Outsiders: The Choice between Informed and Arm's-Length Debt, in: Journal of Finance, Vol. 47, pp. 1367–1400.
- SAUNDERS, ANTHONY/WALTER, INGO (1994), Universal Banking in the United States, New York.
- SCHMID, FRANK A. (1996), Beteiligungen deutscher Geschäftsbanken und Corporate Performance, in: Zeitschrift für Wirtschafts- und Sozialwissenschaften, Jg. 116, pp. 273–310.
- TIOLE, JEAN (1986), Procurement and Renegotiation, in: Journal of Political Economy, Vol. 94, pp. 235–259.

- WENGER, EKKEHARD (1992), Universalbankensystem und Depotstimmrecht, in: GRÖNER, HELMUT, *Der Markt für Unternehmenskontrolle*, Berlin, pp. 73–118.
- WOLF, OTTMAR (1999), Wandelanleihen: Emissionsboom in Europa, in: *Die Bank*, Jg. 11, pp. 778–785.
- ZENDER, JAIME F. (1991), Optimal Financial Instruments, in: *Journal of Finance*, Vol. 46, pp. 1645–1663.