Workouts, Court-Supervised Reorganization, and the Choice Between Private and Public Debt*

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Abstract

This paper investigates the interaction between creditor structure and reorganization law. Private debt offers the advantage of flexible renegotiation out-of-court. Due to incomplete information and hold-out incentives, out-of-court renegotiation will typically fail for dispersed public debt. Introduction of Chapter 11-style renegotiation will benefit public debt firms and be harmful for private debt firms. Moreover, Chapter 11 reduces the role of private debt in corporate borrowing, in accordance with the US experience. The overall efficiency of a reorganization law is therefore ambiguous. Three prominent shortcomings of Chapter 11 - its cost and delay, equity deviations and inefficient continuation - are shown to do little harm or to even be welfare-improving, as they increase the incentives to renegotiate debt out of court and to choose private debt. The effect of a low-cost reorganization procedure is more likely to be positive in a market-based financial system.

KEYWORDS: Private and public debt, workouts, reorganization law, Chapter 11, absolute priority rule.

JEL CLASSIFICATION: G21, G32, G33, G34.

1 Introduction

Does a reorganization law increase economic efficiency? And if so, what is the best design of such a law? In many countries, these questions have arisen recently. The recent financial crises in the debt-laden economies of East and South East Asia have led to an acute awareness of the potentially high cost of insufficient bankruptcy laws and lacking reorganization procedures. Similarly, transition economies in East and Central Europe face the need for a massive and parallel financial restructuring of firms representing a considerable part of national income. But there is an ongoing debate also in the developed OECD countries. The discussion about Chapter 11 of the US Bankruptcy Code of 1978, amended in 1994, is perhaps the most prominent example of legislation explicitly encouraging court-supervised reorganization. The French bankruptcy laws of 1985 and 1995 and German legislation put into effect in 1999 have similarly weakened creditor rights and facilitated court-supervised reorganization.[1] In Britain, where the Insolvency Code gives a clear advantage to senior creditors, there is an active debate about reforming the bankruptcy legislation,[2] as for example in the Netherlands and Italy.

Reform of court-supervised reorganization is discussed and enacted across countries with different financial systems. Does the structure of financial markets matter for the performance of a reorganization procedure? Empirical evidence suggests this. Recent studies show that reorganization costs are higher for firms with dispersed debt. Gilson, John and Lang (1990) show that banks are substantially more likely to reschedule out of court. Franks and Torous (1989) and Asquith, Gertner and Scharfstein (1991) show that firms with complicated and dispersed debt structures incur higher bankruptcy costs. James (1996) shows that banks' debt forgiveness is essential for out-of-court restructuring attempts to succeed. Gilson (1997) finds that transactions costs of debt restructuring are lowered for bank-financed firms. Brown, James and Mooradian (1995) show that banks play a preeminent role in urging distressed firms to timely sales of assets.[3] For evidence outside the US, Hoshi, Kashyap and Scharfstein (1990) show that Japanese firms within a *keiretsu* can cope substantially better with financial distress. As for historical evidence, Hauswald (1996) points out that there is a striking coincidence between major reforms of bankruptcy laws and of banking laws in the US and in Germany. It seems likely, therefore,

[1] See Kaiser (1996) and White (1996).

[2] See Franks and Nyborg (1996).

[3] Some studies do not find a significant difference, notably Franks and Torous (1994) and, for a sample of junk bond issues, Helwege (1999). There is no evidence, however, pointing into the opposite direction.

that the efficiency of bankruptcy code and reorganization law depend on the structure of credit markets in the economy. Oddly enough, while financial economists have studied the design of a reorganization law and offered intriguing proposals for ex post efficient reorganization procedures[4], the interaction between debt structure and reorganization law, which is addressed in this paper, has received only scant attention. The present paper addresses this issue.

The most prominent objection against a reorganization law holds that workouts (out-of-court renegotiation) should be a perfect substitute for court-supervised reorganization. Haugen and Senbet (1978, 1988) are probably the best-known proponents of this view which can also be directly traced to Ronald Coase's celebrated theorem. The opposing view, widely held in the informal Law and Economics literature (see e.g. Jackson (1986) and Baird (1995)), points to difficulties of out-of-court debt renegotiation due to hold-out problems. Formal models sharing this view do so by assuming away renegotiation, as in the seminal paper by Bulow and Shoven (1978). In view of these conflicting views, a proper discussion of the efficiency of court-supervised reorganization should take explicit account of the option to choose between court-supervised reorganization and workouts. This is done in the present paper.

The purpose of the present paper is to integrate the choice between court-supervised reorganization and workouts into a model of the choice between public and private debt and to analyze the interaction between these two decisions. The model portrays a firm choosing debt as a disciplining device to safeguard against an empire-building bias of management. Under the desirable form of debt, however, the debt level can be adjusted to the circumstances, so as to block only unprofitable investment projects, while letting pass good projects. Such a filtering device exists in principle in form of debt renegotiation, or debt workouts, but the question is whether debt workouts perform sufficiently well. And here the creditor structure begins to matter.

Workouts are analyzed in a situation of asymmetric information about the true value of the firm. It is shown that the performance of out-of-court debt renegotiation depends on the creditor structure. The paper demonstrates that a dispersed creditor structure will lead to a renegotiation breakdown. Specifically, the following limit inefficiency result is proven: the probability of successful renegotiation approaches zero as the number of creditors increases. By contrast, debt renegotiation with a single lender is (second best)

[4]See e.g. Bebchuk (1988), Aghion, Hart and Moore (1992), Berkovitch, Israel and Zender (1998) and Cornelli and Felli (1997).

efficient. So the results agree with Haugen and Senbet that out-of-court renegotiation will be efficient if the firm is financed by private debt. The results agree with the opposing view of Bulow and Shoven - if the firm is financed by dispersed public debt.

The paper proposes a simple signaling explanation of the choice between private and public debt. Differences in the expected failure risk determine the choice of the debt structure. Managers of riskier firms will use bank loans because flexible renegotiation of loans is more important to them, but bank credit has higher interest rates. High-quality firms will issue public debt as a credible signal of their quality, and get access to more attractive borrowing rates. The model captures the idea that market-traded securities offer the advantage of fast and efficient public propagation of information about the firm. On the other hand, by keeping investors at "arm's length", public debt increases agency costs between investors and managers, namely the agency costs of financial distress.

The results of the present paper show that the interaction between debt structure choice and reorganization procedure matters for the efficiency of a reorganization law. In particular, the following results are obtained: the introduction of a reorganization law (Chapter 11) is not necessarily efficient and the efficiency varies across financial systems. A reorganization law is more likely to be beneficial in a market-based system. It will speed up disintermediation, which is in accordance with the United States experience after 1978 (reform of the Bankruptcy Code). Also, the number of bankruptcy filings (including court-supervised reorganization) will rise after the introduction of a reorganization law - as was observed in the US.

The three most frequently cited shortcomings of the Chapter 11 procedures are examined. They could be less harmful than commonly perceived, and will typically even improve the efficiency of the reorganization procedure, as they increase the incentives to choose bank debt and to renegotiate out of court. First, violations of the absolute priority rule - shareholders receive a positive value after bankruptcy - will reverse the debt structure choice to more private debt and lead to an equilibrium with higher welfare. Second, inefficient continuation or inefficient liquidation of firms, as frequently observed under Chapter 11, could actually make the use of court-based procedures more costly and thus improve welfare. Again, this becomes only clear if the feedback effects on the debt structure are taken into account. Third, high costs or long duration of the court procedure could lead to more efficiency overall for similar reasons. Seemingly paradoxically, if bankruptcy costs are high, it is more likely that increasing them even further will improve matters, explaining a *trap* for bankruptcy reform. Whether speeding up bankruptcy pro-

cedures or reducing bankruptcy costs is desirable depends on the financial system: It is more likely to be welfare-improving in a market-based system.

The model of the choice between public and private debt follows ideas developed in the substantial literature on this subject. Diamond (1991), Chemmanur and Fulghieri (1994), Dewatripont and Maskin (1995) and von Thadden (1995) have models where private debt leads to a reduction of agency costs because investors can monitor the firm. Rajan (1992) suggest that banks have no incentive to lower interest rates when receiving favorable news about the firm because this information remains private. High-quality firms will therefore have a distaste for bank debt. There are a few papers where the choice between private and public debt is based on differences in debt reorganization. The present model shares this idea but differs substantially from the other papers. In the papers of Detragiache (1994), Bolton and Scharfstein (1996) and Bolton and Freixas (2000), issuing public debt serves as a commitment against risk-shifting or strategic default. Green and Juster (1995) propose a financial signaling model where public debt is chosen as a signal of high quality. Their model is conceptually the closest to the present paper.

To the best of my knowledge, this paper is the first integrating the choice between workouts and court-supervised reorganization into a model of the debt structure decision. A few other papers combine a choice between workouts and court-supervised reorganization but they omit the debt structure choice and are of more limited scope. Gertner and Scharfstein (1991) analyze a model of workouts under perfect information. Inefficiencies among multiple creditors arise due to a hold-in effect if coercive exit consents are used. To see the difference, note that in the context of a debt overhang situation as in the present paper, a workout would actually be more efficient if debt is dispersed rather than concentrated. White (1994) conceives of Chapter 11 as a filtering device which makes the emergence of inefficient pooling equilibria less likely. Hold-out effects if there are many creditors have been demonstrated before, notably Bolton and Scharfstein (1996) and Detragiache and Garella (1996). Compared to these papers, the present model has two innovations. First, dispersion and concentration of debt arise endogenously. Second, uninformed investors are holding *common beliefs* about the actual value of the firm.

Finally, two earlier papers discuss that the optimal bankruptcy design may depend on the dominant debt source of firms, or on the financial system. Berkovitch and Israel (1999) show that a debtor chapter may be efficient for arm's length creditors in a market-oriented system, but may be counterproductive for relationship creditors in a bank-oriented system. The driving force is the difference in the information level of creditors. The paper by

Detragiache (1994) is closer to the present one since there are no information differences between bank and public debt creditors. Firms choose public debt as a commitment device against increasing the probability of bankruptcy. In both papers, the interaction between the debt structure and the bankruptcy code is only one-sided: Unlike the present paper, they do not take into account that the design of the reorganization procedure will also feed back into the average debt structure, or the shape of the financial system. Also, both papers remain silent about the decision between workout and court-supervised reorganization. As a result, they cannot discuss how specific features of the reorganization law design, like the extensions discussed in this paper, influence the efficiency of the law by making out-of-court restructurings more or less likely to succeed.[5]

The paper is organized as follows: the model is set up in Section 2. In Section 3, debt renegotiation is analyzed and the market equilibrium is presented. In Section 4 and Section 5, the impact of a court-supervised reorganization procedure and of presumed deficiencies in the US Bankruptcy Code are examined. In Section 6, some empirical implications are summarized. Section 7 concludes.

2 The Model

2.1 Investment Project

Consider a firm where the capital structure choice in t_0 is made to ensure the best possible investment incentives in t_1. All financial variables are expressed in t_0 present values. The investment opportunity in t_1 necessitates costs of I which are unknown in t_0. The common prior belief is that I is uniformly distributed over a unit interval, $I \sim U[\underline{I}, \overline{I}]$, where $\overline{I} = \underline{I} + 1$. In t_1, the manager learns privately the realization of I, while investors remain uninformed. Investors receive a (verifiable) signal about I only in t_2.

The project yields an incremental cash flow of either R or nothing in t_2. Whether R is received depends on the type of the project $\phi \in \{H, L\}$: If the project is good, $\phi = H$, then the cash flow R is received with certainty. If it is bad, $\phi = L$, then the cash flow is risky: R is received with probability $q < 1$, and nothing with probability $1 - q$. In t_0, ϕ is

[5] Detragiache discusses some shortcomings of Chapter 11, but her paper comes to markedly different conclusions regarding the efficiency: Under the parameter specifications of the present model, Detragiache's model would predicts that Chapter 11 is always efficient and that equity deviations make things always worse. Moreover, in her model, low quality firms choose public debt, whereas inthe present model, high quality firms choose public debt.

unknown to all parties, and the project is expected to be good, $\phi = H$, with probability α, and bad, $\phi = L$, with probability $1 - \alpha$. The true realization of ϕ, $\phi = H$ or $\phi = L$, becomes publicly observable in t_1. The following assumption is made:

$$R - \overline{I} > 1 \qquad \text{and} \qquad 0 > q\,R - \underline{I}\,. \tag{1}$$

This assumption assures that the project is profitable if it is good and wasteful if it is bad, regardless of the realization of I. Moreover, if it is good, the minimum expected surplus, $R - \overline{I}$, is always larger than the interval of uncertainty about the project value. Both assumptions are not essential for the results, but they simplify the algebra.

From the assets already in place in t_0, the firm derives an uncertain cash flow Y. Y determines whether the firm will have abundant or little internal funds available. As of t_0, Y is projected to be low, $Y = \underline{Y}$, with probability θ and high, $Y = \overline{Y}$, with probability $1 - \theta$. Y is received in t_2, but the realization of Y is publicly observable in t_1. θ can be directly interpreted as the *business risk* of the firm, as will be seen. At t_0, the value θ is private information of the firm's owner. For simplicity, it is assumed that θ is uniformly distributed over an interval with a minimum of $\underline{\theta}$ and a maximum of $\overline{\theta}$, $\theta \sim U[\underline{\theta}, \overline{\theta}]$. The timing of the model is summarized in *Figure 1.*

Thus, uncertainty in the model is governed by four random variables, investment cost I, cash flow Y, project quality ϕ and business risk θ. All four random variables are assumed to be independently distributed. The two variables Y and ϕ determine the publicly observable (and verifiable) *state* in t_1, at the time of the investment decision. Four states are then possible: *(i)* in the best case, $(\overline{Y}, H)$, the firm is rich in internal funds Y and has good investment prospects; in the two intermediate scenarios, the firm may either *(ii)* $(\underline{Y}, H)$, be poor in cash but have good investment prospects; *(iii)* $(\overline{Y}, L)$, be rich but have no good ways to invest. Finally, there is *(iv)* the worst case $(\underline{Y}, L)$ where the firm is poor in cash and in investment opportunities. We assume that

$$\underline{Y} > \overline{I} - q\,R\,, \tag{2}$$

which says that the manager will always have enough internal funds to finance the bad project, if he wants to, even in the poor cash flow state $\underline{Y}$, and even if the highest possible investment $\overline{I}$ needs to be raised.

The interesting conflict of objectives in this model arises between state $(\underline{Y}, H)$, where the project is desirable but cash flow is low, and state $(\overline{Y}, L)$, where it should be blocked but cash flow is abundant. In order to highlight this conflict, we introduce the following

assumption:

$$\overline{Y} + q\,R > \underline{Y} + R\,. \tag{3}$$

Inequality (3) assumes that the expected t_2-cash flow, which can be pledged to obtain funding, is larger in state $(\overline{Y}, L)$ than in state $(\underline{Y}, H)$. We will next derive a rationale for the firm to include state-contingent debt claims in its financial structure, and conditions (2) and (3) will greatly simplify the number of cases to be considered in this analysis.

2.2 Managerial Discretion and the Capital Structure Trade-off

In t_0, the owner delegates the operation of the firm to a manager. The manager has discretion over the investment project, and he receives the private signal about I in t_1. Prior to that, the owner chooses the capital structure of the firm, with the objective to mitigate the consequences of this delegation.

As part of the capital structure decisions in t_0, the owner decides first whether to use publicly traded debt or private debt, like bank debt. Mixed debt structures combining both debt forms are not considered in this paper.[6] The choice between public or private debt captures the difference between renegotiable and non-renegotiable debt. If the owner decides to use private debt, then she borrows only from one bank. If she chooses public debt, she sells n corporate bonds to n investors who purchase a single bond each. The markets for private debt and for public debt are both competitive.

This model is inspired by the well-known theories that hard claims (debt) serve as a disciplining device to safeguard against managerial discretion. The manager derives utility from undertaking the project: If the project is undertaken, then the manager obtains a non-transferable, non-monetary control rent B, irrespective of the project's profitability. This control rent captures non-transferable benefits from controlling a larger company than before, or *"empire-building"* motives. Empire building is also the driving force behind the well-known models of the debt-disciplining theory of capital structure by Stulz (1990) and Hart and Moore (1995), who formalize earlier ideas on the "free cash flow problem" and managerial overinvestment expressed notably by Jensen (1986).[7]

The manager is assumed to maximize his own utility when making the investment decision. Therefore, from the owner's point of view, the manager needs to be given the right incentives to align his preferences with the interest of the equityholders. Two

[6] This assumption is made for expositional reasons and is not essential for the results of this paper.

[7] Zwiebel (1996) proposes a model where the manager himself chooses hard claims as a commitment device.

distinct devices can serve this purpose: either *(A.)* a direct incentive contract, or *(B.)* debt disciplining via the capital structure choice.

A. Direct Incentive Contracts: All feasible direct incentive contracts can be represented by a monetary compensation schedule w which is paid to the manager in t_2; w can be a function of all verifiable variables, i.e. the state (Y, ϕ), the level of investment I and the final payoff, $\{0, R\}$. We assume that such an incentive contract w can be proposed by the owner in a take-it-or-leave-it offer in t_1, after the state is observed. The manager then accepts or rejects the contract offer.[8]

Feasible incentive contracts are constrained by the following assumption: *The manager has no wealth and is protected by limited liability.*

With this constraint on possible contracts, two elements explain then why the owner may actually find it too costly to propose such a direct incentive contract. First, the compensation must be large enough to overrule the benefit B that the manager receives when undertaking the project. Second, since the manager is protected by limited liability and has no personal wealth to pledge, the harshest punishment that can be inflicted on the manager is a zero wage.

Therefore, the question is when the owner would find that these obstacles make incentive contracting an unattractive route to align the manager's actions with the goal of equity value maximization. We find:

Lemma 1

(i) If the control rent is below the maximum loss from the bad project, $B \leq \overline{I} - q\,R$, and if the project is bad, then the owner will propose an incentive contract, offering a payment $w^*(I)$ to the manager if and only if the project is not undertaken, where $w^*(I) = B$ for all I such that $B \leq I - qR$, and $w^*(I) = 0$ for all smaller I. If the project is good, there will be no incentive contract.

(ii) If $B > \overline{I} - q\,R$, then the owner will never propose an incentive contract.

Proof: See the Appendix.

The Lemma says that the owner will only offer a sufficient compensation to dissuade the bad investment if $B \leq I - qR$, that is if the private benefit to the manager is not larger

[8] This set-up comprises the alternative assumption that the owner proposes the incentive contract w in t_0, if the t_0-contract can be renegotiated in t_1. Also, a different distribution of the bargaining power over the incentive contract would not qualitatively change our results.

than the loss from undertaking the bad project. Otherwise, a zero compensation will be offered and the manager will undertake the bad project. This finding is very intuitive: If we think of the incentive contract as a bribe to influence the manager's actions, then clearly the bribe will only be used if the utility gain for the owner is larger than what it costs to buy the manager.[9]

We conclude that there are important cases where a direct incentive contract is too expensive to block a bad investment.

B. Debt Disciplining. This leaves the capital structure as the only other option to achieve equity value maximization. For the analysis of this alternative, the expected net value of the project in t_0 will be expressed as V, that is V is the firm value *minus* the expected value of the cash flow Y. The project value V may be a function of the business risk θ, but this argument is suppressed whenever possible. $EI = \underline{I} + \frac{1}{2}$ denotes the expected investment cost.

Consider first the case where there is no debt, $D = 0$. The manager will then always undertake the investment project, and the project value V is the same as for an all-equity firm:

$$V^{LOW} = (\alpha + (1-\alpha)q)R - EI\,. \tag{4}$$

In fact, the same project value is obtained as long as debt is below the threshold where debt starts to have an impact on the manager's investment decision, or:

$$D < Y + q\,R - \overline{I}\,. \tag{5}$$

Condition (5) says the existing debt level D will leave the manager enough borrowing slack in all contingencies: By issuing debt or equity against the t_2-cash flow which is not ye pledged, $Y + qR - D$, the manager can raise at least $\overline{I}$, the highest possible funding needs.

Now consider a debt level which is higher than the threshold expressed in inequality (5). Let us assume for the moment that debt is not renegotiable. Assume that the debt level is just high enough to block bad projects, but not large enough to also block good

[9] From the point of view of *social* welfare maximization, i.e. when taking into account the manager's welfare as well, the contracts listed in Lemma 1 would amount to an efficient solution. However, the owner is interested in maximizing the equity value, and knowing that the manager's benefit B is non-expropriable, she will typically prefer another solution than a social planner would.

projects. This is the case if

$$\underline{Y} + q\,R - \underline{I} < D < \underline{Y} + R - \overline{I}\,. \tag{6}$$

After substituting condition (3), expression (6) implies that $D < \overline{Y} + qR - I$, so the bad project will be undertaken if the high cash flow $\overline{Y}$ is realized. The expected value increment in this case would be:

$$V^{MED}(\theta) = (1-\theta)[(\alpha + (1-\alpha)q)R - EI] + \theta\alpha[R - EI]\,. \tag{7}$$

Finally, consider a further increase in leverage, such that the debt claim D is high enough to block an inefficient investment even if the cash resources are large, $Y = \overline{Y}$. D must then be chosen such that

$$D > \overline{Y} + q\,R - \underline{I}\,. \tag{8}$$

We call the minimum debt level satisfying inequality (8) D^{HIGH}. A leverage increase to D^{HIGH} or more, however, leads to a cost: Condition (3) implies that $D^{HIGH} > \underline{Y} + R - \underline{I}$. That is, if the low cash flow $\underline{Y}$ is realized, then good *and* bad investments are blocked. Hence the ex ante net value in this case will be

$$V^{HIGH}(\theta) = (1-\theta)\alpha\,(R - EI)\ . \tag{9}$$

Comparison of (7) and (9) shows that $V^{HIGH}(\theta) > V^{MED}(\theta)$ if

$$\theta\alpha\,(R - EI) + (1-\theta)(1-\alpha)\,(q\,R - EI) < 0\,. \tag{10}$$

Moreover, it can be verified that $V^{HIGH}(\theta) > V^{MED}(\theta)$ implies $V^{HIGH}(\theta) > \max V^{LOW}$. Hence, if condition (10) holds, then issuing debt of (at least) D^{HIGH} is optimal. Since this depends on the failure risk θ, the obvious next question is: What is the condition such that all types θ would optimally issue debt of D^{HIGH} or higher? This will be the case if (10) holds for all values of θ and I, or if:

$$\overline{\theta}\alpha\,(R - \underline{I}) + (1-\overline{\theta})(1-\alpha)\,(q\,R - \underline{I}) < 0\,. \tag{11}$$

Condition (11) says that the expected loss from undertaking the unprofitable investment in state $(\overline{Y}, L)$ is larger than the expected loss from blocking the efficient investment in state $(\underline{Y}, H)$, even if investment costs $\underline{I}$ are low.

To conclude, we have identified the two parameter conditions making sure that debt-disciplining is the preferred option. From now on, the analysis will focus exclusively on the case where these two parameter conditions hold jointly, namely inequality (11) together with the condition identified in Lemma 1:

$$B > \overline{I} - q\,R\,. \tag{12}$$

These two conditions imply that *(i)* the owner will always issue debt D^{HIGH} (or higher) in t_0, and that *(ii)* a direct incentive contract will not be used since the manager's private benefit from undertaking the project exceeds the largest loss that the bad project may entail.[10]

As a result, the debt level choice D^{HIGH} will be preferred even if it means blocking good projects if the poor cash flow $\underline{Y}$ is realized. Moreover, our earlier parameter restrictions (1) - (3) imply that it is impossible to block any bad project if $Y = \overline{Y}$ without at the same time blocking all good projects if $Y = \underline{Y}$, whatever the actual realizations of failure risk θ and the investment cost I.

The basic trade-off of the capital structure choice can be summarized as follows: On the one hand, debt is used as a "hard claim" against the overinvestment bias of management. On the other hand, debt raises the prospect of financial distress in the form of *debt overhang* (or "underinvestment") (see Myers (1977)). More precisely, debt overhang occurs in this model if the investment project is known to be profitable, $\phi = H$, but cannot be financed because all of the surplus would be appropriated by existing claims of (senior) securities. Even if nothing can be done to mitigate this trade-off, the preferred choice is the high debt level D^{HIGH}, due to the assumptions (11) and (12). Debt is used to discipline the manager, a gain outweighing the cost of lost growth opportunities.

The analysis, however, does not stop there. Importantly, any contract device putting in place a *"filtering"* debt barrier that only blocks bad projects while being passed by good projects would be a welcome improvement. The owner in fact prefers filtering or *"state-contingent"* debt, i.e. debt claims leaving open the possibility to obtain debt concessions in state $(\underline{Y}, H)$, when internal funds are insufficient to finance a good project. Debt *renegotiation* serves as the vehicle to introduce the optimal form of state-contingency.

[10] It is also easy to see that any *combination* of direct incentive contract and capital structure does not yield a better solution for the owner: First, if debt of D^{HIGH} or higher is issued, bad investments are blocked, and there is no role for an incentive payment w. Second, if the debt level is insufficient to block a bad investment, the manager still would have to be compensated for the full amount of his benefits, $B + \overline{I} - I$, which, by Assumption (12), exceeds the benefits to the owner of doing so.

To make sure that the manager cannot effectively eliminate the disciplinary effect of debt by issuing more senior claims in t_1, the owner will protect the debt claims issued in t_0 by a *seniority covenant*, a condition prohibiting the issue of more senior claims.[11]

A final consideration: Wouldn't it be better to postpone issuing debt to t_1, when the information on the quality of the project is publicly revealed? The answer is negative: If the firm is not leveraged from the beginning, the manager would have the possibility to raise cash in t_0, and given his preferences, he would surely do so and ensure investment in t_1 in all states. But this cannot be optimal, given that condition (11) is assumed to hold.

2.3 Debt Renegotiation: Period t_1

The presence of a debt overhang problem creates a rationale for a state-contingent debt claim: it would be desirable to have a low debt claim in the bad cash flow state $\underline{Y}$ and a high debt claim in the good cash flow state $\overline{Y}$, each filtering out the inefficient, but not the efficient project. State-contingent debt can be obtained through *debt renegotiation* in the bad state $\underline{Y}$.

The timing in t_1 is as follows. After Y is publicly revealed, debt can be renegotiated. Renegotiation is simply modelled as a one stage take-it-or-leave offer. In case of public debt, the manager is making the offer. In case of bank debt, the bank makes the offer.[12] There is no cost associated with debt renegotiation. Possible votes of the existing debtholders on the removal of the seniority covenant are not taken into account in this paper.[13]

The renegotiation game captures debt renegotiation out-of-court. After debt renego-

[11] Smith and Warner (1979) among others document the wide-spread use of seniority covenants in practice.

[12] This bargaining model was chosen to capture two realistic features: *(i)* Exchange offers are almost always initiated by managers and decided upon by investors. *(ii)* Banks wield considerable bargaining power in debt restructurings. This is captured by making the manager the first and the bank the last to make an offer. The results are robust with respect to the renegotiation procedure (see Section 6).

[13] In particular, this excludes *exit consents* which make the right to receive senior securities conditional on the approval of the exchange offer and the seniority waiver. Exit consents are an attractive instrument for the debtor in the present model, because they reduce the incentives of small creditors to hold out. A sequel to the present paper shows in fact that exit consents further weaken the case for a reorganization law (Hege and Mella-Barral (2000b)). Important prior discussions on exit consents are in Gertner and Scharfstein (1991) and Kahan and Tuckman (1994). Hege and Mella-Barral (2000a) argue that exit consents suffer from a time consistency problem: Creditors will only tender if the debtor can commit not to offer more senior securities later on.

tiation, any of the creditors can file for bankruptcy if the firm is not able to meet the payments due in t_1 or t_2. Bankruptcy is tantamount to liquidation, as in Chapter 7 of the US Code. Then the investment opportunity I is lost and remaining assets are distributed respecting priority. In the basic model, there is no court-supervised reorganization procedure. This is introduced in Sections 4 and 5.

In principle, neither the equityholder nor the manager should retain any value when the firm is in financial distress. However, only the manager knows the true value of I and how much debt reduction is precisely needed in order to realize the project value V. We assume that, if investment is undertaken, the manager can raise up to $\overline{I}$ on the market in t_1. *Any excess funds, $\overline{I} - I \geq 0$, can be immediately appropriated and consumed by the owner.* Moreover, we assume that the *manager will always raise as much fresh money in t_1 as investors are willing to lend.*[14]

The workout is successful if and only if the debt level after renegotiation D does not exceed $R - I$. If this condition is satisfied, $D \leq R - I$, then the manager could obtain funds from any of the following three sources: *(i)* The initial lender(s) how hold debt claims worth D; *(ii)* the owner of the firm, provided she has a sufficiently deep pocket; *(iii)* new investors. The reason that all three would make the same financing decision - provide the new funds if and only if an additional expected return of I can be pledged - is that any earlier investment is sunk and makes no difference. Also, competition on the capital markets ensures the financier of the project receives a zero profit on the funds I. Therefore, there is no difference in the incumbent investors' renegotiation behavior whether they or new investors provide the funds in t_1.

This renegotiation model contributes to the work on inefficient debt renegotiation with multiple creditors. In the present model, the bondholders share *identical beliefs* about the value of the firm. This seems to be the natural assumption. This is contrast to all the earlier contributions which have assumed that the creditors hold heterogeneous private beliefs about the value created by a successful workout.[15] The present paper demonstrates

[14]This assumption is in fact already implied by the existing components of the model, as the following discussion shows. Since the owner pockets any excess funds $\overline{I} - I$, she will make sure, if the firm is distressed in t_1, that the manager has incentives to in fact raise exactly $\overline{I}$. These incentives are easily given by offering a compensation schedule $w(I) = \varepsilon(\overline{I} - I)$ to the manager - recall that this is feasible, since I is verifiable by the time that $w(I)$ will actually be paid out, in t_2. The owner would choose ε arbitrarily small, which is why we can neglect this payment, and replace it for simplicity by the assumption that the manager always raises $\overline{I}$ in financial distress.

[15]In particular, Bolton and Scharfstein (1996), Hart and Moore (1994) and Detragiache and Garella

that the hold-out effect with many creditors will also arise if investors have *homogeneous beliefs, but incomplete information* about the firm valuation.

The equilibrium concept applied throughout is Perfect Bayesian Equilibrium.

3 Workouts and Market Equilibrium in the Absence of a Reorganization Law

The model will be solved backward in the usual fashion, starting with debt renegotiation in t_1. Debt renegotiation is of interest only if the state $(\underline{Y}, H)$ has been realized, that is if the firm has the low cash flow but the project is good. Renegotiation can succeed only in this state, and the subgame starting after state $(\underline{Y}, H)$ will be called the *renegotiation game*. We will analyze this subgame for the private debt case and the public debt case separately, before turning to the market equilibrium.

3.1 Renegotiating Private Debt

To solve the renegotiation game for private debt, we need to proceed backwards. The manager will accept any offer that gives him more than zero. The bank has all the bargaining power when fixing the concession. Like a monopolist supplier who takes the demand effect into account when fixing prices, the bank will take into account that the size of the concession will increase the success probability of the workout. This success probability will depend on the distribution of I which the bank has to guess. The bank forgives debt up to a limit which solves the maximization problem of a monopolist having all the bargaining power.

In the state $(\underline{Y}, H)$ that we consider, $\underline{Y} + R$ is the certain return in t_2. Therefore, the *maximum* concession that the bank needs to consider is to reduce the face value of its claim to $\underline{Y} + R - \overline{I}$: This leaves the manager the possibility to pledge up to $\overline{I}$ to investors providing new money, enough to finance the investment even under the highest possible cost realization. The *minimum* concession that the bank would possibly consider is to lower the debt value to $\underline{Y} + R - \underline{I}$: This would at least allow to finance the good project if the investment costs are at the lowest possible value, $\underline{I}$. This is the minimum concession

(1996) consider the private values case where investors have different valuations for the company. Detragiache and Garella (1996) analyze moreover a common values model where valuations are identical, but individuals obtain heterogenous signals about the true value of the firm.

since below this threshold, the bank would prefer to make no concession at all. For any intermediate concession proposal of the bank, say a concession to $\underline{Y} + R - \overline{I} + x$, where $x \in (0, 1)$, the management can raise up to $\overline{I} - x$. This means that the concession will fail to enable the investment for all cost realizations in the interval $[\overline{I} - x, \overline{I}]$, an event which has a prior probability of x (by virtue of the uniform distribution of investment costs).

We can then consider x as the bank's choice variable when making the renegotiation proposal. If the manager can undertake the project, the bank will get a final payoff equal to the reduced face value, $\underline{Y} + R - \overline{I} + x$; if he can't, the bank, as the residual claimant, gets the entire proceeds in t_2, but those are only worth $\underline{Y}$. Therefore, the bank has an expected payoff of:

$$(1 - x)(\underline{Y} + R - \overline{I} + x) + x\,\underline{Y}\,.$$

The bank maximizes this quadratic (strictly concave) objective function by choosing x, and the first-order condition is

$$-(R - \overline{I}) + 1 - 2x\,.$$

Recall that $R - \overline{I} > 1$, as assumed in Condition (1). Therefore, the first-order condition is always negative, and the boundary condition $x = 0$ is the unique solution for the bank's renegotiation offer. We have shown that:

Lemma 2 *Suppose the firm has private debt. In the unique equilibrium outcome of the renegotiation game, renegotiation is successful with probability one.*

Proof: See the Appendix.

Intuitively, the minimum value of the good project $R - \overline{I}$, is also the minimum gain to the bank if renegotiation is successful. This gain is always larger than 1, and hence larger than the interval of uncertainty about the true value of the project. Therefore, the bank finds it optimal to make a generous renegotiation strategy, by sacrificing some value in order to not endanger the success of the workout.

3.2 Public Debt

In the case of public debt, it turns out that the possibility to obtain debt concessions depends crucially on the probability that any individual of the many dispersed creditors

is *pivotal*[16] for the success of the exchange offer. An exchange offer is said to be *made conditional on unanimous consent* if at least one investor will not receive the new debt contract in exchange for the old one in spite of accepting the offer. The following additional assumption will be introduced:

Assumption 1 *Exchange offers are not made conditional on unanimous consent.*

It is not excluded that exchange offers are made *conditional on success* of renegotiation (i.e. sufficient participation to overcome the debt overhang problem).

Empirically, Assumption 1 seems plausible: Exchange offers are frequently made conditional on a certain *threshold* of approval (usually a fraction of outstanding debt), but *never on everyone's approval.* A manager, when making an exchange offer simultaneously to many dispersed bondholders, cannot rely on all bondholders actually responding, let alone on all bondholders responding in a rational fashion. Thus, the assumption can be viewed as a reduced form representation for a richer model where the manager holds beliefs that with some probability, one of the many investors might not be fully rational. From the theoretical point of view explored in the mechanism design literature, this assumption is important, however: If the manager could make an exchange offer conditional on unanimous consent, then he could ensure that every single creditor is always pivotal if all other investors accept the offer. This would be a powerful tool against hold-out incentives and make dispersed debt akin to bank debt.

The central piece of the analysis, which is sufficient to understand the inefficiency result in Lemma 3 below, will be developed next, leaving the remainder to the Appendix. Here, we focus only on the case where the exchange offer is made conditional on success. Suppose $n-1$ investors do exchange, and consider the problem of the n-th investor. Recall that $R-EI$ is the expected value of the good project and $R-\overline{I}$ the lowest possible value of the good project. The terms of the exchange offer are: each debt contract, with a face value of D/n, is exchanged for a new and lower contract with a face value of $(\underline{Y}+R-\overline{I}+x)/n$. That is, x denotes the aggregate debt level that is offered to all the bondholders in excess of $\underline{Y}+R-\overline{I}$, which is what the bondholders collectively could be paid even from the worst investment cost type, $\overline{I}$. Each bondholder is asked for a concession of $\hat{D}/n = D/n - (\underline{Y}+R-\overline{I}+x)/n$. As in the analysis of private debt,

[16] A creditor i is said to be pivotal if the exchange offer is successful (enabling investment) if creditor i accepts and fails if creditor i rejects the offer, everything else being unchanged.

$x \in [0,1]$, covering the range of uncertainty over the true investment costs I, x captures at the same time the failure probability for the workout.

We will next consider the incentives of the n-th bondholder to approve the exchange offer. On the one hand, if the n-th bondholder approves the exchange, then the success probability is $1-x$, the total reduction of debt claims below the firm value in the best possible case, $\underline{Y} + R - \overline{I} + 1$. The n-th investor would then earn a profit of π^e:

$$\pi^e = (1-x)\frac{\underline{Y} + R - \overline{I} + x}{n} + x\frac{\underline{Y}}{n}\,.$$

On the other hand, consider the consequences of the n-th bondholder holding out. An important effect is that this reduces the success probability for the exchange offer overall, and we need to take this into account. The reduction of the success probability is n's probability of being *pivotal* for the success, which we denote by $\mu^n(x)$. We can calculate $\mu^n(x)$ as follows: Under the uniform distribution, the probability of being pivotal is the size of a hold-out's non-surrendered debt claim, $\hat{D}/n$,[17] relative to the range of possible continuation values for the firm where the exchange offer could succeed if everybody agreed, which is an interval of length $1-x$. Thus:

$$\mu^n(x) = \frac{1}{1-x}\frac{\hat{D}}{n}\,. \tag{13}$$

If the n-th bondholder decides to hold out, his expected payoff π^h is:

$$\pi^h = x\frac{\underline{Y}}{n} + (1-x)\begin{cases} D/n & \text{with probability} 1-\mu^n(x) \\ \underline{Y}/n & \text{with probability } \mu^n(x) \end{cases}\,.$$

The condition for the n-th bondholder accepting the exchange offer, conditional on all other $n-1$ other bondholders tendering, can then be written as the incentive constraint $\pi^h \leq \pi^e$, which is:

$$x\frac{\underline{Y}}{n} + (1-x)\left[\left(1-\mu^n(x)\right)\frac{D}{n} + \mu^n(x)\frac{\underline{Y}}{n}\right] \leq x\,\frac{\underline{Y}}{n} + (1-x)\frac{x + \underline{Y} + R - \overline{I}}{n}\,, \tag{14}$$

or:

$$\left(1-\mu^n(x)\right)D + \mu^n(x)\underline{Y} \;\leq\; x + \underline{Y} + R - \overline{I}\,. \tag{15}$$

Under the "best" exchange offer from the manager's point of view, this incentive constraint is just binding. For inequality (15) to be satisfied, $\mu^n(x)$ must be strictly larger

[17] After tendering, each debtholder has a claim worth $(\underline{Y} + R - \overline{I} + x)/n$, if holding out, she keeps the original claim D/n.

than zero, since $D > x + \underline{Y} + R - \overline{I} > \underline{Y}$. But then reconsider equation (13): It is clear that $x \to 1$ is necessary for $\mu^n(x)$ to be bounded away from zero. In other words, the possible excess cash reserves in the firm, $1 - x$, must be extremely small so as to give even a very small investor a sufficient probability of being the pivotal voter in the exchange offer. This in turn implies that the ex ante probability of successful renegotiation is negligible.

The formal result is summarized in the following Lemma:

Lemma 3

(i) Suppose the firm issues public debt. Then as n, the number of investors, goes to infinity, the probability of renegotiation being successful approaches zero.

(ii) For large enough n, no subsequent attempt to create a concentrated creditor structure (for example, a single creditor purchasing the outstanding bonds on a secondary market) can be successful.

Proof: See the Appendix.

Lemma 3 has the following intuition: As the share of a single investor in the total debt gets smaller and smaller, the probability of her being pivotal decreases. The more investors there are, the larger the incentive to hold out. Hence the manager, if he is to meet the incentive compatibility constraint ensuring that holding out is not lucrative, can offer only an exchange that leaves a smaller and smaller expected surplus to the owner.

The intuition behind the second part of Lemma 3 is closely related. The optimal exchange offer will have binding incentive constraints for each of the creditors. From incentive condition (14), adapted to the non-symmetric case, it follows that the larger the fraction of total credit held by a single creditor, the larger the probability of being pivotal. Hence a large investor will be asked to forgive more, and the size of a creditor's stake affects her return negatively. Therefore, no single investor would find it profitable to undo a dispersed debt structure.[18]

Note that incomplete information is a necessary ingredient for the result. Suppose to the contrary that there is perfect information about I. The manager would submit an offer that is just sufficient to achieve efficiency, but needs every single investor's acceptance and make the offer conditional on renegotiation success. This is tantamount to conditioning on unanimous approval: by accepting, nobody can lose; each investor is worse off when renegotiation fails, so acceptance is a weakly dominant strategy.

[18] This effect is resembles the well-known free-rider problem in the takeover literature.

3.3 The Market Equilibrium

Next, we will turn to the question how owners choose their creditor structure as a function of their initial business risk type, θ. Since θ is private information of the owner, the market equilibrium is a signaling equilibrium where each θ-type will self-select to the specific debt instrument that will truthfully disclose the type. The costly signal is the expected costs of financial distress which vary according to the type θ and the debt instrument: The higher the failure risk, the more beneficial is it to have renegotiable private debt. Private debt is efficient in the bad state, and in addition it offers a direct benefit to the owner in form of a part of the renegotiation surplus. Owners who attach a low probability to financial distress prefer inefficient renegotiation. In turn, they will receive a more favorable interest rate.

We will next explore these ideas formally. Consider the expected payoff of the owner if the firm has private debt and enters renegotiation, i.e. if the debt overhang state $(\underline{Y}, H)$ has occurred. Renegotiation succeeds with probability 1 (see Lemma 2), the bank reduces its claim to $D = \underline{Y} + R - \overline{I}$, and the owner keeps the remainder, which is $R - EI - D = \frac{1}{2}$. Thus, the owner's expected payoff in this state is equal to $\frac{1}{2}$ with bank debt.

The best initial loan offer the owner can propose is the offer that would give a bank just a zero expected profit. The bank has only one piece of information at hand to update its belief about θ, namely the fact that the owner chooses private debt. Let us guess that all types θ higher than some cutoff type θ^C choose private debt. For the disciplining effect of debt finance, a debt face value of at least D^{HIGH} needs to be issued, and we assume that the debt level is chosen at this lower bound, $D = D^{HIGH}$. Since the bank makes zero profit, this debt will be priced in t_0 at its fair value, K_0^B. The bank pays K_0^B to the owner in t_0 in exchange for the claim D^{HIGH},[19] where K_0^B is equal to:

$$K_0^B \;=\; \left(1 - \frac{\overline{\theta} + \theta^C}{2}\right) D^{HIGH} \;+\; \left(\frac{\overline{\theta} + \theta^C}{2}\right) \left(\underline{Y} \;+ \alpha \left(R - \overline{I}\right)\right). \tag{16}$$

The first term on the right-hand side expresses the no-default payoff, the second the default payoff, taking into account that good projects yield a benefit of $R - \overline{I}$ to the bank (since the manager always raises the maximum possible amount $\overline{I}$). Similarly, for a public debt firm, the competitive bond market will initially price a bond issue with a face value

[19] Recall that the only role of raising K_0^B is the disciplining role of debt. We can imagine that the owner adds K_0^B to her optimal consumption plan.

D^{HIGH} as:

$$K_0^D \;=\; \left(1 - \frac{\underline{\theta} + \theta^C}{2}\right) D^{HIGH} \;+\; \left(\frac{\underline{\theta} + \theta^C}{2}\right) \underline{Y}\,. \tag{17}$$

The default probabilities used in (17) make use of the conjecture that all types $\theta \in [\underline{\theta}, \theta^C)$ will issue public debt. The comparison of equations (16) and (17) yields a condition for the type θ that is just indifferent between taking out a bank loan or floating public debt. In addition to getting K_0^B initially, a bank-financed owner expects to keep a surplus of $\frac{1}{2}$ in the event of renegotiation. Thus, the condition determining the cutoff θ^C can be written as:

$$K_0^B + (1-\theta^C)(\overline{Y} + \alpha(R - EI) - D^{HIGH}) + \frac{\theta^C}{2} = K_0^D + (1-\theta^C)(\overline{Y} + \alpha(R - EI) - D^{HIGH})\,. \tag{18}$$

After substitution of $D^{HIGH} = \overline{Y} + qR - \underline{I}$, equation (18) characterizes the separating market equilibrium. This condition can be rewritten as:

$$\theta^C \left(1 + \alpha(R - \overline{I})\right) = (\overline{\theta} - \underline{\theta}) \left(\overline{Y} - \underline{Y} + qR - \underline{I}\right) - \overline{\theta}\alpha(R - \overline{I})\,. \tag{19}$$

The separating market equilibrium has the following properties. Because there is a continuum of types, θ, but just a single discrete signal, the choice between bank or public debt, firms self-select into one of two semi-pools: Firms at the good end of the quality interval, $\theta \in [\underline{\theta}, \theta^C)$, will signal their high quality by using public debt. This is cheaper since the risk premium is lower, hence $K_0^D > K_0^B$. On the other hand, these firms cannot renegotiate in the event of financial distress. This is the signaling device, which will only be used by firms expecting a low probability for this event. For firms at the poor end of the quality interval, $\theta \in (\theta^C, \overline{\theta}]$, forgoing the renegotiation option is too costly. They prefer to be pooled with all the firms at the risky end and to pay a risky premium according to the average firm quality in the bank pool rather than risking certain default in the event of financial distress.

This separating equilibrium will only exist if the cutoff point θ^C is strictly interior in the interval $(\underline{\theta}, \overline{\theta})$. First, there is at least one type of firms, viz. the best type $\underline{\theta}$, uses public debt if θ^C is just above $\underline{\theta}$:

$$(\overline{\theta} + \underline{\theta})\alpha(R - \overline{I}) + \underline{\theta} \leq (\overline{\theta} - \underline{\theta})(\overline{Y} - \underline{Y} + qR - \underline{I})\,. \tag{20}$$

Second, at least one type of firms, namely the worst type $\overline{\theta}$, uses bank debt if θ^C is just smaller than $\overline{\theta}$, or:

$$\overline{\theta}(2\alpha(R-\overline{I})+1) \geq (\overline{\theta}-\underline{\theta})(\overline{Y}-\underline{Y}+qR-\underline{I})\,. \tag{21}$$

The result on the market equilibrium is expressed in Proposition 1:

Proposition 1

(i) Suppose conditions (20) and (21) hold.

(a) There exists a single separating equilibrium with a cut-off type $\theta^C \in [\underline{\theta}, \overline{\theta}]$ such that a firm of type $\theta < \theta^C$ will choose public debt, a firm with $\theta > \theta^C$ will choose private debt and type θ^C will be indifferent between the two.

(b) There also exist pooling equilibria where either all types use bank debt or all types use public debt.

(ii) If Conditions (20) and (21) do not hold, then the only equilibrium is that all firm types issue bank debt.

Proof: See the Appendix.

Note that inequality (20) is always satisfied if $\underline{\theta} \approx 0$, i.e. if there are firms with virtually no failure risk; then both debt forms will coexist in the market equilibrium. In the market equilibrium, better firms will issue public debt, and worse firms will prefer intermediated debt. This result confirms conventional observations - high quality firms prefer public debt, and riskier firms or firms without a credit history stay with bank finance. The form of the equilibrium depends on $D-\underline{Y}-R-\overline{I}$, the credit risk exposure of lenders, and on level and variance of the failure risk, captured by lower bound and breadth of the interval of θ - values.

4 Perfect Court-Supervised Reorganization

In this section, a "perfect" court-supervised reorganization procedure is introduced. Two issues are addressed: First, the interaction between bankruptcy legislation and the debt structure choice. Second, and related to this, the welfare analysis of bankruptcy legislation.

In the extensive-form game, court-supervised reorganization will be introduced as an alternative to straight bankruptcy: After the two-stage alternative offer game, if the firm

is insolvent (i.e. cannot meet its obligations at t_1 or t_2) there is now a choice between filing for straight liquidation as before or filing for court-supervised reorganization. Creditors *and* the manager have a right to file for court-supervised reorganization if out-of-court renegotiation fails, as under Chapter 11 of the US Bankruptcy Code of 1978. The reorganization procedure analyzed in this section is frictionless: The court decides without any delay, and the court always takes the efficient decision concerning the continuation of the firm, by imposing the minimum debt reduction needed to get the profitable project going. This implies that the court collects and publicly reveals the private information about the investment cost I. Finally, the old creditors are given all the transferable surplus. The perfect court-supervised reorganization procedure, however, is costly. It is assumed that there is a flat cost of $b < R - \overline{I}$ representing both direct and indirect costs of bankruptcy.[20] The outlays of the bankruptcy procedure b have priority over creditors, and they the firm's assets are first used to pay b before other claimants receive anything.

In short, while the reorganization procedure modelled here is inspired by Chapter 11 of the US Bankruptcy Code of 1978, it shares little with the most frequently mentioned shortcomings of the practice under the US Bankruptcy Code of 1978 (see the next Section). In particular, it implies efficient decision-making about continuation and liquidation, there is no delay, and it respects priority. It is in this sense that the procedure is called *"perfect"*. The perfect procedure could be viewed as a reorganization law that has fully integrated proposals to design the court procedure as an efficient mechanism.[21]

In reality, of course, court-supervised reorganization does not quite work that way. Arguably, the only feature in the perfect reorganization procedure that captures the reality of the US-Chapter 11 experience well is the assumption that bankruptcy is costly. Abundant empirical evidence confirms that bankruptcy costs are considerable; indirect costs of bankruptcy easily run up to several times the amount of the direct bankruptcy costs, and total bankruptcy costs have been estimated to sum to up to 20 or more percent of the pre-default asset value.[22]

The other important element of the above assumption about the "perfect" procedure is that the court is effective in eliminating asymmetric information about I. Arguably, this may not be too far-fetched, at least from a US perspective. Note that under Chapter 11, the manager is required to reveal under oath all relevant information about the present

[20] The restriction $b < R - \overline{I}$ is obvious. Otherwise there is no gain from using court-supervised reorganization.

[21] See the references in the Introduction.

[22] See Warner (1977), White (1983), Altman (1984), Weiss (1990), and Franks and Torous (1989).

financial standing of the firm. Reorganization plans are usually quite detailed and contain information not readily available to outside investors.

With court-supervised reorganization being an option, there is now a double interpretation as for out-of-court renegotiation: either they represent as before workouts which never reach the court. Or they represent *pre-packaged bankruptcies*, a route frequently adopted in the US, which enter and leave the courthouse much faster and at much lower cost. The impact of Chapter 11 on the renegotiation game is summarized in Lemma 4:

Lemma 4

(i) With private debt, renegotiation will be successful with probability $min\{1, b\}$.

(ii) With public debt, as the number of creditors goes to infinity, the probability of successful renegotiation approaches zero.

Proof: See the Appendix.

Clearly, if renegotiation is not successful, then creditors will file for court-supervised reorganization since bankruptcy costs are below the minimum value of the profitable project, $b < R - \overline{I}$. The interesting element of Lemma 4 is the case where $b < 1$, i.e. where b is smaller than the range of values of I. Then, for a private debt firm, the bank maximizes its profits by allowing the manager to raise only up to $\underline{I} + b$ for investment in t_1. Hence the workout will fail if investment costs are high, $I \geq \underline{I} + b$, meaning that the firm will end up in court-supervised reorganization with probability $1 - b$.[23] On the other hand, the inefficiency of reorganizing public debt (at least in the limit where the number of creditors n approaches infinity) remains unchanged. For the equilibrium in the full game, the following result is derived:

Proposition 2 *The proportion of public debt firms will increase after court-supervised reorganization is introduced.*

Proof: See the Appendix.

The intuition for Proposition 2 is the following. There are two effects working in the same direction. First, court-supervised reorganization mitigates the cost of financial

[23] This is very similar to the effect in the costly state verification literature, see e.g. Townsend (1979) and Gale and Hellwig (1985). Papers explaining inefficient bankruptcy along similar lines, but with only a single creditor, include White (1980), Webb (1987) and Giammarino (1989).

distress: a firm with public debt loses now only the bankruptcy cost b, compared to the loss of the good investment opportunity valued $R - EI$ if there is no reorganization law. Second, since the bank will make a less generous renegotiation offer if court-supervised reorganization is available, this will increase the financial distress cost for bank-financed firms, i.e. a deadweight cost will now also arise for firm types using bank debt, albeit a smaller one than under public debt. Both effects decrease the relative costs of using public debt, and since these costs serve as the signaling device, the debt structure will react to this cost change in a straightforward manner: The lower the signaling cost, the more firms will use public debt, i.e. the larger the interval of firm types that find it attractive to emit the costly signal.

Let us collect our insights to come to a conclusion about the impact of Chapter 11. Lemma 4 and Proposition 2 imply that the number of bankruptcy filings (including court-supervised reorganization) will increase after the introduction of a reorganization law. There are two reasons: first, less firms will have bank debt which can be renegotiated out-of-court. Second, of those, a greater proportion will not succeed in a workout.

What is the overall welfare impact of Chapter 11? The answer is, in general, ambiguous. The adequate efficiency criterion in the present model is comparing the total expected deadweight loss under financial distress incurred under any of the bankruptcy law regimes. This amounts to summing over the losses of foregone investment opportunities on the one hand and bankruptcy costs on the other hand.

The relevant insights can be collected from Lemma 4 and Proposition 2. Lemma 4 implies that court-supervised reorganization affects the overall efficiency of debt restructuring for private and for public debt firms *in opposite directions*: On the one hand, it increases efficiency for public debt firms, and decreases efficiency for private debt firms. To see this, note that for public debt firms, the deadweight loss is reduced, as renegotiation continues to be unsuccessful, but the consequences are mitigated. On the other hand, the overall deadweight loss of privately financed firms increases. Recall that without a reorganization law, private debt firms would always work out efficiently (Lemma 2). With a reorganization law, inefficiencies emerge: This is so as the threat point of the renegotiation is altered, and breakdown becomes a viable threat for the bank in order to secure the maximum payoff.

Moreover, Proposition 2 reveals a third effect: The proportion of public debt firms will alter due to changes in the reorganization law regime. A portion of firms will switch from private to public debt. But overall efficiency is smaller for public debt firms than

for private debt firms. Therefore, the welfare impact of the change in the proportions is negative. This discussion can be summarized as:

Lemma 5 *Introducing a perfect reorganization law faces the following trade-off:*

(i) The expected cost of financial distress for public debt firms is reduced.

(ii) The deadweight loss for private debt firms increases if $b < 1$.

(iii) The proportion of less efficient public debt firms increases.

The comparative statics of the debt structure reveals some interesting insights. The debt structure is endogenous in this model, so this comparative statics exercise requires to vary the exogenous parameter which drives the debt structure. The following results obtain:

Proposition 3 *The efficiency of a perfect reorganization law depends on the debt structure. A reorganization law is inefficient if the proportion of public debt firms prior to its introduction is small. It is efficient if this proportion is large. Finally, if* b *is small, then a reorganization law is always efficient.*

Proof: See the Appendix.

A good intuition for Proposition 3 is gained by first considering only those firms that *do not* change their creditor structure. Among these, firms with public debt gain, firms with bank debt lose from introducing a perfect reorganization law. The efficiency effect of court-supervised reorganization must clearly be positive if a vast majority of firms have dispersed public debt, and vice versa. It remains to consider the third effect, the shift in the creditor structure leading to, on average, more public debt. This effect is dominated by the direct effect if either private or public debt dominates over the range of firm types. In intermediate cases where both public and private debt are well-represented across the range of firm types, this shift effect could be responsible for turning the total welfare impact negative.

Therefore, the efficiency of a reorganization law depends crucially on the dominant source of borrowing, banks or bond markets. The more firms rely on market-based debt instruments, the more likely will there be a benefit from introducing a reorganization law. Moreover, consider an economy with a *massive bankruptcy problem*, i.e. a country where

a large number of concomitant financial distress case occur concomitantly, as it happened recently in emerging market hit by financial crises or in transition economies. The massive bankruptcy problem is *not in itself a sufficient reason* to recommend the introduction of a court-based reorganization procedure: This inevitably lowers the incentives to successfully manage debt renegotiation out-of-court, an effect which is likely to dominate in a bank-oriented financial system.

Another interesting observation concerns the relationship between bankruptcy costs and financial system. The fact that a lean and fast reorganization procedure (where b is small) is always efficient is by itself not surprising. Less expected, however, is the opposite case: A bank-based financial system may be better off having an "expensive" reorganization procedure rather than a "cheap" one. An intuition can be gained from carefully rehearsing the implication of Lemma 5: Less costly bankruptcy procedures weaken at the same time the ex post incentives for banks to renegotiate out-of-court and the ex ante incentives for managers to choose private debt, and both effects have a negative impact on the efficiency of the law.

5 Deficiencies of Court-Supervised Reorganization

Distortions contained in the Chapter 11 reorganization procedure have attracted a great deal of attention in recent years.[24] Primarily the following concerns have emerged:

(1) Chapter 11 is often a long and extremely costly procedure.

(2) Chapter 11 leads to violations of the absolute priority rule.

(3) Chapter 11 outcomes have a management bias leading systematically to inefficient continuation of firm that should be liquidated.

This section addresses these concerns sequentially and analyzes their impact on the performance of Chapter 11.

5.1 Cost of Court-Supervised Reorganization

The total (direct and indirect) cost of filing for court supervised reorganization was assumed to be $b < R - \overline{I}$. This section investigates the comparative statics of a change in

[24] See e.g. White (1989), Bradley and Rosenzweig (1992), Franks and Torous (1989)(1994), Aghion, Hart and Moore (1992) and Bebchuk and Chang (1992).

b. Let $F(b) \leq 1$ be the proportion of bank-financed firms. Due to the stipulated uniform distribution of θ, $F(b)$ can be expressed as:

$$F(b) = \frac{\overline{\theta} - \theta^C}{\overline{\theta} - \underline{\theta}}$$

Let $L(b)$ denote the expected deadweight loss due to bankruptcy. Recall that when $b < 1$, then a workout for a bank-financed firm will fail with probability $1 - b$, causing a loss of b. For a public debt firm, the workout will always fail, meaning that the bankruptcy cost b accrues always. Therefore, the deadweight cost $L(b)$ is:

$$L(b) = (1 - F(b))b + F(b)b(1 - b) \tag{22}$$

Considering the comparative statics of $L(b)$, which is the appropriate measure of the welfare effects, we find:

Proposition 4 *A marginal reduction of the bankruptcy cost b increases the proportion of publicly financed firms. It increases or decreases the deadweight cost $L(b)$. If most firms have public debt or if b is low, then $L(b)$ will always decrease as b decreases.*

Proof: See the Appendix.

The fact that welfare may be increasing or decreasing as one reduces bankruptcy costs b is due to the interaction between court-supervised and out-of- court debt restructuring. Only if bankruptcy costs are already low is a reduction b unambiguously a good thing. Otherwise, it may make things worse. This is more likely to be the case if bankruptcy costs are relatively high (close to or larger than 1). Moreover, the higher the proportion of public debt firms, the larger the benefit from a reduction in b.

The non-monotonicity of the result may appear surprising. In fact, it is a direct consequence of the renegotiation model. To get a good intuition, simply suppose that all types of firms are bank-financed. Then the loss function is:

$$L(b) = b(1 - b) \tag{23}$$

which clearly is a concave function over the relevant interval $b \in [0, 1]$ with a unique maximum at $b = 0.5$. Lowering b creates disincentives for banks to restructure out-of-court. The effect of reducing b is only unambiguously positive if b is already so low that banks have little incentive to restructure out-of-court anyway.

These insights have a clear implication for a market-oriented financial system like the United States. The critiques that bankruptcy costs are excessive may well have a point

since US firms rely predominantly on the bond market for their debt financing. However, making the Chapter 11 procedure leaner and faster - this was the intention of the 1994 reform, and could be the result if the incentives for reaching pre-packaged bankruptcy agreements are further improved - could still have a negative effect overall. In the model, this is precisely the case if b is high ! This can be interpreted as implying that a veritable *trap for bankruptcy reform* may arise in a system where *(i)* public debt markets dominate and *(ii)* the costs of legal procedures are high.

5.2 Violations of the Absolute Priority Rule

The absolute priority rule (APR) is the principle that junior claimants should not be receiving anything before all senior claims have been served in full. A simple measure looks at whether shareholders wind up receiving a positive value. Studies by Eberhart, Moore and Roenfeldt (1990), Franks and Torous (1989)(1994), White (1989) and Weiss (1990), among others, confirm that the absolute priority rule is routinely violated.

Before modifying the game, I will give a brief summary of the discussion as to why Chapter 11 propagates violations of APR. Management maintains the exclusive right to submit a reorganization plan within 120 days. This deadline is frequently extended. After the reorganization plan has been submitted, a vote will be held requiring the consent of at least two third of the claims and the claimants in each class of claims (where classes are organized according to seniority). This implies that the consent of the shareholders is needed. If the reorganization plan fails to win approval, the court can move on to a *"cram-down"*: roughly, a cram-down amounts to setting up and enacting a reorganization plan without the claimholders' consent. As the court is bound by rules, cram-down is generally a time-consuming and very costly procedure; it is hardly used at all. The requirement to win approval of the shareholders is seen as a likely source for violations of APR: the threat to deny approval and to inflict the cost of a cram-down upon debtholders imparts substantial bargaining power to shareholders.

To incorporate these ideas formally, the game is modified as follows. Under the court-supervised reorganization procedure the manager retains a positive benefit $f > 0$ when the firm emerges from the court procedure. Let m^B denote the expected benefit to the manager of a private debt firm in case of financial distress. Recall that under a perfect reorganization law, we had established that $m^B = \frac{1}{2}$. Let m^D denote the corresponding expected benefit of the manager of a public debt firm. It is easily verified that $m^D = f$:

Lemma 4 applies, so out-of-court renegotiation of public debt will always fail. Either creditors or the manager will then file for court-supervised reorganization and the manager will keep f.

The manager's retention f is a convenient measure of the severity of the violation of the Absolute Priority Rule (equity deviations). The next Proposition summarizes the comparative statics of violations of APR:

Proposition 5 *Suppose the Absolute Priority Rule (APR) is violated, and the manager retains $f > 0$ when the firm emerges from court-supervised reorganization. Then the manager's expected payoff in financial distress is $\frac{b^2}{2}$ larger if the firm is bank-financed than if the firm uses public debt, exactly as in the case where APR is respected, $f = 0$, and independent of f, the size of violations of APR violations. The proportions of public debt and private debt firms are the same as in the case where APR is respected, $f = 0$.*

Proof: See the Appendix.

The policy implication of Proposition 5 is that concerns about violations of the absolute priority rule are mostly unwarranted. Concerns about violations of the absolute priority rule are unwarranted, and equity deviations are neutral, at least from the perspective of the effects studied in this paper.

The neutrality result is surprising at first: The reader might have expected that equity deviations should make public debt more attractive - after all, the manager receives a positive payoff if the firm emerges from bankruptcy, and this happens more frequently with public debt. It turns out, however, that this is only one side of the effects. The other side is that the bank will adjust its renegotiation strategies endogenously to allow for equity deviations. The bank knows that its offer will not be accepted unless the manager can retain at least m^D. The bank will offer accordingly. As before, we have a pooling equilibrium in the renegotiation game once the bank does not know the type when making the offer. In this equilibrium, the effects are exactly offsetting: $m^B - m^D$ and hence, the proportion of public debt are unchanged.

Moreover, if we were to perturb the renegotiation game and give the manager the possibility to make offers, then the findings would be even more surprising. In this case, there are equilibria of the renegotiation game where I is partially or fully revealed, and these equilibria have in common that the overall welfare effect of violations of the Absolute Priority Rule is now positive! To see the intuition, suppose the manager makes an offer that gives the bank exactly the true value minus f. Although the true value of the

firm is revealed, the bank cannot do better by rejecting this offer: The reorganization procedure will leave at least f as residual value to the manager. So the offer will be accepted by the bank. Hence, by keeping the bank indifferent between acceptance and rejection, separating mixed strategy equilibria emerge.[25] To see why welfare is higher than in the case where APR is respected, note that all relatively bad types of $I > \underline{I} + b$ have a positive probability of success. But for all these types, renegotiation fails with probability one in the pooling outcome of the renegotiation game, explaining a reduction in the deadweight loss.[26] As a consequence, bank debt is more attractive than in the case of court-supervised reorganization respecting APR, and the proportion of bank debt firms increases, explaining an additional positive welfare effect.

To conclude, equity deviations occur so systematically in reality that it makes sense to search for reasons. One popular assumption is that they are needed to have incumbent shareholders and management keep their specific assets in the company once it is restructured. The present model, by strictly focusing the incentive structure of debt renegotiation, reveals an alternative explanation: First, out-of-court equity deviations are a necessary ingredient for the success of workouts. Witness that in the present paper, equity deviations for workouts, captured by the fact that $m^B > 0$, are present all along even if there is no reorganization law or of reorganization provisions operate smoothly. Second, equity deviations in court may be a good thing, or at least be neutral, because they make it less attractive to opt for court-supervised procedures instead of a workout.

5.3 Liquidation Bias of Court-Supervised Reorganization

This and the next section address the final concern about Chapter 11, viz. that the process of court-ruled reorganization leads to wrong decisions about continuation versus liquidation of firms. In this section, I consider a bias favoring excessive liquidation of firms which are worthwhile continuing; the next section considers the reversed case. A liquidation bias appears to occur systematically e.g. under the British Insolvency Code (Franks and Nyborg (1996)). Inefficient liquidation, however, is also a concern under Chapter 11 (White (1994)): Only about one tenth of firms filing for Chapter 11 are continued.

[25] Among these equilibria is the unique fully separating outcome of the renegotiation game surviving the usual refinements.

[26] This efficiency gain is, from a technical point of view, rather similar to introducing stochastic monitoring in a costly state verification model, see e.g. Gale and Hellwig (1989).

In the perfect reorganization procedure, the court was taking the efficient decision by default. To incorporate inefficient liquidation in a parsimonious way, we keep the payoff structure of the model unchanged. As before, continuation is always efficient if debt is renegotiated. We assume, however, that Chapter 11 will occasionally go awry, and the firm will be liquidated, even though it has the good project with a value $R - EI > 0$. Let ψ denote the probability of the court procedure going wrong and liquidating the firm. For simplicity, ψ is constant and the same for all types θ and I of firms.

The following result obtains:

Proposition 6 *Suppose that firms are liquidated in court with probability $\psi > 0$. Total bankruptcy costs and the share of bank debt are increasing in ψ. They will always be larger than under the ideal version of court-supervised reorganization (Proposition 2). The welfare loss may decrease or increase.*

Proof: See the Appendix.

Ex ante, the distortion in the bankruptcy outcome is tantamount to an increase in the expected cost of bankruptcy. Thus, intuition and proof of this result are quite straightforward because the connection between continuation decision and bankruptcy has already been highlighted: An increase in bankruptcy costs makes public debt more costly and will reduce the share of public debt. The welfare impact, as measured by the aggregate deadweight loss again, is an trickier issue. The following example demonstrate that welfare could increase as ψ increases. Start with a market equilibrium where the share of private debt is $F(b)$, and where ψ increases so much that the equilibrium shifts into a pooling bank equilibrium. Also, say, total bankruptcy costs rose from b_1 to b_2 (including the loss from noisy Chapter 11 outcomes). Then the deadweight loss was $(1 - F(b_1))b_1 + F(b_1)(1 - b_1)b_1$, and it is now: $(1 - b_2)b_2$. The total welfare gain can be calculated as: $\Delta W = b_1(1 - F(b_1)b_1) - b_2(1 - b_2)$. There exist parameter values for $F(b_1), b_1, b_2$ where this equation holds. Examples in the opposite direction are easily constructed.

5.4 Continuation Bias of Court-Supervised Reorganization

In the discussion surrounding Chapter 11, the "management bias" of the procedure is frequently cited, which may be taken as an indication that inefficient decision-making is more likely to suffer from a distortion in the opposite direction: In this view, courts

tend to rule in favor of *too much* continuation when liquidation would be efficient. The following is a typical story told in order to understand how inefficient outcomes may come about: A coalition of manager and bankruptcy judge can play a dominant role during reorganization. Managers have a straightforward interest in the continuation of the firm, and they might find support from a judge who is afraid of liquidating an ailing enterprise prematurely. Together, they can easily keep the firm afloat for a very long time, at the expense of creditors who see a drop in the liquidation value in the meantime.

The continuation bias would lead to a similar result as a liquidation bias. This will only be discussed here in a brief, and very informal, manner. Suppose the manager has private information about the quality of the project, $\phi = H$ or $\phi = L$. The private information arrives after debt contracts are signed, but prior to the debt renegotiation stage at the end of period 1. Note that the manager's incentive is generally distorted under a standard debt contract. He is willing to undertake the project even if it is bad, $\phi = L$, as he draws a private benefit of m^B or m^D, respectively, from continuation. Then we consider a comparison between the following two scenarios: In the first scenario, the court always gets informed about the project and decides efficiently, in the second scenario there are errors in the court's decision-making, leading to excessive continuation of bad projects. Following the logic of Proposition 6, the bankruptcy costs are higher in the second scenario. This gives a clear indication as to why we would expect the main results of this section, namely the increase in the share of bank debt and the ambiguous welfare effect, to carry over.

6 Robustness, Empirical Implications, and the Political Economy of Bankruptcy Reform

6.1 Robustness

The results are robust with respect to the particular form of the renegotiation game. Recall that the bank had the bargaining power under private debt, and the manger under public debt. A variation in the distribution of bargaining power would alter the distribution of the surplus due the successful continuation of the firm. In the case of public debt, there is no surplus (renegotiation is almost completely inefficient) and the form of the renegotiation game has no impact on the results. In the case of bank debt, the sequence of the renegotiation game matters for the allocation of the surplus (the last party to make

the offer keeps the surplus), but there is no impact on the efficiency of renegotiation: Recall that the good project will always be realized when the bank has the bargaining power; this holds a fortiori if the bargaining power is redistributed, since the manager's payoff will be an increasing function of the success probability.

6.2 Empirical Implications

This section summarizes and distills some of the empirical implications of the paper and compares the findings to existing empirical evidence.

(i) Debt structure: The more reorganization provisions enhance debtor rights, the more should direct and dispersed debt finance dominate over intermediated and private debt.

While there is no explicit and rigorous study investigating such a link, there is informal evidence. In the US, there is clear conspicuous temporal coincidence of the secular decline in bank finance in the US and the introduction of Chapter 11 in 1978. Similarly, there is a trend towards disintermediation in European countries after reforms facilitating court-supervised reorganization.

(ii) Bankruptcy filings: The number of bankruptcy filings increases with the introduction of a reorganization law.

The reason is of course the disincentives for out-of-court agreements that emerge from reorganization provisions. This is consistent with the surge in total bankruptcy filings (Chapter 7 and Chapter 11 combined) in the US after since 1979, when Chapter 11 went into effect. Other countries shared this experience, for example France after the 1985 law.

(iii) Absolute priority rule: Workouts should always show higher equity deviations than court-supervised reorganizations. The higher the success rate of workouts, the more flagrant should be the violation of absolute priority.

The first insight is confirmed by Franks' and Torous' (1994) finding that equity deviations (the share obtained by shareholders as a consequence of debt restructuring) are significantly more severe for workouts than for Chapter 11 procedures. I am not aware of evidence on the second link.

(iv) ''Creditor rights'' and debt dispersion: The relationship is as ambivalent as the notion "creditor rights".

La Porta et.al. (1998) postulate that tough bankruptcy legislation emphasizing "creditor rights" should be conducive to a dispersed securityholder structure. Their own study provides mixed evidence at best: some countries with prominent corporate bond markets are outspoken "debtor rights" advocates (US, Canada). The present paper explains why the fashionable term "creditor rights" is not sufficiently precise to formulate testable hypotheses: If "creditor rights" refer to absence of equity deviations, then strengthening "creditor rights" should indeed be favorable for a dispersed creditor structure. If, on the other hand, strong "creditor rights" mean that management has no option to file for court-supervised reorganization and automatic stay, then this should imply that debt concentration is encouraged and debt dispersion *discouraged*.

6.3 The Political Economy of Bankruptcy Reform

Finally, if one is willing to assume that corporate law is a "rational" response to economic problems[27], then two more implications for the political economy of bankruptcy reform may emerge which, inevitably, are more speculative in nature.

(v) A reorganization law is more beneficial if the debt structure is more market-oriented.

From this perspective, a particularly odd case seems Britain which has the oldest market for corporate bonds and a creditor-biased Insolvency Code. The present analysis could help to understand why dissatisfaction with the British law is so rampant. Also, the fact that reorganization-oriented legislation has recently been passed in Continental Europe could be understood as an attempt of opening financial systems to market-oriented modes of debt finance.

(vi) Abolishing ''shortcomings'' of reorganization provisions can be a mixed blessing.

It may be rational that efforts to speed up procedures and to reduce bankruptcy costs are feeble and half-hearted. What could be appear as a paradox, but is clearly explained

[27] Baird (1995) presents evidence relative to the emergence of Chapter 11.

by the present paper, is that such initiatives are more likely to have a negative impact if bankruptcy costs are large. Bankruptcy reforms are in fact long-lasting policy projects. The US is a notorious case for the slowness of banking and bankruptcy reform, but by far not the only one. Germany took a full 20 years to get a new bankruptcy code passed.

7 Conclusion

This paper casts a trade-off where bank loans offer valuable state-contingency through renegotiation in debt overhang situations, and publicly traded debt has a cost advantage. A micro-rationale for the difference in the renegotiation outcome is provided. It is explained how the financial system, in particular the relative weights enjoyed by market-based or bank-based lending sources, and the reorganization law interact. A reorganization law like the US Bankruptcy Code of 1978 is likely to have an impact on the markets for business credit. Empirical implications emerge showing that the debt structure is an important determinant for the performance of a reorganization law and, conversely, that the financial system is likely to change as a consequence of the bankruptcy law. The policy debate on the bankruptcy law should take these general equilibrium effects into account. A host of questions for future empirical research emerge.

The paper corroborates the view that cross-country research, both theoretically and empirically, on bankruptcy legislation deserves more attention than has been devoted to it so far. Hauswald (1996) is a commendable exception. He compares banking systems and bankruptcy codes and suggests that liquidation bankruptcy and universal bank on the one hand and reorganization and specialized banking on the other hand should be thought of as complementary systems. Empirical questions emerge from the present paper which lend themselves especially to cross-country studies.

Appendix

Proof of Lemma 1: Note that $w \geq 0$ since the manager has no wealth and is protected by limited liability. When making the contract proposal in t_1, the owner observes the state (Y, ϕ). If $\phi = H$, the manager will make the decision maximizing equity value anyway, so no incentive contract is needed. If $\phi = L$ and investment is undertaken, the optimal schedule will be such that the maximal possible punishment is imposed, thus $w = 0$ in this case. If $\phi = L$ and there is no investment, $w^*(I)$ must be large enough to satisfy the incentive condition for the manager:

$$w^*(I) \geq B \tag{24}$$

This incentive condition says that the manager is better off by accepting the payment w and abandoning investment than by undertaking investment, which would give the manager private benefits B. If the manager undertakes the project, the expected loss to the owner is $I - q\,R$ (the manager raises $\overline{I}$, but the difference $\overline{I} - I$ is a utility gain for the owner).

Thus, the owner will suggest an incentive contract satisfying condition (24) only if:

$$B < I - q\,R \tag{25}$$

Given condition (25), the optimal incentive schedule will be

$$w^*(I) = \begin{cases} B & \text{if } B \leq I - qR \\ 0 & \text{otherwise ,} \end{cases}$$

which is identical to the incentive schedule stated in the Lemma. **QED.**

Proof of Lemma 3: (i) The proof first considers only pooling offer where all types I of managers make the same offer. Offer strategy $x \in [0, 1]$ and success probability $\mu^n(x) = \frac{D}{n(1-x)}$ are as defined in Section 3. n's expected payoff from holding out, π^h, is:

$$\pi^h = x\,\frac{\underline{Y}}{n} + (1 - x) \begin{cases} D/n & \text{with probability } 1 - \mu^n(x) \\ \beta\underline{Y}/n & \text{otherwise} \end{cases}$$

where β denotes the share of a hold-out's claim in the total face value of debt. β is a parameter depending on whether and how the offer is conditionalized (see below). Again, by approving the exchange, n would earn π^e, which is as in Section 3. Then the incentive constraint $\pi^h \leq \pi^e$ is equivalent to:

$$(1 - \mu^n(x))\,\frac{D}{n} + \mu^n(x)\beta\frac{\underline{Y}}{n} \leq \frac{x + \underline{Y} + R - \overline{I}}{n} \tag{26}$$

Condition (26) shows that making the exchange offer conditional on success is the manager's best strategy: The smaller β, the more likely is (26) to hold; but β is minimized when the offer is conditional on success, meaning that the original face values are reinstated in case of a failure of the exchange offer.

Next, consider $n \to \infty$. Recall that $D > x + \underline{Y} + R - \overline{I} \geq \underline{Y}$, which implies that $1 - \mu^n(x) << 1$. But from the definition of $\mu^n(x)$ in (13), with D being constant, $x \to 1$ is necessary for (26) to hold.

Second, I show that there does not exist a generic separating or semi-separating equilibrium. Take the set of types I adopting the same strategy as the best type, $\underline{I}$. Call this strategy $\hat{x}$, and call this set of types $\hat{G}$. Consider then $\hat{I} \equiv \sup\{I \mid I \in \hat{G}\}$, i.e. the worst type in $\hat{G}$. If $\hat{G}$ is a not singleton set, then offer $\hat{x}$ fails for the type $\hat{I}$, since in any equilibrium, $\hat{x}$ must be such that creditors are just indifferent between accepting and rejecting. If $\hat{G}$ is a singleton set, then $\hat{I}$ cannot keep any surplus. In either case, type $\hat{I}$ has a zero expected payoff in the renegotiation game. Therefore, the truth-telling constraint for type $\hat{I}$ implies that all types $I > \hat{I}$ must receive zero.

Since any separating strategies in the interval $I \in [\hat{I}, \overline{I}]$ are only incentive compatible if some types have strictly positive payoffs, this implies that there can be at most two different strategies, $\hat{x}$ adopted by $I \in \hat{G}$ and one other strategy adopted by all $I \in (\hat{I}, \overline{I}]$. Suppose then strategy $\hat{x}$ is played. Eq. (26) implies that small investors expect a positive payoff of holding out whenever the size of the probability mass of set $\hat{G}$ is larger than $1 - x$. It follows that, as $n \to \infty$, then $x \to 1$ and the size of the set $\hat{G}$ vanishes, and the equilibrium is pooling for a generic set of types.

(ii) For this analysis, we need to generalize the incentive constraint $\pi^h \leq \pi^e$, in order to allow for creditors with different stakes in the firm's debt. Let D^i be creditor i's debt level, and x^i be creditor i's share in the total exchange offer. Let $x = \sum_i^n x^i$. As before, x denotes also the aggregate value offered to investors in excess to the minimum, $\underline{Y} + R - \overline{I}$. Let $\hat{D}^i = D^i - \frac{x^i}{x}(\underline{Y} + R - \overline{I} + x)$ be the concession asked from investor i. The probability to be pivotal, $\mu^i(x) = \frac{\hat{D}^i}{1-x}$. Then the individual incentive constraint $\pi^h \leq \pi^e$ for i is:

$$(1 - \mu^i(x))D^i \ + \ \mu^i D^i \frac{\underline{Y}}{D} \ \leq \ (\underline{Y} + R - \overline{I})\frac{x^i}{x} + x^i$$

which can be written as:

$$\left[\left(\frac{\underline{Y}}{D}\right)\frac{\hat{D}^i}{1-x} + \frac{(1-x) - \hat{D}^i}{1-x}\right]\frac{D^i}{x^i} = \frac{\underline{Y} + R - \overline{I}}{x} + 1 \tag{27}$$

Substituting $\hat{D}^i$ in (27) and differentiation with respect to D^i shows that, for x given in

equilibrium,

$$\frac{\partial}{\partial D^i}\left(\frac{x^i}{D^i}\right) < 0, \tag{28}$$

i.e. the *relative* concessions (per unit invested) of debtholders will be strictly increasing.

Suppose there is an investor willing to buy up some or all of the dispersed debt. Suppose this investor has a strategy that *(a)* is successful and *(b)* earns a non-negative payoff. Condition *(a)* implies that the investor has to offer to each debtholder the equivalent of the value of the debt. The remainder of the proof shows that conditions *(a)* and *(b)* cannot be met jointly.

Consider the debt values of fully dispersed debt claims each with a face value D/n. Recall that x is the failure probability in this case. Each of them has a market value D_1 of:

$$D_1 \;=\; (1 - E\theta)\frac{D}{n} + E\theta\;\left(\frac{\underline{Y}}{n} + (1-x)\frac{R - \overline{I} + x}{n}\right)\;. \tag{29}$$

Consider what happens if one of the claimants with a debt claim D/n buys up another debt claim D/n. Let $x^{'} = \sum x_i$ be the aggregate failure probability in this case. After the purchase, the joint claim has then a value, D_2, which is:

$$D_2 \;=\; (1 - E\theta)\;2\;\frac{D}{n} + E\theta\;\frac{x^i}{x^{'}}\left(\underline{Y} + (1 - x^{'})R - \overline{I} + x^i\right) \tag{30}$$

For $n \to \infty$, $\exists\; \varepsilon > 0$, $x - x^{'} < \varepsilon$. On the other hand, from condition (28),

$$\frac{x^i}{x^{'}} < 2/n \tag{31}$$

Hence, for $n \to \infty$, $D_2 < 2\,D_1$, finishing the proof: no investor can offer the value of their claims, when dispersed, to other investor and make a non-negative profit. **QED.**

Proof of Proposition 1: *(i)* The argument in the text verifies the equilibrium conditions on K_0^B and K_0^D and the incentive constraint on the cutoff type θ^C.

In order to prove existence of this equilibrium, it must be shown that the single crossing property holds. This is immediate from inspection of the incentive condition for each type θ which is exactly like (19), except that θ replaces θ^C. Inspection of (19) shows that the condition is linear in θ, hence there can be at most value of θ where equality holds.

Next, eq. (19) shows that there can be at most a single cutoff point between firm types preferring private or public debt. Thus, among all separating equilibria, the one characterized by (19) is unique.

(ii) The existence of the pooling equilibria is verified by constructing equilibrium beliefs supporting each of the two equilibria. First, a pooling bank equilibrium is supported

by the following belief: if the firm issues public debt, it is believed to be of type $\overline{\theta}$. But then the firm is better off issuing bank debt: the initial payment $K_0^B > K_0^D$, and also the payoff in the renegotiation game is higher. Thus, a pooling bank equilibrium exists always.

Second, existence of a pooling public debt equilibrium can be supported by the following belief (which is exactly opposite to the belief just considered): If the firm issues bank debt, it is believed to be of type $\overline{\theta}$. This is an equilibrium if all firm types $\theta < \overline{\theta}$ is better off issuing bank debt if:

$$(1 - E\theta)D^{HIGH} + E\theta\underline{Y} < (1 - \overline{\theta})D^{HIGH} + \overline{\theta}\left(\underline{Y} + \alpha(R - \overline{I})\right) + \theta\frac{1}{2}\,. \tag{32}$$

The critical test for this condition are the types in the neighborhood of type $\theta = \overline{\theta}$. But substituting $\theta = \overline{\theta}$ into eq. (32) gives exactly the same as eq. (21). Thus, whenever (21) holds, a pooling public debt equilibrium exists.

Finally, note that any belief different from the belief that a bank-financed firm is of type $\overline{\theta}$ leads to a strictly higher value of K_0^B, hence would give a strictly larger payoff under bank debt to any type $\theta \in [\underline{\theta}, \overline{\theta}]$. Hence no other belief can sustain a pooling bank debt equilibrium in (21) is violated. **QED.**

Proof of Lemma 4: *(i)* By backwards induction. Let y denote the reduced debt level, in excess of $\underline{Y} + R - \overline{I}$. The bank's best offer is given by:

$$\pi^r(b) \;=\; y(\underline{Y} + R - \overline{I} + y) + (1 - y)(\underline{Y} + R - \overline{I} + \frac{y}{2} - b)\;.$$

This gives raise to the first order condition:

$$\frac{d\pi^r(b)}{db} = 0 \quad \Leftrightarrow \quad y \;=\; b\;.$$

It is straightforward to show that $\pi^r(b)$ is strictly concave, so the maximizer must be unique.

(ii) Using the same notation as in Lemma 3, we get that:

$$\pi^h \;=\; x\,\frac{\underline{Y}}{n} \;+\; (1 - x)\begin{cases} D/n & \text{with probability } \; 1 - \mu^p(x) \\ \beta\frac{1}{n}\left(\underline{Y} + R - \overline{I} + x - b\right) & \text{with probability } \quad \mu^p(x) \end{cases}$$

and:

$$\pi^e \;=\; \frac{1}{n}\left(\underline{Y} + R - \overline{I} + x\right)\;.$$

$\beta = 1$ follows as in Lemma 3. The incentive condition $\pi^h \leq \pi^e$, leads to:

$$(1 - \mu^p)D + \mu^p(\underline{Y} + R - \overline{I} + x - b) \leq \underline{Y} + R - \overline{I} + x\;.$$

But this implies that $\mu^p(x) >> 0$. **QED.**

Proof of Proposition 2: Let m^Y and n^Y denote the expected shares of the renegotiation surplus that accrue to the manager and the bank, respectively. Following Lemma 4, if $b > 1$, then bank-debt firms will always work out and $m^Y = \frac{1}{2}$. The deadweight loss of public-debt firms is b and thus $n^Y = b - \frac{1}{2}$. If $b < 1$, then the same straightforward calculations shows that $m^Y = \frac{b^2}{2}$ and $n^Y = \frac{b^2}{2}$. Let θ^Y denote the cutoff type if there is a reorganization law. Next, write the analogous incentive condition to equation (19), which now however applies to cutoff type θ^Y as:

$$\theta^Y \left(m^Y + n^Y\right) = \frac{\overline{\theta} - \underline{\theta}}{2} \left(\overline{Y} - \underline{Y} + qR - \underline{I}\right) - \frac{\overline{\theta}}{2}\alpha(R - \overline{I}) \tag{33}$$

Note that $R - \overline{I}$ must be replaced by n^Y in eq. (33). Next, compare equations (33) and (19). The RHS of both equations is identical. Since $m^Y \leq \frac{1}{2}$ and $n^Y < R - \overline{I}$, it follows that $\theta^Y > \theta^C$. **QED.**

Proof of Proposition 3: Let F^N be the bank share bank financed types θ *without*, and F^Y the same share *with* a bankruptcy procedure. Recall that always $F^N \geq F^Y$. Let L^N the welfare loss without, and L^Y the welfare loss with a bankruptcy procedure.

If $b \geq 1$ then:

$$L^Y = (1 - F^Y)b \tag{34}$$

If $b < 1$ then:

$$L^Y = b - F^Y\ b^2 \tag{35}$$

Next

$$L^N = (1 - F^N)\left(R - \overline{I} + 1/2\right) \tag{36}$$

We have to show that *(1)* $L^N - L^Y < 0$ for $F^N \approx 1$ and that *(2)* $L^N - L^Y > 0$ if F^N small or b small.

Note that F^N and F^Y are determined by the endogenous parameters θ^Y and θ^C. The comparative statics of these variables is derived from altering the parameters of the model.

(1) This is obvious from comparing (36) to (34) and (35), respectively: $\lim_{F^N \to 1} L^N - L^Y \leq 0$, and strict inequality, $L^N - L^Y < 0$, if b is small enough such that $F^Y < 1$.

(2) Note that $F^N \to 0$ implies that $F^Y \to 0$ since $F^N \geq F^Y$.

Hence:

$$\lim_{F^N \to 0} L^N - L^Y = R - \overline{I} - b > 0$$

irrespective whether $b \geq 1$ or $b < 1$. Finally, as $b \to 0$, $L^Y \to 0$, but $L^N > 0$, hence $L^N - L^Y > 0$. **QED.**

Proof of Proposition 4: θ^Y, the cutoff point in a separating equilibrium if there is a reorganization law, is defined in Eq. (33). First, I have to show $\frac{\partial \theta^Y}{\partial b} > 0$. Implicit differentiation Eq. (33) proves this immediately, since the RHS of (33) is a constant, and $m^Y + n^Y$ is strictly decreasing in b, regardless whether $b \geq 1$ or $b < 1$.

The second claim is that $L(b)$ as a function of bankruptcy costs b is ambiguous. Take the example where all firms are bank-financed given in the text. Then $L(b) = b(1-b)$, and hence $\frac{dL}{db} > 0$ if $b < .5$ and $\frac{dL}{db} < 0$ if $b \in (.5, 1)$.

The final claim is that $\frac{dL}{db} > 0$ if *(i)* $\theta^Y \to \overline{\theta}$ or *(ii)* $b \to 0$. For *(i)*, note that $\theta^Y \to \overline{\theta}$ implies $F(b) \to 0$ and hence $L(b) \to b$, from which $\frac{dL}{db} > 0$ is immediate. For *(ii)*, note that $b \to 0$ means that $m^Y + n^Y \to 0$, and hence, from Eq. (33), $\theta^Y > \overline{\theta}$, implying that the only possible equilibrium is where all firms are bank-financed, $F(b) = 1$. But then $L(b) = b(1-b)$, and $\frac{dL}{db} > 0$ for all $b < .5$. **QED.**

Proof of Proposition 5: Solving backwards: Suppose the bank offers to reduce the aggregate debt level to $\underline{Y} + R - \overline{I} + x$. As managers are certain to receive at least m^D under bankruptcy, they will accept the offer only if they are able to retain at least m^D. So a firm with types $I \in [\underline{I} + x, \underline{I} + x + m^D]$ will reject the offer even though the offer would be sufficient to enable investment. Thus, the bank's expected profit from this offer $\underline{Y} + R - \overline{I} + x$ is:

$$\pi^r(x) = (1 - x - m^D)(\underline{Y} + R - \overline{I} + x) + (x + m^D)(\underline{Y} + R - \overline{I} + \frac{x + m^D}{2} - b - m^D)$$

Differentiating yields the first order condition:

$$x = 1 - (m^D - b)$$

which is again a unique optimum by virtue of $\pi^r(x)$ being strictly concave. Now m^B and m^D are obviously:

$$m^B = m^D = \frac{(1 - x - m^D)^2}{2}$$

as the manager receives m^D for certain, and the expected share in the renegotiation surplus is the probability of successfully renegotiating, $1 - x - m^D$, times the average profit, $\frac{1}{2}(1 - x - m^D)$. Hence for the differential profit $m^B - m^D$:

$$m^B - m^D = \frac{(1 - x - m^D)^2}{2} = \frac{b^2}{2} \ .$$

Note that this difference is the same as was obtained when APR is respected, where the difference was $m^Y - 0 = m^Y = \frac{b^2}{2}$. Further, $\frac{\partial (m^B - m^D)}{\partial m^D} = 0$. With everything else unchanged, θ^C remains constant in the separating equilibrium. **QED.**

Proof of Proposition 6: The proof of the shift in the public debt share is immediate and omitted. To see the ambiguous welfare impact, it suffices to construct one example in each direction. An example with a welfare increase is given after the Proposition. For an example with a welfare decrease, suppose all firms choose bank debt in equilibrium prior to the rise in the noise, and no other equilibrium exists. Note that all firms will choose bank debt after the rise in the noise, since the share of bank debt weakly increases with the noise. Denote the total bankruptcy loss, including the expected costs from inefficient liquidation, before and after the increase in the noise of the bankruptcy outcome by b_1, and after the increase by b_2, and note that $b_2 > b_1$. Hence, the total welfare effect is $(1-b_1)b_1-(1-b_2)b_2$. Choose $b_1 < .5$ and $b_2 = .5$, which yields $(1-b_1)b_1-(1-b_2)b_2 < 0$. **QED.**

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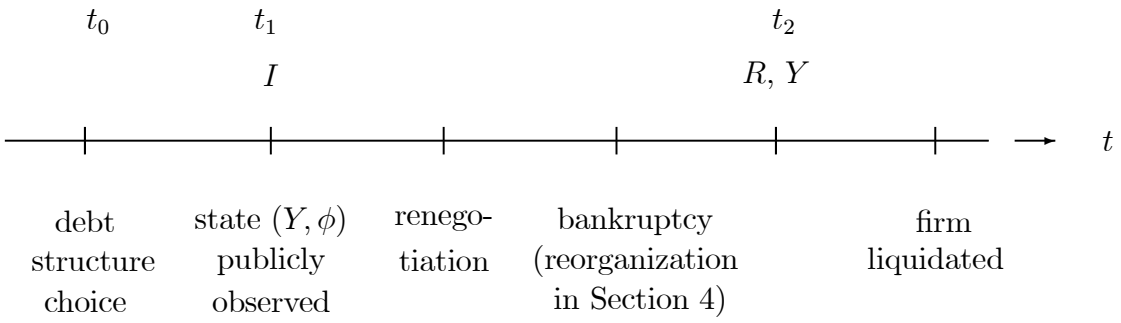
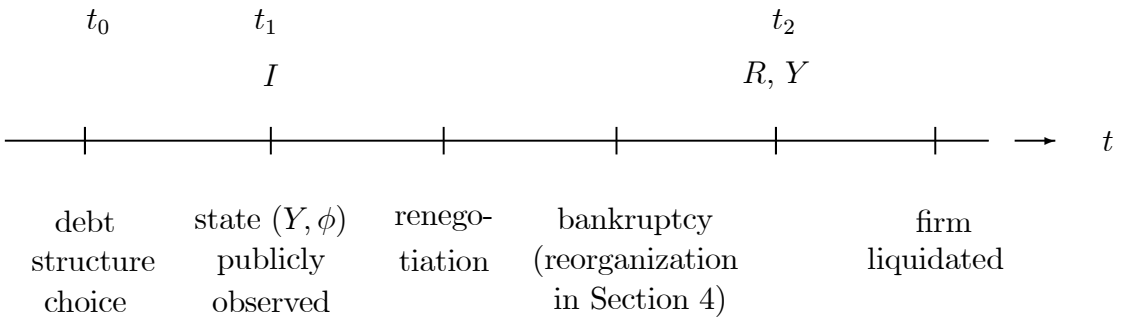


Figure 1: Time Line



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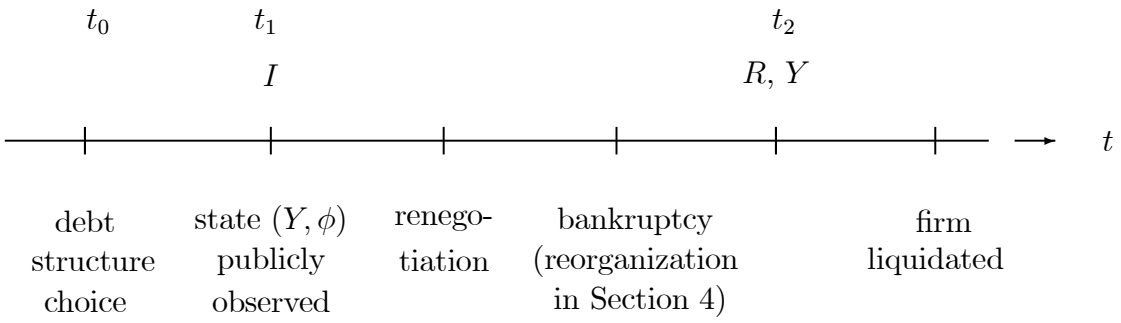

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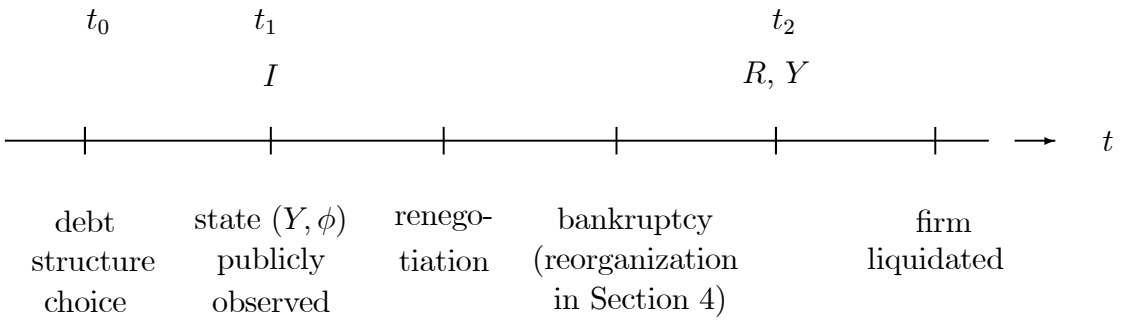

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