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Creditor Conficts prior to Bankruptcy and Credit Rationing

Jochen Bigus

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Creditor Conflicts prior to Bankruptcy and Credit Rationing

by Jochen Bigus

University of Hamburg,

Graduate Programme "Law and Economics"

Abstract:

In this paper we focus on conflicts of interest between senior and junior debt which occur prior to bankruptcy. When coalitions between the entrepreneur and one creditor are possible and the coalition has private information, a special kind of agency problem may arise. The entrepreneur and one creditor could cooperate and change investment policy jointly, at the cost of the remaining creditor. This may even work, when asset substitution is not efficient. In principle, there are two kinds of coalition problems. The coalition comprised of the entrepreneur and the junior creditor tends to favor risk-increasing, a coalition involving the senior creditor favors risk-decreasing.

Adopting the formal framework of *Stiglitz/Weiss* (1981) and *Bester/Hellwig* (1987), we analyze a *risk-decreasing* coalition problem. The entrepreneur and the senior creditor form the coalition and behave opportunistically. The junior creditor may anticipate this problem and then rations credit supply. If the junior creditor can seize some private wealth from the entrepreneur (external collateral), the problem is mitigated.

The coalition problem depends on the type of senior and junior debt. When there is a me-first-rule or when there is unsecured and subordinated debt, coalition problems may be more severe than in the case of secured and unsecured debt. When the senior claim is completely backed by collateral, *e.g.* by mortgages, the senior creditor doesn't have an incentive for coalition. If it's not fully backed and the value of secured claims depends on investment policy, *e.g.* in the case of blanket assignments of receivables, there may be a coalition problem.

JEL-Classification: G31, G32, G21

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Creditor Conflicts prior to Bankruptcy and Credit Rationing

1 Introduction

One important agency problem of debt financing is the well known asset substitution problem, sometimes also labeled the risk shifting problem. After signing the debt contract, the entrepreneur, representing equity, has an incentive to choose risky investments. Because of limited liability and fixed repayment, the entrepreneur has a convex pay-off function. She profits from gains entirely but shares losses with the creditor. Therefore, a riskier project which leads to higher gains but also to higher losses may affect the entrepreneur and the creditor differently. The entrepreneur may be interested in risk-shifting even if it is inefficient to do so causing losses to the creditor. Hitherto, models of the asset substitution problem were usually based on the assumption that there is *one* or more creditors with *equally ranked* claims (see *Galai/Masulis* (1976), *Stiglitz/Weiss* (1981), *Green/Talmor* (1983), *Bester/Hellwig* (1987), *Kürsten* (1995)).

In this paper, we analyze the asset substitution problem assuming *different* creditor classes, *i.e.* senior and junior debt. Option pricing literature only deals with the issue of valuation (see *Smith* (1979), *Dubofsky* (1992)), but doesn't point out the potential conflicts of interest between different creditor classes and how these conflicts may affect investment policy. To my knowledge, there is no model which deals directly with *coalition problems*. Coalition problems occur under asymmetric information where the entrepreneur and one (or more) creditor(s) could cooperate and change investment policy jointly at the cost of the remaining creditor(s). This may even work if asset substitution is not efficient. This problem may occur considering banks with a senior claim and with close ties to the firm, e.g. for German "housebanks".

Surprisingly, the literature on financial agency problems has not addressed coalition problems but two early essays on bankruptcy issues have, maybe since creditor conflicts occur especially when the firm has filed for bankruptcy. *Bulow/Shoven* (1978) and *White* (1980) show, that there may be creditor conflicts *prior* to bankruptcy. However, *Bulow/Shoven* (1978) don't focus on different creditor claims as we do. *White* (1980) considers different claims. She doesn't, however, analyze the problem that a coalition may have an incentive to move to inefficient risk-*decreasing*, which shall be directly addressed in this paper.

The existence of heterogeneous creditor claims may lead to an additional category of agency costs. This is arguably similar to the heterogeneity within the shareholder's group where, for instance, conflicts of interest between controlling and non-controlling shareholders may lead to additional agency costs of equity (see *Bebchuk/Kraakman/Triantis* (1997)).

The paper is organized as follows. In section 2, we provide the intuition behind the problem. In section 3, we present a simple model based on *Bester/Hellwig* (1987). In section 4, we discuss the relevance of coalition problems. Section 5 concludes.

2 Heterogeneous creditor claims: an intuitive presentation

Determining the characteristic pay-off functions of the entrepreneur and the different creditors, one can easily see the potential for conflicts of interest. Let's assume the claims of the senior creditor S and the junior creditor J have a face value of D_S ($D_S > 0$) and D_J ($D_J > 0$), respectively. The loan from S is fully paid back before the loan from J. The entrepreneur E gets the rest. Different creditor claims can occur, if there is a “me-first-rule” in favor of S, or secondly, if there is secured and unsecured debt,[1] or thirdly, if there is unsecured as well as subordinated debt with even lower priority. The characteristic pay-offs are $\tilde{R}_i$, i= E, S, J (total revenues of the firm are $\tilde{R}$; $\tilde{R} > 0$):

(1.1) $\tilde{R}_S = \min (D_S; \tilde{R})$,

(1.2) $\tilde{R}_J = \min [D_J; \max(\tilde{R} - D_S; 0)]$,

(1.3) $\tilde{R}_E = \max (0; \tilde{R} - D_S - D_J)$.

Using the terminology of option pricing theory and assuming that option premia are zero,[2] one can see, that (see *Dubofsky* (1992)):

- The senior creditor S owns a riskless bond and is short a European put on firm's assets with strike value D_S.

- The junior creditor J owns a "bullish vertical spread". She owns a European call on firm's assets with a low strike price of D_S and is short a European call with a greater strike price of $D_S + D_J$.

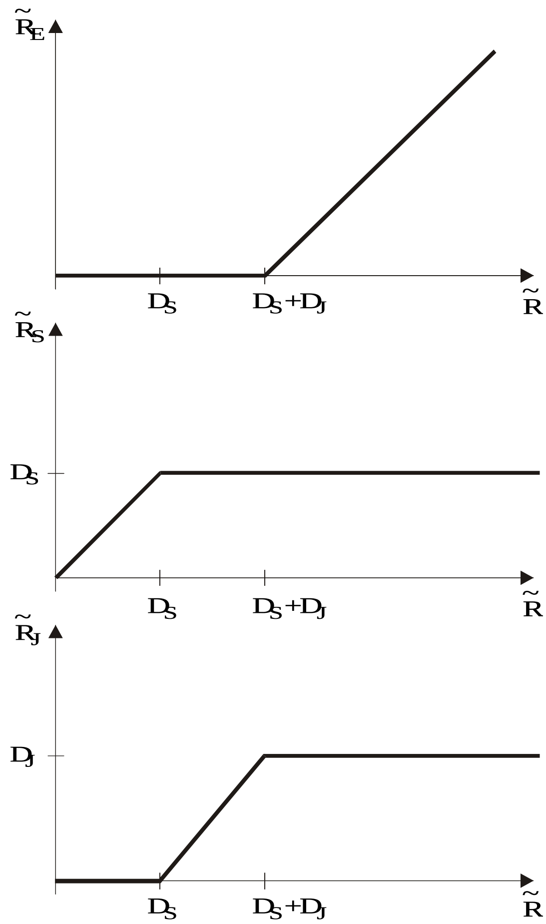
- The entrepreneur effectively owns a European call option on firm's assets with strike price $D_S + D_J$.

The following graph shows the characteristic pay-off-functions:

1 For simplicity, we are assuming, that total revenues of the firm aren't affected by pledging activities. Taking posession of collateral and liquidating it might involve transaction costs. Moreover, there might arise opportunity costs, if collateral limits taking wealth-enhancing business opportunities.

2 See *Jurgeit* (1989), p. 36 and p. 179. Since on the one hand the short position in puts actually imply negative pay-offs for low prices of the underlying assets, on the other hand the senior creditor's revenue can't be negative, one adds the riskfree bond.

Graph 1: Pay-off-functions of entrepreneur E, senior creditor S, and junior creditor J



The entrepreneur has a convex pay-off-function, the senior creditor has a concave pay-off-function. Therefore, the entrepreneur is interested in risk-shifting, whilst the senior creditor is not. This basic conflict of interest has been analyzed in the risk-shifting literature, assuming in general equally ranked creditor claims. The position of the equally ranked creditors is comparable to the position of the senior creditor here.

In the case of different creditor claims one has to take into account the special, ambiguous position of the junior creditor J. Her pay-off-function is both (locally) concave and convex. When total revenues are high, the position of J is similar to the senior creditor. When total revenues are low, the position of J is comparable to the position of the entrepreneur. For total revenues with $\tilde{R}$ close to D_S, the junior creditor yields a large loss. J might be interested in risk-increasing activities, because this might enhance individually expected revenues (she can lose no more). If total revenues are rather high, that means with $\tilde{R}$ close to D_S+D_J, both of the creditors have a concave pay-off-function. Risk-increasing may then devalue the creditor claims, and the entrepreneur will gain.

In the following section I provide an analysis of a *coalition problem* adopting the formal framework of *Stiglitz/Weiss* (1981) and *Bester/Hellwig* (1987). The entrepreneur and the senior creditor could cooperate and change investment policy jointly, to the cost of the remaining creditor. The coalition chooses a *less risky*, but inefficient project. Note, that the literature has focussed so far on risk-*increasing* activities, since the entrepreneur on her own has no incentive to choose relatively safe projects. Therefore, differing to *Stiglitz/Weiss* (1981) and *Bester/Hellwig* (1987), we assume that the risky project is the efficient one.

3. A model of credit rationing facing creditor conflicts

3.1 Assumptions

(A1) In t = 0, entrepreneur E sets up a limited liability firm, which is liquidated in t=1. She can choose between the projects Y_a und Y_b. Both of them require the same fixed investment I (I>0). For simplicity, both projects have only two possible outcomes: success and failure. The returns in t=1 amount to (i=a,b):

$$(2.1)\quad \tilde{X}_i = \begin{cases} x_i, & \text{with prob. } p_i \\ 0, & \text{with prob. } 1-p_i, \end{cases}$$

where (2.2) $p_a x_a > p_b x_b > I > 0$ and $1 > p_b > p_a > 0$ and $x_a > x_b > 0$.

Please note, that the less risky project Y_b is the inefficient one.

(A2) The entrepreneur E has no wealth in t=0. The creditors S and J can finance the project jointly, giving senior debt and junior debt, respectively. S provides in t=0 a payment of I_S, J a payment of I_J, where I = I_S+I_J. The *gross interest payments*, *i.e.* the claims in t=1 amount to $D_S = I_S(1+r_S)$ and $D_J = I_J(1+r_J)$, respectively. The credit interest rate is: $r_k \geq \frac{1}{p_i} - 1$ for k = J,S and i = a,b.

Assuming that both the senior and the junior creditor are risk-neutral and the market interest rate of riskless investments is zero, the initial investments provided in t=1 amount to

$I_S \leq p_i D_S$ and $I_J \leq p_i D_J$, respectively.

Furthermore, for simplicity let's assume $x_i \geq D_S$ (i = a,b).

(A3) There are homogeneous expectations with regard to the entrepreneur's project set and the projects' returns. However, after writing the contract, only the senior creditor can observe the entrepreneur's project choice in t=0, since there are close ties to the firm. The junior creditor cannot observe project choice. Third parties, like courts, cannot verify neither project choice nor project return.

(A4) Besides the creditors, the entrepreneur is also risk-neutral. Each player tries to maximize (expected) individual wealth in t=1. The entrepreneur will only accept the credit contract if she gains.

(A5) The entrepreneur and the senior creditor can form a coalition: they agree on investment policy or/and on side payments.

The following list of symbols may be useful:

C	amount of external collateral
D_S (D_J)	face value of senior debt (of junior debt, respectively)
$\hat{D}_J$ ($\hat{D}_J^C$)	critical level of junior debt (when there is collateral) which induces the coalition $\{E,S\}$ choosing the less risky, inefficient project Y_b
E	name of the entrepreneur
$\{E,S\}$	coalition comprised of entrepreneur and senior creditor
I	initial investment in t=0
I_S (I_J)	investment by the senior creditor (junior creditor), $I_S + I_J = I$
$\hat{I}_J$	maximum investment by the senior creditor in t=0 anticipating the coalition problem
J	name of the junior creditor
L	loanable funds offered by junior creditor(s)
N	number of identical entrepreneurs demanding junior debt
p_a (p_b)	success probability of project Y_a (Y_b), $p_a < p_b$
r_S (r_J)	credit interest rate, demanded by the senior creditor (junior creditor)
R_S (R_J, R_E)	return of senior creditor (junior creditor, entrepreneur) in t=1
S	name of the senior creditor
x_a (x_b)	return of project Y_a (Y_b) in case of success, $x_a > x_b$

Y_a (Y_b) risky, efficient project (less risky, inefficient project)

3.2 Coalition problems

Considering (A1), expected return of project Y_a is higher. However, project Y_b is less risky considering the higher probability of success. Without coalitions, the entrepreneur tends to choose the risky and efficient project Y_a. This holds as long as one doesn't take into account coalitions.

If the junior creditor cannot observe project choice, the coalition $\{E, S\}$, consisting of the entrepreneur and the senior creditor, may have an incentive to choose the inefficient, but less risky project Y_b. Note that the senior creditor and the entrepreneur share the same information, when there are close ties to the firm. Without side payments, only S may gain, but the entrepreneur will lose. However, if the *coalition* gains, S can compensate the entrepreneur E. Therefore, even in the case S can't observe project choice, E has an incentive to inform S expecting a binding side-payment in t=1. One can imagine that the entrepreneur doesn't fully repay S but subtracts the side-payment in t=1, or that S reduces her claim in t=1. [3]

In what follows, we will first show the expected payoffs of each player and of the coalition $\{\mathrm{E,S}\}$. Then we derive the conditions for the coalition's incentive to switch to the less risky and inefficient project, which depends on the size of the junior claim. Finally, we show how the junior creditor anticipates the coalition problem by rationing her claim D_J.

Since $x_i \geq D_S$ (i = a,b) is assumed, the individual expected payoffs R_j (j = E, S, J) are given as:

(3.1) $R_S = p_i\ D_S - I_S,$ i=a,b

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3 Furthermore, one can interprete side-payments as a pure cash-payment in t=1. Side-payments may also involve future monetary benefits which are offered by the coalition's creditor, e.g., favorable credit contracts with quite low interest rates or other financial services.

$$(3.2) \qquad R_J(D_J) = \begin{cases} p_i D_J - I_J & ,\text{if } x_i \geq D_S + D_J \\ p_i(x_i - D_S) - I_J & ,\text{if } x_i < D_S + D_J \end{cases} \qquad i=a,b$$

$$(3.3) \qquad R_E(D_J) = \begin{cases} p_i(x_i - D_S - D_J) & ,\text{if } x_i \geq D_S + D_J \\ 0 & ,\text{if } x_i < D_S + D_J \end{cases} \qquad i=a,b.$$

Without coalitions, the entrepreneur tends to choose the risky and efficient project Y_a, since she receives a greater return. In the case $x_a > x_b \geq D_S + D_J$, she chooses Y_a, since $p_a(x_a - D_S - D_J) > p_b(x_b - D_S - D_J)$ because of $p_b > p_a$ and $p_a x_a > p_b x_b$. In the case $x_a \geq D_S + D_J > x_b$; she also receives more by choosing Y_a, since $p_a(x_a - D_S - D_J) > 0$.[4]

When coalitions are possible, things are changing. Considering (3.1) and (3.3), the coalition $\{E, S\}$ faces a joint expected return of:

$$(4) \qquad R_{E;S}(D_J) = \begin{cases} p_i(x_i - D_J) - I_S & ,\text{if } x_i \geq D_S + D_J \\ p_i D_S - I_S & ,\text{if } x_i < D_S + D_J \end{cases} \qquad i=a,b.$$

We can distinguish between three cases: $x_a > x_b > D_S + D_J$ (*case 0*), $x_a \geq D_S + D_J > x_b$ (*case 1*) und $D_S + D_J > x_a > x_b$ (*case 2*). With regard to (4), the coalition $\{E, S\}$ chooses the inefficient project Y_b, when the following condition holds, depending on the size of the claims D_J and D_S (remember: $x_a > x_b$):[5]

$$(5.0) \qquad p_a(x_a - D_J) - I_S < p_b(x_b - D_J) - I_S \quad , \text{if } x_a > x_b \geq D_S + D_J,$$
$$(5.1) \qquad p_a(x_a - D_J) - I_S < p_b D_S - I_S \quad , \text{if } x_a \geq D_S + D_J > x_b,$$
$$(5.2) \qquad p_a D_S - I_S < p_b D_S - I_S \quad , \text{if } D_S + D_J > x_a > x_b.$$

We rule out *case 0* ($x_a > x_b \geq D_S+D_J$), since the inequality doesn't hold considering the assumptions $p_b > p_a$ and $p_a x_a > p_b x_b$. With respect to *case 2,* the inequality holds independently of D_J. Solving the inequality with respect to *case 1*

4 Only with respect to the case $D_S + D_J > x_a > x_b$, the entrepreneur is indifferent (and not willing choose a project, since she receives a zero return in either case.

5 The entrepreneur will only join the coalition, if the side payment exceeds her loss by choosing the inefficient, less risky project. That means, the side payment shall exceed $p_a(x_a - D_S - D_J)$, if $x_a \geq D_S + D_J > x_b$ and exceed 0, if $D_S + D_J > x_a > x_b$.

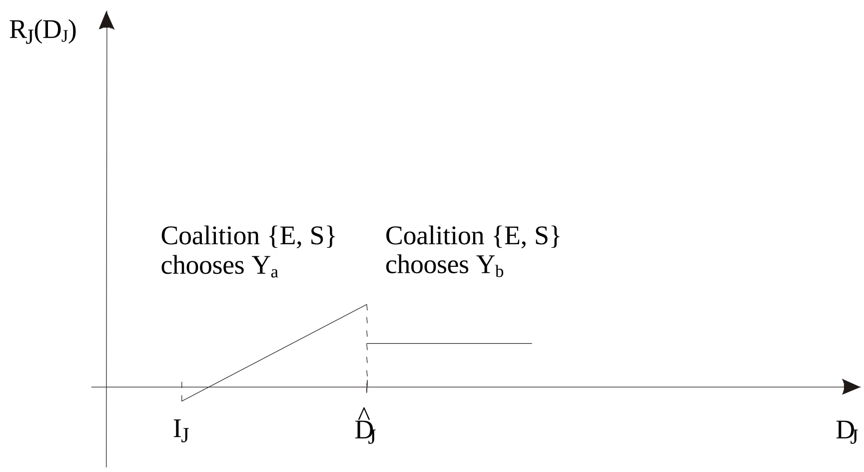
($x_a \geq D_S + D_J > x_b$), one can determine the "critical" debt level of the junior creditor, $\hat{D}_J$. With respect to this level $\hat{D}_J$, the coalition is indifferent between the risky, efficient and the less risky, inefficent project:

$$\text{(6)} \qquad \hat{D}_J := x_a - \frac{p_b D_S}{p_a} \qquad , \text{if } x_a \geq D_S + D_J > x_b \ .$$

The coalition $\{E, S\}$ only chooses the inefficient project Y_b, when the debt level of the junior creditor J exceeds $\hat{D}_J$. However, the junior creditor J may anticipate the coalition's choice. Her expected payoff depends on the size of her claim (Graph 2 shows the pay-off function of the junior creditor J with respect to her debt level):

$$\text{(7) } R_J(D_J) = \begin{cases} p_a D_J - I_J & , \text{if } 0 < D_J \leq \hat{D}_J , \\ p_b (x_b - D_S) - I_J & , \text{if } \hat{D}_J < D_J . \end{cases}$$

Graph 2: *Expected payoff of the junior creditor J considering a coalition comprised of entrepreneur and senior creditor, depending on the claim of J (D_J)*



The pay-off function $R_J(D_J)$ is not monotonically increasing and consists of two parts. The first part increases with factor p_a, the second part shows constant revenues, independent of D_J.[6] *Ceteris paribus*, the junior creditor obviously rations her claim to the level $\hat{D}_J$, if she can't get a higher expected payoff exceeding the critical debt level $\hat{D}_J$. That means, there is rationing, if the following condition holds:

(8) $\quad p_a \hat{D}_J > p_b (x_b - D_S)$.

Substituting (6) $\hat{D}_J := x_a - \dfrac{p_b D_S}{p_a}$, one can transfer (8) to $p_a x_a > p_b x_b$. This inequality holds considering assumption (A1). To conclude: in any case, there will be rationing to the level $\hat{D}_J$, if there are coalition problems. The junior creditor won't accept a higher interest rate, since then the debt level exceeds $\hat{D}_J$.

Since assumption (PM2) $I_J \leq p_a \cdot D_J$ is valid, the junior creditor limits the initial payment in t=0. In a competitive market, she yields zero return and provides the initial payment $I_J = p_a \cdot D_J$, *i.e.* considering (6) she provides at most

(8.1) $\quad \hat{I}_J = p_a x_a - p_b D_S$.

In a less competitive market, the initial payment is even lower ($\hat{I}_J < p_a x_a - p_b D_S$). Since the junior creditor provides $I_S \leq p_a \cdot D_S$ (assumption (PM2)), the entrepreneur receives in t=0 a maximum initial payment $\hat{I}$:

(8.2) $\quad \hat{I} = I_S + \hat{I}_J = p_a \cdot D_S + p_a x_a - p_b D_S$

$$= p_a x_a - (p_b - p_a) D_S.$$

However, when the entrepreneur needs I (with $p_a x_a - (p_b - p_a) D_S < I < p_a x_a$), then a project with positive net present value won't be financed because of the coalition problem.

The following example serves for clarification: The total investment in t=0 is I=50. In order to complete a project, the entrepreneur needs partly money from the bank, partly

6 Note, that the junior creditor J may also face exclusively negative payoffs for $D_J > \hat{D}_J$, when $p_b(x_b - D_S) < I_J$.

products and services from a supplier. The bank's credit is senior in t=1 and amounts to I_S = 30. The question is, whether the supplier will offer services, with $I_J = I - I_S = 20$, when they have a junior claim in t=1.

The entrepreneur could invest in project Y_a with return x_a=100 in case of success (p_a = 0.6) and zero return in case of failure. The expected return to Y_a is 60. The inefficient project Y_b yields a return of x_b=60 with probability p_b = 0.9, zero return in case of failure and thus an expected return of 54. The senior creditor S (the bank) requires a repayment of D_S = 50 in t=1. With respect to the efficient project Y_a, her expected return then equals her contribution in t=0 (0.6*50=I_S).

However, the coalition (bank and entrepreneur) has an incentive to choose the inefficient project, if the claim of the junior creditor J (supplier) is sufficiently large. Note, that the entrepreneur doesn't have an interest in risk-decreasing on her own, since she gets nothing, if $D_S + D_J \geq 60$, that means, if $D_J \geq 10$. Considering (6), the critical debt level is: $\hat{D}_J$ = 100–(0.9*50/0.6) = 25. Is J's debt level below $\hat{D}_J$, the risky project will be chosen, is it above, the less risky, inefficient project will be chosen. If the claim of J in t=1 amounts to 25, the expected return of the junior creditor (supplier) will be: $R_J(D_J = \hat{D}_J)$ = 0.6*25 = 15 (45–30). Compared to this, the maximum expected return of J for $D_J > \hat{D}_J$ is: $R_J(D_J > \hat{D}_J)$ =0.9*(60–50) = 9. The coalition $\{E, S\}$ then yields 54–9 = 45.

If, *e.g.*, D_J amounts to 40, the entrepreneur shall get a side-payment, which exceeds the returns she would get choosing the risky project: 0,6*(100–50–40) = 6. To be better off, the senior creditor (bank) will only agree upon a side-payment which is lower than 15, since the coalition yields 45 and his expected, non-cooperative return amounts to 30. To sum up, E and S agree on a side-payment which exceeds 6 but is lower than 15. However, anticipating that the coalition has an incentive to risk-*decreasing*, J (the supplier) rations credit and provides in t=0 in maximum I_J = 25*0.6 = 15. However, since the senior creditor S can only contribute I_S = 30, and the entrepreneur is wealth-constrained, the efficient project Y_a cannot be realized. It requires an initial investment of 50.

3.3 Equilibrium credit rationing ?

So far, we've only regarded the supply side of the market for junior claims. Now, we will show, that the existence of coalition problems may induce credit rationing in equilibrium. First we will regard the case of a monopoly market with a fixed supply of junior claims, then the case of many junior creditors with variable supply. Please note the assumption that the senior creditor doesn't provide additional money, maybe because rather services/products are required, maybe because of liquidity constraints, maybe anticipating agency problems which may arise from coalitions between the entrepreneur and the junior creditor (see *Bigus* (1999)). In principle, I adopt the arguments given by *Bester/Hellwig* (1987), pp. 140-143.

Let's assume that the junior creditor owns an amount L of loanable funds and that there are N identical entrepreneurs each of them demanding I_J. If $I_J \leq L < N \cdot I_J$, then funds are scarce. If there is a monopolistic market for junior debt, the junior creditor J has all the bargaining power. With respect to (8), the expected payoff of J is maximized at $D_J = \hat{D}_J$. This excludes the case $D_S + D_J > x_a > x_b$ and suggests the case $x_a > D_S + D_J > x_b$, which assumes that there is a positive return to the entrepreneur by choosing the risky project Y_a, but no return by choosing the less risky project Y_b. An entrepreneur who gets junior debt expects the payoff:

$$(10) \qquad R_E\,(D_J = \hat{D}_J) = p_a\,(x_a - D_S - D_J) > 0, \text{ when } x_a > D_S + D_J > x_b.$$

Since each entrepreneur can receive a positive expected payoff regarding (10) – without investing any money and considering risk neutrality –, all of them will apply for loans. The junior creditor faces the problem of selecting $L/\, I_J$ applicants to distribute her funds. The remaining $N-(L/\, I_J)$ entrepreneurs don't get any loan. They would even offer a higher interest to get a loan, *i.e.* more than $\hat{D}_J$, but the junior creditor will reject the offer, facing the coalition's incentive.

Some credit rationing may also occur when there are many junior creditors and the supply of funds is variable. Considering an aggregate competitive supply function $L(R_J/\, I_J)$, which is an increasing function of the junior creditor's rate of return $R_J/\, I_J$, there may well be the case that $L(R_J/\, I_J) \geq N \cdot I_J$. However, credit rationing is still possible, if

$$(11) \qquad L\left(\frac{R_J\,(D_J = \hat{D}_J)}{I_J}\right) < N \cdot I_J.$$

In this case, supply of junior credit funds is too small to satisfy total demand. As in the monopoly case, each entrepreneur would like to get credit since each of them gets a positive expected pay-off. However, there is credit rationing.

This argumentation only holds when we accept the crucial assumption that the senior creditor doesn’t provide additional money or doesn’t buy out the junior creditor. When the senior creditor isn’t liquidity-constrained, he should be the only creditor. By definition, the coalition problem wouldn’t arise when there is only one creditor.[7] Therefore, one has to ask why we observe senior and junior claims at all. According to the results of the model the senior creditors, *e.g.* banks, should purchase the claims of junior creditors, *e.g.* suppliers. However, we don’t observe banks buying suppliers’ claims, maybe since transaction costs are too high ?[8]

3.4 Coalition problem and collateral

In addition to the assumptions in Section 3.1, we now suppose that the entrepreneur is endowed with some wealth W, which can be used as collateral but cannot be used to finance investment directly. For instance, this wealth may consist of non liquid assets or future income.[9] The credit contract then specifies a

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7 The coalition may also be avoided when the junior creditor writes a contract with the senior creditor not to agree to a change of the project. In order to „convince“ the senior creditor, the junior creditor would have to pay him at least the gain the senior creditor would yield choosing the less risky, inefficient project. This would increase the costs of junior capital. Moreover, when project choice isn’t verifiable, the senior creditors‘ asset substitution incentive remains.

8 From a theoretical point of view, there may also be some advantages to the joint existence of senior and junior debt, for instance, opportunistic behavior by the entrepreneur may be limited, see *Berglöf/von Thadden* (1994) and *Hart/Moore* (1995). From a practical point of view, the correct pricing of junior claims may be difficult, since even the entrepreneur doesn’t know the entire set of current and future projects. Therefore, it’s difficult to evaluate the entire set of opportunistic actions which may induce high transaction costs of bargaining. Moreover, the senior creditor, e.g. *banks*, may not have the expertise to correctly assess the value of specific claims of junior creditors, *e.g.* of suppliers.

9 See for a similar extension *Bester/Hellwig* (1987), p. 143f.

required interest rate and a collateral $C \leq W$. To be precise, this collateral stems from the private fortune of the entrepreneur. Let’s call it *external* collateral to distinguish it from *internal* collateral like, for instance, seized firm's assets. The question is, whether the coalition problem can be mitigated or even eliminated. In the case of *homogeneous* creditor claims, collateral tends to mitigate incentive problems even if there are some transaction costs involved.[10]

Let's assume that the junior creditor can contract on external collateral, since she may be affected negatively by the coalition problem. If the collateral is large enough, e.g. $D_J \leq C$, the debt of J is not risky. That means, there is no gain to the coalition $\{E, S\}$ by choosing the inefficient project Y_b. The coalition problem would then be eliminated.[11] If collateral isn't large enough, *e.g.* $D_J > C$, the coalition problem can be at least mitigated. In what follows, first I will show the expected payoffs of each player and of the coalition $\{E, S\}$ with respect to collateral. Again, we derive the conditions for the coalition's incentive to switch to the less risky and inefficient project which now also depends on the size of collateral. Finally, we show how the junior creditor anticipates the coalition problem by rationing her claim D_J.

Assuming $x_i \geq D_S$ (i = a,b) and $D_J > C$, the individual expected payoffs R_j (j = E, S, J) are then given as (i = a,b):

$$\text{(11.1)} \quad R_S = p_i\ D_S - I_S,$$

$$\text{(11.2)} \quad R_J\,(D_J;\,C) = \begin{cases} p_i D_J + (1-p_i)C - I_J & ,\text{if } x_i \geq D_S + D_J, \\ p_i D_J + (1-p_i)C - I_J & ,\text{if } x_i < D_S + D_J \leq x_i + C, \\ p_i(x_i - D_S + C) + (1-p_i)C - I_J & ,\text{if } x_i < x_i + C < D_S + D_J, \end{cases}$$

10 See *Bester* (1985), *Bester/Hellwig* (1987), see for a more detailed analysis *Kürsten* (1997).

11 However, the "normal" asset substitution problem may remain. If the senior claim is risky, the entrepreneur has an incentive to choose risky, maybe inefficient projects. See *Bigus* (1999).

$$(11.3)\qquad R_E(D_J;C) = \begin{cases} p_i(x_i - D_S - D_J) - (1-p_i)C & \text{,if } x_i \geq D_S + D_J, \\ -p_i(D_S + D_J - x_i) - (1-p_i)C & \text{,if } x_i < D_S + D_J \leq x_i + C, \\ -C & \text{,if } x_i < x_i + C < D_S + D_J. \end{cases}$$

The entrepreneur loses the collateral in the bad state, which occurs with probability $(1-p_i)$. If the claim of J is too large, she also loses collateral in the good state. The loss in the good state amounts to $D_S + D_J - x_i$, if $D_S+D_J \leq x_i+C$ and amounts to C, if $D_S+D_J > x_i+C$, respectively. The coalition $\{E,S\}$ now receives a joint return of:

$$(12)\ R_{E;S}(D_J; C) = \begin{cases} p_i(x_i - D_J) - I_S - (1-p_i)C & \text{,if } x_i \geq D_S + D_J, \\ p_i(x_i - D_J) - I_S - (1-p_i)C & \text{,if } x_i < D_S + D_J \leq x_i + C, \\ p_i D_S - I_S - C & \text{,if } x_i < x_i + C < D_S + D_J. \end{cases}$$

With regard to (12), the coalition $\{E,S\}$ will now choose the inefficient project Y_b, if:

$$(13)\qquad p_a(x_a - D_J) - I_S - (1-p_a)C < p_b D_S - I_S - C\text{ , if } x_b+C < D_S + D_J \leq x_a+C,$$

$$p_a D_S - I_S - C < p_b D_S - I_S - C\text{ , if } x_b+C;\ x_a+C < D_S + D_J.$$

With respect to the critical level $\hat{D}_J^C$, the coalition is indifferent between the risky, efficient and the less risky, inefficient project:

$$(14)\qquad \hat{D}_J^C := x_a + C - \frac{p_b D_S}{p_a}\quad .$$

Compared to (6), the critical debt level is increasing in the size of collateral. The junior creditor J anticipates the coalition's choice. Her expected payoff will be:

$$(15)\qquad R_J(D_J;C) = \begin{cases} p_a D_J + (1-p_a)C - I_J & \text{,if } 0 < D_J \leq \hat{D}_J^C, \\ p_b(x_b - D_S + C) + (1-p_b)C - I_J & \text{,if } D_J > \hat{D}_J^C, \end{cases}$$

Substituting $\hat{D}_J^C$ in (15) by (14), one can easily derive, that J will maximize individual expected returns if she chooses the debt level $\hat{D}_J^C$. Therefore there still may me credit rationing, if there is not sufficient external collateral. However, collateral can mitigate the coalition problem. Therefore, one can say, that there is an additional function of *external* collateral: mitigating conflicts of interest between different creditors *before* bankruptcy occurs.

4 Discussion

We shall discuss how restrictive the model assumptions are and how coalition problems may depend on the specific form of senior and junior debt. With respect to the model assumptions we shall mention the shortcomings of the specific two-states-framework and shall discuss the information set.

There has been some criticism on the robustness of the *Stiglitz/Weiss*-model which implies two possible states of nature and defines riskiness by the probability of default. Using density functions of a more general type and referring to the risk definition by *Rothschild/Stiglitz* (1970), the credit rationing result of *Stiglitz/Weiss* and the result that external collaterals are wealth-enhancing, isn't clear-cut (*Kürsten* (1995), (1998)). This caveat may also apply to our model. Investigating these shortcomings more precisely, may be an area for future research.

According to the information set, the model requires that project return isn't verifiable.[12] Thus, the junior creditor can't contract upon project returns. In case of verifiability, the court would observe the actual return and would know which project has been chosen, at least if it was successful. When the bad state occurs,

12 Note that, though project return isn't verifiable the entrepreneur has an incentive to cooperate with the senior creditor choosing the less risky project since then he can gain even more.

however, the court can't find out which project has been chosen, since then both projects yield zero return.[13] Obviously, when we consider more states, a particular *ex post* outcome may not serve as a signal for a particular project choice, especially when we consider continuously distributed project returns. Thus, in a world with more than two states we probably can drop the assumption that project returns are not verifiable. To make the model work, however, we shall at least assume, that project choice isn't verifiable.

Are coalition problems relevant ? It depends on the specific form of senior and junior debt. Certainly, they may be relevant in the case of a me-first rule, where the senior creditor has a prior claim on the firm's total assets without specifying property rights on certain assets. This case is mainly considered in the model. There may be also some relevance in the case of unsecured and subordinated debt when the unsecured creditors have some superior information. However, we don't often observe this latter kind of heterogeneous debt except the debt structure of banks. Rather, we observe a combination of secured and unsecured debt where the secured creditors have some property rights on *specific* firm's assets. Indeed, coalition problems tend to be less severe in the case of unsecured and secured debt than in the former two cases.

When there is secured and unsecured debt, the aforementioned coalition problem won't occur, when a claim is completely backed by collateral and the claim's value is rather independent of investment policy, *e.g.* when the claim is completely backed by mortgages which imply a rather safe return. Thus, the senior creditor tends to have no incentive to choose a less risky investment policy; the coalition problem won't occur. However, when the value of collateral and the secured claim's value depend on investment policy, the senior creditor may be

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13 One may raise the objection, that project choice is revealed by the payments the junior creditor receives. However, this is only true when the project was successful. In the bad state, both projects yield a zero return.

interested in risk-decreasing activities. This may be the case when the claim is backed by a blanket or overall assignment of receivables. To sum up, we may explain why we hardly observe me-first rules and why we observe specific forms of collateral, *i.e.* mortgages[14].

To explain collateral, the literature has pointed out different issues. Unsecured creditors will be unwilling to lend in the first place since their claims may be devalued if the entrepreneur finances bad projects with additional money from new creditors. The fundamental problem is, that the "new" creditors can transfer a part of their default risks to the "old" creditors. Even in a “one-creditor-setting”, there are advantages to secured debt, considering information and agency problems. Secured debt mitigates both problems of underinvestment and overinvestment (see *Stulz/Johnson* (1985), *Hart/Moore* (1995), respectively). Monitoring and bonding costs tend to be lower (see *Drukarczyk* (1991)). When there are several creditors, however, this paper suggests that senior debt may also induce specific agency problems.

Additionally, the coalition problem may also occur when there is priority due to the *maturity* rather than to the rank of debt. When there is risky short-term debt and risky long-term debt and the creditor of the short-term loan has prior information she may be interested in risk-decreasing activities. When the long-term debt isn’t sufficiently backed by collateral, risk-decreasing may lead to wealth-shifting to the cost of the long-term creditors. For instance, this conflict may arise between a well-informed *housebank* with short-term claims outstanding and other creditors (including bondholders) with long-term claims. In order to provide incentives to choosing the less risky investment policy, the housebank

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14 Admittingly, even in a one-creditor-setting mortgages tend to mitigate incentive problems more efficiently than an assignment of account receivables – depending on the specific legal framework, see *Rudolph* (1984). However, here we consider conflicts between different creditors rather than conflicts between the entrepreneur and her creditors.

may offer a side-payment (for instance, favorable terms with regard to the private debt or preferred access to stocks of presumably highly underpriced IPO’s).

With regard to this conflict, the risk-decreasing coalition problem may be relevant in the German *housebank* system. German commercial banks play an important role in financing small and medium-sized companies. Often, the bank has secured claims and close ties to the firms. Therefore, they generally have some superior information on investment policy, whereas other creditors may be left somewhat in the dark.[15] To sum up, there are benefits and costs related to housebank financing. In some cases, the housebank may monitor the entrepreneur on behalf of *all* creditors. Thereby it may realize economies of scale and scope concerning information production and evaluation (see *Bhattarchya/Thakor* (1993)). Moreover, by establishing a long-term relationship, housebanks are able to renegotiate at low costs. However, there are also some costs. The housebank may take advantage of superior bargaining power *ex post* when it has an information monopoly (see *Rajan* (1992)). We focussed on the risk-decreasing coalition problem involving housebanks, which may devalue the claims of other creditors.

So far, we have only considered coalitions between the senior creditor and the entrepreneur. However, it's also possible that the entrepreneur and the *junior* creditor form a coalition. Their aim would be to choose risky projects although it may be inefficient to do so (*risk-increasing coalition problem*). The senior creditor loses when her claim isn’t sufficiently backed by collateral. This kind of coalition problem seems to be especially relevant, when entrepreneurial discretion is not limited too much by internal collateral. For instance, discretion may be hardly limited if there are unsecured debt and subordinated debt with even lower priority, as is often the case in German commercial banks. Recently, it was

15 The degree of asymmetric information might be substantially high even in large companies as the case of the German construction company "Philipp Holzmann" in 1999 showed. Most of the creditors didn't notice that Holzmann was heavily in debt whereas the main creditor, Deutsche Bank, presumably noticed the firm's bad condition.

suggested that the subordinated creditors should monitor the bank on behalf of the unsecured creditors.[16] This proposal seems to be questionable, when there are conflicts of interest and when the subordinated creditors will gain from risk-increasing investments but the unsecured will not.[17]

To sum up, one has to take into account an additional category of agency costs of debt which may arise from conflicts of interests between different creditors. There is somewhat of an analogy to conflicts of interests among heterogeneous shareholders, which may arise between controlling and non-controlling shareholders.[18]

5 Conclusion

In this paper we focus on conflicts of interest between senior and junior debt which may occur prior to bankruptcy. When coalitions between the entrepreneur and one creditor are possible, a special kind of agency problem may arise. The entrepreneur and one creditor could cooperate and change investment policy jointly, at the cost of the remaining creditor assuming the remaining creditor can’t observe investment policy but the coalition’s creditor can. A coalition is formed, when the entrepreneur has no incentive to change the investment policy but one creditor has. If the coalition's gain is positive, the gaining creditor pays a side-payment to the entrepreneur and thus induces her to choose a different, maybe inefficient project. In principle, there are two kinds of coalition problems. The

16 See *European Shadow Financial Regulatory Committee* (1999), p. 209, *Handelsblatt* (1999), p. 27, *Euromoney* (2000), p. 145.

17 To evaluate this problem, one has to ask, whether the risk of the bank's asset portfolio can be changed substantially. In principle, the bank management has the discretion to do so. One can think of asset securitization which can lead to a considerable immediate change in the risk of the bank's asset portfolio.

18 See, for instance, *Bebchuk/Kraakman/Triantis* (1997).

coalition comprised of the entrepreneur and the junior creditor tends to favor risk-increasing, a coalition involving the senior creditor favors risk-decreasing.

In the model, the *risk-decreasing* coalition problem has been analyzed. The entrepreneur and the senior creditor form a coalition. The senior creditor might be a bank with close ties to the firm which may be relevant in the German housebank system. The junior creditor, *e.g.* a supplier, may anticipate this problem and then rations credit supply. If the junior creditor can seize some private wealth from the entrepreneur (external collateral), the problem is mitigated. Note that external collateral serves to mitigating creditor conflicts whereas the literature generally points out that collateral mitigates the entrepreneur-creditor conflict.

We shall mention three caveats. First, since we adopted the framework of *Stiglitz/Weiss* (1981) and *Bester/Hellwig* (1987), one has to check, whether the results will be robust using density functions of a more general type. This might be an area for future research. Second, the severity of the coalition problem depends on the *type* of heterogeneous claims. When there is a me-first-rule or when there is unsecured and subordinated debt, the aforementioned problems may be more severe than in the case of secured and unsecured debt. When the senior claim is completely backed by collateral, *e.g.* by mortgages, the senior creditor doesn't have an incentive for coalition. If it's not fully backed and the value of secured claims depends on investment policy, *e.g.* in the case of blanket assignments of receivables, there still may be a coalition problem. Third, the forming of coalitions tends to be more difficult the more creditors are in the senior class, since there are transaction and negotiation costs. Thus, the coalition problem may not occur when the senior creditors are bondholders. However, the aforementioned problems may be also relevant when priority is due to the *maturity* of claims rather than to the rank of claims.

Thus far, the literature has focussed on the incentive compatible effects of collateral (*Chan/Thakor* (1987), *Bester/Hellwig* (1987), *Kürsten* (1997)), mitigating conflicts of interest between the entrepreneur and the creditors. When the senior claims are completely backed by collateral, they also tend to mitigate conflicts of interest between different creditor classes. Thereby, also the *type* of "collateral" may matter: me-first-rules are probably not suited to mitigating creditor conflicts.

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