Committing to Commit: Short-term Debt When Enforcement is Costly

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ABSTRACT

In legal systems with expensive or ineffective contract enforcement, it is difficult to induce lenders to enforce debt contracts. If lenders do not enforce, borrowers will have incentives to misbehave. Lenders have incentives to enforce given bad news when debt is short-term and subject to runs caused by externalities across lenders. Lenders will not undo these externalities by negotiation. The required number of lenders increases with enforcement costs. A very high enforcement cost can exceed the ex-ante incentive benefit of enforcement. Removing lenders' right to immediately enforce their debt with a "bail in" can improve the ex-ante incentives of borrowers.

How should borrowers and lenders structure financial contracts when contract enforcement is ineffective and costly? If contractual remedies do not benefit lenders, then they may not enforce their contracts. In emerging markets and in economies making the transition to capitalism, where the financial benefit from legal enforcement may be small, this is a much-discussed problem. Known as the problem of lender passivity, it describes the situation in which lenders do not go to bankruptcy court after a borrower defaults (see Kornai (1979), Mitchell (1993), and Dewatripont and Maskin (1995)). I argue that short-term debt can be an effective solution to this problem.

Borrowing with large amounts of short-term debt can lead to the threat of runs on firms, because there may be an externality across lenders. This externality and the implied collective action problem can allow short-term debt to overcome the problem of passive lenders. These runs on firms are very similar to the bank runs analyzed in Diamond and Dybvig (1983). My analysis investigates the links between short-term debt, runs on firms, and the problem of lender passivity. It also describes how "firm runs" are related to bank runs.

Costly or ineffective enforcement of contracts may be caused by high costs or corruption in the legal system. It may also be caused by laws that provide little protection to outside creditors attempting to enforce contracts (see La Porta et al. (1998)). Weak legal environments may also have few investor protection laws (or weak enforcement of laws) against fraud, self-dealing, or other misbehavior of borrowers. This may leave the costly enforcement of private contracts as the only deterrent to misbehavior by borrowers.

For borrowers to commit to behave, lenders must commit to enforce their contracts that serve to punish bad behavior. I consider an economy with large enforcement costs that are so large that lenders may be worse off if they enforce their contracts ex-post. Enforcement that would serve to punish the borrower would also hurt the lenders.

I want to think about this lender commitment problem more broadly than as a lender's choice of whether to foreclose and liquidate assets (as in Diamond (1991, 1993a, 1993b), Diamond and Rajan (2001a), Hart and Moore (1994), Hart (1995), and many others). Suppose that some large lenders find out about their borrower's misbehavior. Will they cut off credit and in the process bring the misbehavior to public scrutiny? Will they invoke a bankruptcy law that does not allow them to foreclose? There are many recent examples, but to be concrete and topical, let me phrase this in terms of the scandal involving the Italian firm, Parmalat. A Parmalat lender who learns of the management's actions may have incentives to keep quiet for a significant period, because the lender has much to lose if the actions become public immediately. How can we get around this problem? Is there a capital structure that partly "contracts around" the bad legal protection of outside investors?

Short-term debt that is subject to "firm runs" can serve to commit multiple lenders to enforce their claims, providing costly ex-post punishment to borrowers, and thus provide beneficial ex-ante incentives to borrowers. In common with bank runs, "firm runs" work by the potential for an externality imposed across lenders.

The idea here is related to the idea behind bank runs in Diamond and Dybvig (1983). When banks do not have cash on hand to pay all depositors and must liquidate assets at a loss to pay those who withdraw first, this can lead all depositors to withdraw whenever they expect enough others to withdraw, even though this makes them collectively worse off. They all withdraw because the payments to those who withdraw impose losses on those who wait to withdraw after the bank runs out of money. This is an ex-ante externality on those who withdraw later (a strategic complementary). Depositors respond to the prospect of others imposing the externality on those who do not withdraw immediately. All demand immediate payment, forcing a default, although the default hurts them collectively. If the bank can never refinance from new depositors, the bank run can be caused by a panic—the very fear of a bank run (as in Diamond and Dybvig (1983)). This describes economy wide (or worldwide) crises, where depositors believe that no large investors or groups of investors will lend to the bank.

Diamond and Rajan (2001a) argue that the threat of runs on short-term bank demand deposits that are repaid on a first-come first-served basis serves as a commitment device for banks. Because the originating bank can collect a higher payment from its borrowers, due to its relationship lending, than can less skilled loan collectors, depositors and the bank are hurt if the bank is forced to sell its loans. Such a sale is triggered by a run that occurs whenever depositors anticipate a loss. This commits the bank to fully repay depositors rather than seek concessions from them. This commitment device allows the bank to borrow against the loans' full value, rather than their lower resale value.

If firm assets can be irreversibly liquidated sufficiently quickly to repay debt, then the same argument applies to firms. The threat of a run will commit firms to repay debt rather than renegotiate the claim. For some firms, real assets can be sold or liquidated as rapidly as bank loans. Examples include retailers or financial firms other than banks. Von Thadden, Berglof, and Roland (2003) assume that such rapid liquidation is possible, and they develop a model of collateralized debt that is very similar to a model of bank runs. This allows firms to commit to repay more than the liquidation value of their assets. In addition, von Thadden, Berglof, and Roland study the optimal design of corporate bankruptcy laws in a setting where rapid liquidation can be limited by a collective contract.

The liquidation losses that lead to a bank run may not be present in non-bank firms. If a firm cannot sell or liquidate assets sufficiently rapidly to repay maturing lenders who demand payment, the externality on lenders will not automatically be present (see Diamond and Rajan (2001a)). When the decision to liquidate or sell assets, or to renegotiate lender claims, is delayed until after a run, it is not obvious why lenders should rush to demand payment because they expect others to do so. In addition, we must ask what effect a run has on the firm when it does not force immediate liquidation of assets. In the weak legal systems of many countries, lenders do not have the ability to force immediate liquidation of assets.

How is the threat of runs related to corporate finance and financial crises when there is not immediate liquidation of assets? What is the externality on other lenders if it is not from paying your claim by rapidly selling off assets at a loss and hurting the others? What happens after a run if assets are not liquidated?

An externality that changes the relative claims of the lenders on future cash flows can lead to runs. There are many ways that this can work. If a lender who demands payment is offered superior priority on a first-come first-serve basis, this imposes an external cost on other lenders. Alternatively, this could be as simple as one lender getting a higher interest rate than another equal priority lender. The same effect occurs if a lender is given extra collateral if he refuses to roll over debt, taking value away from other lenders.

Relative value externalities can lead to costly runs. These runs provide good ex-ante incentives if they punish borrowers who misbehave. The consequence could be a bankruptcy court that hurts borrowers without benefiting lenders. It could instead be cutting off credit that causes the borrower to default on one of his obligations to others, which invokes an external commitment device. These serve to reduce the private benefits of borrowers. I assume that there is some commitment device available, but it does not benefit lenders to use it. Lenders need to commit to use the commitment devices. They need to commit to commit.

For concreteness, I will call the action that lenders must commit to take "going to court." Interpreting this as bankruptcy means committing to go into bankruptcy court sooner rather than later. However, this is only one interpretation. It is a commitment to stop lending to the borrower, which leads to some negative consequence for the borrower if a sufficient number of lenders do the same. The consequence need not be access to a court of law.

If the firm borrows from a single lender, there can be no externalities across lenders. The single lender will never go to court if it hurts "all lenders." This will limit the amount that the borrower can raise from a single lender. If there are multiple lenders and sufficient externalities, then it is possible that lenders can commit to go to court although it hurts the lenders collectively. If a contract is structured properly, it can commit lenders to a state contingent policy of going to court such that borrowers have the incentive to behave. The multiple lenders must have the right to demand a short-term payment: The contract must be short-term debt. The debt must be short-term both to allow the lenders to go to court rapidly and to allow the proper set of externalities. A lender must be able to respond to the threat of an externality imposed by another lender demanding payment by simultaneously demanding payment. In addition, short term debt deters lenders from reaching an agreement to refrain from running.

Short-term debt that is subject to runs serves as a commitment device to utilize costly intervention by making an individual lender's decision to refinance the borrower differ from the collective value of refinancing. When the borrower cannot repay all debt, all short-term lenders will demand payment. This is generally useful for the borrower's ex-ante incentives, but if the costs and benefits of going to court vary, it can lead to the lenders going to court in states of nature that hurt themselves ex-post without providing good ex-ante incentives to borrowers. This is an unusual aspect of contracts in which lenders commit to hurt lenders. In such circumstances, ex-post interventions that prevent lenders from running (which some may call bailouts) can actually improve borrowers' ex-ante incentives. I argue that the Long Term Capital Management intervention by the Federal Reserve Bank of New York may possibly have been good for ex-ante incentives; the intervention may have "negative moral hazard." I also use the framework to discuss and analyze an International Monetary Fund (2002) proposal for "collective action clauses" in debt contracts.

The balance of the paper is organized as follows. Section I surveys related literature. Section II describes the model. Section III discusses a special case that I refer to as the basic model, which is used to develop most of the results. Section IV describes two additional motivations for externalities across lenders. Section V describes the empirical implications of the model. Section VI describes the more general model. Section VII presents implications of the more general model when the costs and benefits of going to court are state dependent. Section VIII shows that short-term lenders will not negotiate away their commitment to go to court. Section IX concludes the paper.

I Related Literature

There is a large literature on the moral hazard problems of borrowers. Early work by Fama and Miller (1972, chapter 4) and Jensen and Meckling (1976) studied the problem of incentives for choice of risk caused by the division of cash flows into senior debt claims held by outsiders and junior claims held by borrowers. Townsend (1979), Diamond (1984), Gale and Hellwig (1985), Jensen (1986), Shleifer and Vishny (1989), and Stulz (1990) study the problem of inducing borrowers to repay debt when they can invest cash for personal benefit, either within their firm or by diverting cash to themselves.

Contracts in which lenders intervene to provide incentives, based on updated information about borrowers, have been studied by Calomiris and Kahn (1991) and by Diamond (1991). The model that I develop in this paper is closely related to the model of demand deposits in Calomiris and Kahn, because both rely on the role of short-term debt (or demand deposits) to allow lenders to intervene rapidly to stop a "crime in progress." Calomiris and Kahn and Diamond (1991) assume that intervention helps the lender ex-post, so lender commitment is not a problem.

The problem of lender commitment to liquidate assets (a very strong form of intervention) is studied in Bolton and Scharfstein (1990, 1996), Diamond (1991, 1993a, and 1993b), Hart and Moore (1994, 1995) and Hart (1995). In Bolton and Scharfstein (1990) and Hart and Moore (1994, 1995), lenders cannot commit to liquidate the asset for less than the borrower offers to pay. In my model, multiple lenders can commit to intervene even when it reduces their proceeds if they have short-term claims with appropriate externalities across lenders.

Kraska and Virimil (2000) show how a single lender can commit to incur a cost of state verification in the Townsend (1979) model. Given the borrower's optimal choice of payment, the lender is indifferent between verifying or not, and the borrower will pay the lender no more than the lender can obtain from verification.

Dewatripont and Maskin (1995) show that a lender can avoid advancing additional funds to bad borrowers if the lender is liquidity constrained and cannot advance the funds. This forces the borrower to refinance from a less informed lender who will not lend the full remaining value of the borrower's project. This provides incentives to the borrower. The problem that I address is similar to that in Dewatripont and Maskin, but in my model the harder budget constraint is due to externalities across lenders rather than to information differences and liquidity constraints.

Earlier, I discussed the role of externalities across lenders in the models of runs in Diamond and Dybvig (1983) and Diamond and Rajan (2000, 2001a, 2001b). Diamond and Rajan (2001a) show that the implied threat of a bank run commits a bank to collect relationship loans that are illiquid, because only the originating bank can collect full value, by committing depositors to sequentially liquidate assets for less than that full value. Von Thadden, Berglof, and Roland (2003) use a similar model in which firm lenders have the right to liquidate in the order that they demand payment, by taking extra collateral sequentially. They also find that this allows multiple lenders to commit to liquidate for less than they collectively obtain from liquidation. They study the design of corporate bankruptcy laws that limit value-destroying liquidation without removing its ability to allow lending in excess of the liquidation value of assets. Berglof and von Thadden (1994) show that if lenders negotiate sequentially, then multiple lenders will have greater bargaining power than a single lender.

Bolton and Scharfstein (1996) study the effect of the number of lenders on the ex-post bargaining power of lenders whose borrower might refuse to pay them despite having sufficient cash. When different lenders own title to different assets of the firm, and the assets are complementary, their bargaining power is increased. Tough bargaining power helps lenders negotiate with incumbent borrowers but hurts when dealing with outside buyers. Outsider buyers face costs of acquiring information about the assets, and may not bid for them if the sellers bargain for too high a price. If outside buyers will pay little independent of the toughness of seller bargaining, the firm will borrow from multiple lenders. In addition, the model is based on cooperative bargaining, leading to ex-post efficient outcomes. Lenders never take actions that give them a lower payoff than from rolling over their debt.

II Overview and Description of the Model

There are three dates, 0, 1, and 2. All borrowers and lenders are risk neutral and value consumption only on date 2 (which means that consumption needs alone do not require payments before that date). Each borrower has a project to fund and needs to raise one unit of capital on date 0 from lenders. Lenders require an expected return of R=1, because each has access only to a constant returns to scale outside investment that returns one per unit, per period. I will write R in expressions involving the lenders' required expected return, with the understanding that it is assumed to be equal to one. The endowment of lenders exceeds the scale of available projects, and the outside investment is always in use. As a result, lenders are always willing to lend at this expected rate of return; there is a competitive capital market in each period. All cash flow from a borrower's investment occurs on date 2. A borrower can take an unobservable action that reduces the cash flows that lenders can obtain but that increases his private benefit (his personal payoff). The date 2 cash flow is either H (high) or L (low) and the borrower's action influences the probability that the cash flow is H. For almost all of the exposition, I assume that L=0, but I show in Section VI that the results hold more generally.

A. Borrower Actions

The borrower chooses his unobservable action after the project is financed, but before date 1. He can choose between two actions: D=0 or and D=1. Action D=1 is referred to as diversion of funds, but also represents moral hazard or empire building. I refer to choosing D=1 as "diverting." Choosing D=1 reduces the probability that date 2 cash flow is H and increases the borrower's private benefit. If the borrower does not divert (chooses action D=0), the probability of the high cash flow is P_0 and the borrower's non-verifiable private benefit is N_{0G} (the second subscript, G, is the lender's action and is explained below). If the borrower diverts (D=1), the probability of the high cash flow is $P_1 < P_0$, and the private benefit is increased to $N_{1G} \geq N_{0G}$.

B. Borrower Incentives and Lender Intervention

The borrower can be given cash incentives by receiving a share of the cash flows H and L. It is possible for outsiders to intervene in the firm. The amount of the private benefit that the borrower keeps depends on how rapidly outside lenders intervene. If outsiders intervene on date 1, the private benefit is reduced. The effect of intervention is similar to the nonpecuniary bankruptcy penalty in Diamond (1984). Lenders can choose to intervene, choosing G=1, which I call choosing to "go to court" on date 1, or they can do nothing on date 1 and choose G=0. Action G=1 is more general than literally going to a court or foreclosing. I refer to it as going to court, as a convenient shorthand and a suggestive example. The role of going to court is to reduce the borrower's private benefits at minimum cost. It does not benefit the lender if there are poor creditor rights (no right to liquidate or fire managers) or if there is a corrupt and inefficient legal system. There are private commitment mechanisms on which lenders can "piggy back." They can invoke these private mechanisms by cutting off funding to the borrower, and for example, forcing the borrower to default on an external obligation. The resulting default by the borrower could expose Ponzi or Parmalat schemes to public view, or it could bring in other external penalties. Finally, going to court could simply lead to liquidation of the asset (the debt is secured and laws allow liquidation rights) at a fraction of its full value on date 2.

Going to court is observable and verifiable. Going to court on date 1 reduces the private benefit, N_{DG}, from N_{10} to N_{11} if the borrower chooses D=1 and diverts. If the borrower does not divert (chooses D=0), the private benefit is N_{00} if the lender does not go to court. It is easiest to think of going to court as reducing only the private benefit from diversion, N_{10}, to N_{11}. The reader may wish to assume that intervention has no effect on N_{00}, or $N_{00} = N_{01} = 0$. The proofs and results allow the private benefit without borrower diversion to be reduced by going to court, if the reduction is less than the reduction given borrower diversion ($N_{10} - N_{11} \geq N_{00} - N_{01}$). In Section VII, I study the implications of variation in the private benefit reduction from going to court. For now, it is assumed to be constant.

Going to court on date 1 is costly, reducing date 2 cash flows. The high cash flow is reduced to a fraction $\phi_H < 1$ of its initial value, to H'= ϕ_H H, and the low cash flow L is reduced to a fraction $\phi_L \leq \phi_H < 1$ of its initial value, to $L' = \phi_L L$. The probability distribution of the outcomes H and L is not affected by the lenders' actions (only by the borrower's).

C. Lender Information

All lenders observe information on date 1 about the cash flow after the borrower has chosen his action, D, and before cash flow is realized. The information is not observable or verifiable by any court. I assume that are two realizations of the information: good news and bad news, which respectively imply conditional probabilities of the high cash flow (H) of $\overline{P}$ and $\underline{P}$ ($\overline{P} > \underline{P}$). The information observed by the lenders is all of the available information about the probability of the high cash flow. The borrower retains no private information about cash flows given the information. Choosing D=0 increases the probability of good news, $\overline{P}$. The probability of good news given action D=0, denoted by p_0, is greater than the probability of good news given action D=1, denoted by p_1. This follows because $P_0 > P_1$, $\overline{P} > \underline{P}$, and $P_0 = p_0 \overline{P} + (1 - p_0)\underline{P}$

and $P_1 = p_1\overline{P} + (1-p_1)\underline{P}$. In what I call the basic model below, I assume that bad news occurs if and only if the borrower diverts (D=1), implying that $p_0 = 1$ and $p_1 = 0$. In this case, the date 1 news reveals the borrower's action, but many interesting results occur when both type I and type II errors are possible.

The borrower must find a way to commit to choose not to divert (commit to choose D=0), because the project would be negative net present value and could not be funded if the borrower would divert, that is:

$P_1 H + (1-P_1)L = p_1\{\overline{P}H + (1-\overline{P})L\} + (1-p_1)\{\underline{P}H + (1-\underline{P})L\} < R = 1$. Note that this implies that that the project is negative net present value given bad news, or $\underline{P}H + (1-\underline{P})L < R$ as well. In addition, borrowers want to commit not to divert because it is inefficient: the increase in private benefit is less than the decrease in expected cash flow: $P_0 H + (1-P_0)L + N_{00} > P_1 H + (1-P_1)L + N_{10}$.

There is limited liability, and any lender's or borrower's share of future cash flows must be between zero and one, and the shares must add to one. It turns out that it is only the borrower's limited liability that constrains contracts. The lender's share is less than or equal to one and payments from the borrower must come from project returns or from refinancing from other lenders.

A lender's share depends on his observable action (going to court, or not) G. In the case of one lender, the lender's shares of the cash flows H and L as a function of the action $G \in \{0,1\}$ are $s_H(G)$ and $s_L(G)$, respectively. The borrower's shares of the cash flows H and L are $b_H(G) = 1 - s_H(G)$ and $b_L(G) = 1 - s_L(G)$, respectively.

III. The Basic Model

This section develops the model's main ideas and implications in a simple setup that I refer to as the basic model. I assume that the low date 2 cash flow, L, is zero (cash flows are H>0 and L=0), while the lender's information exactly reveals the borrower's action, $p_0 = 1$ and $p_1 = 0$. In addition, I assume that going to court drives the borrower's private benefit from diversion from $N_{10} > 0$ to $N_{11} = 0$, and I assume that the private benefit is zero unless he diverts funds ($N_{00} = N_{01} = 0$). Assuming that only one realized cash flow is positive means that contracts can only divide that cash flow, allowing a very limited scope for detailed contingent contracts. Assuming that the information has no error removes many interesting implications, but it focuses attention on the important problem of lender commitment. Assuming that the private benefit is driven to zero implies that going to court is sufficient to remove any incentive to divert funds, even without providing additional cash flow incentives to the borrower.

On date 1, lenders observe the signal P (the probability that the cash flow is H) which exactly reveals the borrower's action. The news is good when the borrower behaves (D=0) and $\overline{P} = P_0$. The news is bad when the borrower diverts (D=1) and $\underline{P} = P_1$. If lenders could commit to go to court given bad news, it would deter the borrower from misbehaving. Instead, if the lender will not go to court conditional on bad news and if the private benefit is large, the borrower *will* misbehave and choose D=1. If the borrower misbehaves, the expected cash flow is $P_1 H < R$, and he will not be able to borrow.

If the borrower would choose D=0 without the need for incentives from the lender going to court (G=0 for good and bad news), then the lender's share, $s_H(0)$, of the cash flow H would be determined by the need to provide the lender an expected return of R=1. The cash flow would be H with probability $P_0 = \bar{P}$. To provide the lender with an expected return of R=1 (while G=0 and D=0) requires $\bar{P}s_H(0)H \geq R = 1$, or $s_H(0) \geq \frac{R}{\bar{P}H}$. The lender gets an expected return of exactly R=1, and the borrower receives the remaining share, $1 - s_H(0) = 1 - \frac{R}{\bar{P}H}$.

Assuming that the lender will not go to court, the borrower's payoff from choosing not to divert, choosing D=0 and denoted by $\Gamma_D = \Gamma_0$, is $\Gamma_0 = \bar{P}(1 - \frac{R}{\bar{P}H})H = \bar{P}H - R$, equal to the net present value of the project (because the private benefit from not diverting, N_{00}, is zero in this basic model). If the borrower diverts instead (choosing D=1), and the lender does not go to court, the private benefit is $N_{DG} = N_{10} > 0$ and the borrower's payoff is $\Gamma_1 = \underline{P}(1 - \frac{R}{\bar{P}H})H + N_{10} = \underline{P}H - \frac{\underline{P}R}{\bar{P}} + N_{10}$. The borrower will misbehave if his private benefit exceeds $N_{10} > (\bar{P} - \underline{P})H + (\frac{\underline{P}}{\bar{P}} - 1)R$. I assume that the private benefit N_{11} exceeds this amount. The borrower will misbehave if the lender never goes to court. Providing the lender with a normal rate of return leaves the borrower with too small a share of the cash flows to deter the borrower from misbehaving.

A. The Incentive Value of Going to Court

If the lender will go to court if and only if there is bad news, the borrower's payoff from choosing to divert is $\Gamma_1 = (1 - s_H(1))\underline{P}$ (because in the basic model, D=1 implies bad news and going to court reduces the private benefit to $N_{11} = 0$). Paying all cash to the lender if he goes to court, $s_H(1) = 1$, provides the borrower with a zero payoff from D=1. The borrower's payoff from D=0 remains equal to the project's net present value because D=0 implies good news in the basic model. If the lender can commit to go to court given bad news generated by misbehavior, the borrower will behave.

If intervention helps the lender or at least does not hurt him, the lender will intervene when information about misbehavior arrives. My goal is to analyze costly enforcement that destroys cash flows. I begin instead with a contrasting case where intervention is costless and enhances ex-post cash flows when the borrower has misbehaved, by partly reversing the effects of the borrower's misbehavior. For this paragraph only, assume that going to court is always costless and increases the probability of the high cash flow, H, from P_1 to P_1+d (d>0, d≤P_0-P_1), if and only if the borrower has misbehaved and selected D=1. This probability is greater than P_1 (the probability of H given diversion (D=1) and no intervention) and less than or equal to P_0 (the probability when the borrower behaves (D=0)). So long as the lender owns a positive share of the cash flow, H, he will go to court if he observes bad news. Going to court stops a "crime in progress" and increases the total ex-post expected cash flows by Hd>0. This is very similar to the role of monitoring a borrower's actions to make loan continuation or initiation decisions in Diamond (1991) and to the role of demand deposits that trigger outside intervention in Calomiris and Kahn (1991). It prevents the continued destruction of firm value. The situation is more complicated when intervention is costly.

Good corporate governance requires the lender to go to court given bad news (to deter D=1). Going to court may hurt the lender as well as the borrower when it is costly. It is impossible to commit to voluntarily hurt yourself. I assume that going to court does not influence the probability that the cash flow is high (equal to H), but does reduce the magnitude of H, the only positive date 2 cash flow. If the lender goes to court, the date 2 cash flow H is reduced to H', which is a fraction $\phi_H < 1$ of H; H'= $\phi_H H$ (the low cash flow remains equal to zero). The expected cost of going to court when there is bad news is $P_1(1-\phi_H)H$. If the lender owns all of the date 2 cash flow, H, he will not go to court. The lender would lose $P_1(1-\phi_H)H$ from going to court.

B. Committing to Go to Court with One Lender

How does a single lender commit to destroy a fraction $1-\phi_H$ of firm value? This is done by sending the bill to someone else and imposing an externality on him. If there is only one lender, then the borrower is the only remaining person to bear the costs of going to court.

Going to court punishes a borrower who diverts, but it is costly. As a result, a contract should commit the lender to go to court after bad news, but not after good. The lender gets a fraction $s_H(G)$ of the positive cash flow, H or $\phi_H H$ (and zero when cash flow is L=0). If there is bad news, $\underline{P}$, because the borrower has diverted (D=1), the lender chooses between the following: If the lender goes to court, he receives $s_H(G=1)\phi_H H\underline{P}$; if the lender does not go to court, he receives $s_H(G=0)H\underline{P}$. The lender chooses to go to court if the lender's share satisfies $s_H(G=0) \le s_H(G=1)\phi_H \le \phi_H$ (because $s_H(G=1) \le 1$).

If there is good news, the probability is $\overline{P}$ and the lender's choice is similar, but with probability $\overline{P}$ instead of $\underline{P}$. The lender will not go to court if $s_H(G=0) \ge s_H(G=1)\phi_H$.

For the lender to go to court given bad news and not go to court when the news is good requires that he is indifferent to going to court for both realizations of the news, P, or $s_H(0) = s_H(1)\phi_H \le \phi_H$. The amount that the borrower can raise at date 0 is increasing in the payments to the lender, $s_H(0)$ (holding the borrower's action fixed). The borrower raises the maximum amount when the lender receives all of the cash flow when he goes to court, or $s_H(1) = 1$, and a fraction ϕ_H of the cash flow when he does not, or $s_H(0) = \phi_H$. The borrower retains the remaining share of cash flow when the lender does not go to court, or $b_H(0) = 1 - \phi_H$.

The lender is given a claim that is senior to the borrower if the lender goes to court, and this imposes all of the costs of going to court on the borrower (as in Diamond (1993b)). The venture capital contracts examined in Kaplan and Strömberg (2003) provide evidence that venture capitalists use contracts with this conditional priority given liquidation.

The lender is given incentives to go to court by imposing an externality on the borrower. The most the borrower can raise is $\phi_H P_0 H$, a fraction ϕ_H of the project's present value. If the cost of the project's required initial capital, R=1, exceeds $\phi_H P_0 H$, then the borrower cannot raise money from one lender. If the enforcement cost is large, only very high net present value projects can be funded by a single lender. This result also applies if there are multiple lenders who can easily reach a deal to work out financial distress and negotiate as one.

C. Two Lenders

This section shows how two lenders can commit to go to court if and only if there is bad news, even if they own all of the project's cash flows and cannot impose an externality on the borrower by taking cash flows he owns. Because going to court given bad news provides sufficient incentives, the basic model does not require the borrower to retain any cash flow for incentive purposes. Assigning all cash flows to the lenders allows all positive net present value projects to be financed (because lenders never actually go to court given that the borrower does not divert). If the net present value is too low to borrow from one lender, simply using two lenders need not "magically" solve the problem. Why would two lenders hurt themselves ex-post any more than one? For the lenders to commit to hurt each other, there must be potential externalities imposed across the lenders, so the cost of going to court can be imposed on other lenders.

Section VIII shows that lenders must also have the ability to impose the externalities during negotiations intended to deter each of them from going to court, but the contracts derived here are robust to the possibility of these negotiations. For now, I assume that no interim lender negotiations are possible.

Because the borrower has no cash to pay at date 1, if the lenders have a short-term claim that gives them rights to go to court on that date, their choice cannot depend on how much the borrower pays them. Each lender has an identical claim on date 2 cash flow of $\frac{1}{2}\rho$. Contracts in which lenders do not divide the cash flow equally turn out to do no better. To show that it is possible to pledge all of the borrower's cash flow to lenders, I examine a case in which each lender owns a claim on one half of the date 2 cash flow, a claim where $\rho = H$. However, I first I characterize the more general case. If both lenders roll over their claim (each choose G=0), they each receive $\frac{1}{2}\rho$ at date 2 with probability P (where P is either $\overline{P}$ if good news or $\underline{P}$ if bad). If both choose to demand payment (G=1) and go to court, they each receive $\frac{1}{2}\phi_H H$ on date 2 with probability P. I assume that $\rho \geq \phi_H H$ and that their claims cannot be met if the borrower goes to court, because a lower value of ρ would make their loans have a negative net present value.

Externalities across lenders are imposed if only one of the lenders demands payment. If only one lender chooses not to roll over his claim, that lender gets a payoff of α (where α is a function of the news P, with realization $\overline{\alpha}$ if there is good news and $\underline{\alpha}$ if there is bad news), while the other lender who rolls over his claim gets a payoff of β (where β is a function of P with realization $\overline{\beta}$ if there is good news and $\underline{\beta}$ if there is bad news). As a mnemonic device, think of α as the payoff from going to court ahead of the other lender and β as the payoff from being the only lender not to go to court, and going "behind" the other lender. I discuss below several possible motivations for the functions α and β. Table I shows the payoffs, written in strategic form, of the two person, noncooperative game between lender 1 and 2. Lender 1 controls the rows and lender 2 the columns. The first listed payoff in each cell is that of lender 1, the second that of lender 2.

Insert Table I about here

Proposition 1 describes the Nash equilibria given the loan face value ρ and the values of the functions α and β conditional on good news ($\overline{\alpha}$ and $\overline{\beta}$) and on bad news ($\underline{\alpha}$ and $\underline{\beta}$).

PROPOSITION 1: There exists a Nash equilibrium where lenders go to court if and only if there is bad news if $\overline{\alpha} \leq \frac{1}{2}\rho\overline{P}$, and $\underline{\beta} \leq \frac{1}{2}\phi_H H\underline{P}$. It is a unique pure strategy equilibrium if in addition, $\overline{\beta} > \frac{1}{2}\phi_H H\overline{P}$ and $\underline{\alpha} > \frac{1}{2}\rho\underline{P}$.

Proof: If both lenders believe that the other will go to court (G=1) if there is bad news, the best response is to do the same if $\underline{\beta} \leq \frac{1}{2}\phi_H H\underline{P}$. If both believe that the other will roll over his claim and not go to court (G=0) given good news, the best response is to do the same if $\overline{\alpha} \leq \frac{1}{2}\rho\overline{P}$. This establishes existence of the Nash equilibria. If there is good news and each believes that the other will go to court (G=1), each will deviate to not go to court (G=0) if $\overline{\beta} > \frac{1}{2}\phi_H H\overline{P}$, implying that (G=1, G=1) is not a Nash equilibrium given good news. If there is bad news and each believes that the other will choose roll over his claim and not go to court (G=0), each will deviate to go to court (G=1) if $\underline{\alpha} > \frac{1}{2}\rho\underline{P}$, implying that (G=0, G=0) is not a Nash equilibrium, given bad news. Q.E.D.

There are several possible motivations for the functions α and β. I begin with the simplest motivation, but discuss others in Section IV. Because the borrower has no date 1 cash, and I assume initially that he cannot refinance his claim by borrowing at date 1, if either lender demands payment on date 1 (G=1), the borrower will be unable to pay. This observable default will imply that the lender goes to court. For all the cash flow to be assigned to lenders, the loan face value is $\rho = H$. Consider initially a claim where if only one lender demands payment on date 1, his claim on $\frac{1}{2}H$ is senior to that of the other lender, and he receives a fraction of the assets to fully protect his original claim of $\frac{1}{2}H$, imposing the costs of going to court on the other lender. The total date 2 cash flow is reduced to $\phi_H H$, implying that imposing all of the costs on the other lender requires $\frac{1}{2}H > \phi_H H$, or $\phi_H \geq \frac{1}{2}$. At least $\frac{1}{\phi_H}$ lenders are needed to insulate one lender from these costs. I assume that $\phi_H \geq \frac{1}{2}$, but I will revisit this condition when I discuss empirical implications. Table II shows the payoffs of this contract structure in an example where $\phi_H = \frac{3}{4}$ and $\rho = H$=2.

Insert Table II about here.

This contract implies that the function $\alpha = \frac{1}{2}HP$. A lender who goes to court alone does not reduce the value of his claim. This is one key to eliminating lender passivity. Because going to court reduces the total date 2 cash flow to $H' = \phi_H H$, this reduces the claim of the second lender (who does not demand payment) to $\beta = \phi_H HP - \frac{1}{2}HP = (\phi_H - \frac{1}{2})HP$. The lender who does not demand payment is worse off than if he also demands payment, because $\beta \le \frac{1}{2}\phi_H HP$. This contract implies that $\bar{\alpha} = \frac{1}{2}H\bar{P}$ and $\underline{\beta} \le \frac{1}{2}\phi_H H\underline{P}$. There is a Nash equilibrium where lenders go to court if and only if there is bad news. A lender who is protected from the costs of going to court alone by achieving superior priority will not be reluctant to go to court. In addition, the best response to a belief that the other will go to court is to go as well. This second feature, unfortunately, holds for both good and bad news. When there is good news, there is also a Nash equilibrium in which both demand payment only because they expect the other to do so: $\bar{\beta} = (\phi_H - \frac{1}{2})H\bar{P} < \frac{1}{2}H\bar{P}$. There is not a unique equilibrium such that lenders go to court if and only if there is bad news.

The contract can be described as long-term debt that can be converted to short-term by either lender demanding payment at date 1, forcing the borrower to go to court. It can also be described as short-term debt that is rolled over if a lender does not demand payment.

Now, consider the payoffs from a slightly more general situation, where if just one lender chooses G=1, the lender goes to court (reducing the cash flow to $\phi_H H$), and he receives a transfer of value of ε (from achieving priority) from the other lender. If lender 1 gets α, and the total $\alpha + \beta = \phi_H HP$, this implies that there is a transfer from lender 2 to lender 1 such that $\bar{\alpha} = (\frac{1}{2}\phi_H H + \varepsilon)\bar{P}$, $\underline{\alpha} = (\frac{1}{2}\phi_H H + \varepsilon)\underline{P}$ and

$\overline{\beta} = (\frac{1}{2}\phi_H H - \varepsilon)\overline{P}$ and $\underline{\beta} = (\frac{1}{2}\phi_H H - \varepsilon)\underline{P}$. This contract is identical to the one discussed above if $\varepsilon = (1-\phi_H)\frac{H}{2}$.

Proposition 1 provides the Nash equilibria for this more general contract. The "firm run" externality almost eliminates the problem of lender passivity (G=0,G=0) for externalities greater than or equal to $\varepsilon = (1-\phi_H)\frac{H}{2} = \frac{1}{4}$ (the condition for $\underline{\alpha} > \frac{1}{2}H\underline{P}$). The number $\frac{1}{4}$ and others in this paragraph refer to the numerical example described in Table II. But it does not make the lenders go to court if and only if there is bad news. First, there are multiple equilibria. Independent of the news P (good or bad) passively rolling over (G=0,G=0) remains an equilibrium for $\varepsilon = (1-\phi_H)\frac{H}{2} = \frac{1}{4}$ and all smaller values. Second, for all $\varepsilon > 0$, there is an equilibrium where both lenders go to court (G=1,G=1) independent of the information, to avoid being diluted by the other lender. This is similar to the panic-based bank run in Diamond and Dybvig (1983). If the contract builds in a large enough externality to eliminate the passive (G=0,G=0) equilibrium, that is $\varepsilon > (1-\phi_H)\frac{H}{2} = .5$, the unique equilibrium is to go to court, good news or bad. For an externality this large, this is exactly the prisoner's dilemma where both lenders always go to court. This is the same as "confess-confess" in the prisoner's dilemma, but the prisoners go to jail while the lenders go to court. How can contracts be structured to induce lenders to go to court, if and only if the news is bad?

D. A Better Contract: Short Term Debt with Refinancing

A closely related contract can be structured such that lenders go to court if and only if there is bad news. The contract is a short-term debt contract with face value $F = H\overline{P}$ due on date 1. The face value is set so the borrower can refinance if and only if there is good news. In addition, the contract is set such that lenders have a dominant strategy of going to court if the borrower cannot refinance.

If the borrower cannot induce new lenders to finance him so he can make the payment of $\frac{F}{2}$ to each lender, the contract is identical to the one described in the prior section. In that case, each lender has a claim on $\frac{F}{2}$ at date 2 if both roll over their claims (G=0) or a claim on $\frac{\phi_H H}{2}$ if both go to court (G=1). If only one demands payment, the demanding lender goes to court and gets a claim of $\frac{1}{2}H$, while the other lender gets a claim of $(\phi_H - \frac{1}{2})H$. All claims are received with probability P. In the notation of Proposition 1, $\rho = F$, $\underline{\alpha} = \frac{1}{2}H\underline{P}$ and $\underline{\beta} = (\phi_H - \frac{1}{2})H\underline{P}$. If F<H, then the unique equilibrium is for the lenders both to go court when there is bad news and the borrower cannot refinance, because $\underline{\beta} < \frac{1}{2}H\underline{P}$ and $\underline{\alpha} > \frac{1}{2}\rho\underline{P} = \frac{1}{2}F\underline{P}$.

The new aspect is that if the borrower can refinance to pay $\frac{1}{2}F$ to a lender who demands payment at date 1, he can buy out the lender's ability to go to court. The amount that can be raised to refinance depends on the news, P. I assume initially that the borrower can only refinance from new lenders (because the initial lenders do not have sufficient resources to buy out the other). The next section looks at the case in which the lenders can buy each other out.

In this section, the borrower can raise up to HP from new lenders and can raise up to $\frac{1}{2}HP$ if only one lender demands payment at date 1, for $P \in \{\underline{P}, \overline{P}\}$. The borrower can refinance if and only if F ≤ HP.

If the borrower can refinance, then a lender who demands payment receives $\frac{F}{2}$, and the payoffs of the two lenders are given in Table III. Note that the borrower refinances even if both go to court.

Insert Table III about here.

If the borrower can refinance, then both lenders should demand payment and be paid $\frac{F}{2}$. No matter what the lenders do, no lender will go to court, because the borrower will refinance. If the borrower cannot refinance his debt, both lenders will go to court.

To go to court if and only if there is bad news, the lender should set the face value so that it can only be refinanced if and only if there is good news. This will be true for all face values F between $H\underline{P}$ and $H\overline{P}$. Set the face value F equal to $H\overline{P}$. When there is good news, the borrower will be able to refinance, no matter what action, G, the two lenders choose. Both lenders get paid $\frac{F}{2}$, and their demand for payment does not force them to go to court (no costs are incurred and no private benefits are reduced).

If there is bad news, the borrower cannot refinance and there is a unique Nash equilibrium where both lenders go to court.

The lenders will not go to court with good news and will go to court with bad news. Refinancing works as in Diamond (1991, 1993b) by separating the lender's incentives to take an action from the right to take the action, and by allowing the borrower to repay the claim.

E. Refinancing By the Other Lender

The previous section assumes that the refinancing can only come from new lenders and concludes that if $F = H\overline{P}$, the borrower will not be able to refinance if there is bad news. Suppose instead that each lender has sufficient resources to buy out the other's claim of $\frac{F}{2} = \frac{H\overline{P}}{2}$ at date 1, if he so desires. I refer to this as the "refinancing by the other lender model" below. This section provides the conditions in which the borrower will still be unable to refinance when there is bad news. The outcome where there is good news in not affected, because the borrower can refinance from other lenders no matter what action the existing lenders choose. When there is good news, no lender will go to court. When there is bad news, the two lenders' payoffs are unchanged from the prior section if both choose to roll over their claims and if both choose to demand payment instead of buying out the other's claim.

The payoffs may differ when only one lender demands payment, because the other lender may choose to refinance that claim to avoid the costs of going to court. If one lender believes that the other will demand payment, his best option (if he does not provide refinancing) is to demand payment as well. His payoff is $\frac{\phi_H H}{2}\underline{P}$ as before (exceeding $(\frac{\phi_H H}{2} - \varepsilon)\underline{P}$, the payoff from being the only lender to roll over his claim).

The new possibility is to refinance the other's claim and pay $\frac{F}{2}$ to obtain a claim on all of the cash flows, yielding a payoff of $H\underline{P} - \frac{H\overline{P}}{2}$.[1] A lender's best response to a belief that the other lender will demand payment is to demand payment as well if $H\underline{P} - \frac{H\overline{P}}{2} \leq \frac{1}{2}\phi_H H\underline{P}$ or $(1 - \frac{\overline{P} - \underline{P}}{\underline{P}}) \leq \phi_H$. This states that the cost of transfer that allows the other lender to be fully repaid exceeds this lender's share of the costs of going to court. I assume that $(1 - \frac{\overline{P} - \underline{P}}{\underline{P}}) \leq \phi_H$, implying that lenders will both have a dominant strategy to go to court if there is bad news.

If instead $(1 - \frac{\overline{P} - \underline{P}}{\underline{P}}) > \phi_H$, then more than two lenders are required to support a pure strategy Nash equilibrium, where all lenders go to court given bad news. With a sufficiently large number of lenders, the cost of buying out all of the others will exceed one lender's share of the costs of going to court. This is Proposition 2.

PROPOSITION 2**:** If there are two lenders and each has the resources to refinance the other's claim, and the borrower issues short-term debt with face value $F = H\overline{P}$, then both lenders will go to court given bad news if and only if $(1 - \frac{\overline{P} - \underline{P}}{\underline{P}}) > \phi_H$. If this inequality does not hold, the borrower needs at least $n > \frac{\overline{P} - \phi_H \underline{P}}{(\overline{P} - \underline{P})}$ lenders for there to be a Nash equilibrium in which all lenders go to court if and only if there is bad news.

Proof: The payoff from not buying out all other lenders and going to court when there is bad news is $\frac{\phi_H}{N} H\underline{P}$. The payoff from buying out all the others when the total face value is $F = H\overline{P}$ is given by $H\underline{P} - \frac{n-1}{n} H\overline{P}$. Not buying out the others and going to court dominates if $\phi_H > n(1 - \frac{\overline{P}}{\underline{P}}) + \frac{\overline{P}}{\underline{P}}$, or if the number of lenders satisfies $n > \frac{\overline{P} - \phi_H \underline{P}}{(\overline{P} - \underline{P})}$. Q.E.D.

For liquid lenders who can refinance the borrower if others demand payment, this provides an additional reason to be one of several lenders. It must be unprofitable to buy out the others if they try to run to court. When it is unprofitable, if there is bad news, all will demand payments and go to court. Recall that there is a previous condition on the minimum number of lenders of $n > \frac{1}{\phi_H}$. This allows the proceeds from diluting other lenders' claims to zero to cover a single lender's costs of going to court. This condition is further discussed along with other empirical implications in Section V. Section IV generalizes the basic model to include additional sources of lender externalities. It can be skipped by readers who do not doubt the generality of the model.

IV Additional Sources of Lender Externalities

This section describes two other ways a lender imposes externalities on other lenders by refusing to passively roll over debt. The model above assumes that the demanding lender receives priority or additional collateral at the expense of the other lenders. One alternative is the liquidation model, in which a lender can force liquidation of assets to pay his claim, imposing losses from liquidation on lenders who do not demand payment. The second alternative is the dilution model, in which the borrower can issue debt claims that dilute existing lenders. One lender's demand for payment can be deterred by receiving a claim that takes value from other lenders, even if no one goes to court immediately. The dilution model's payoffs are identical to the "refinancing by the other lender model" described in the prior section. All three models eliminate lender passivity, and if refinancing from new lenders is allowed, can lead lenders to go to court if and only if there is bad news. The balance of this section is technical and gives the details and proofs.

The liquidation model is similar to that proposed in Diamond and Dybvig (1983), Diamond and Rajan (2001a), and von Thadden, Berglof, and Roland (2003). The asset can be physically liquidated at date 1 for $\phi_H PH$. Partial liquidation is possible, with constant returns to scale. Each lender has the right to liquidate a sufficient quantity to yield proceeds of $\frac{F}{2}$. Set $F = H\overline{P}$ and assume that $\phi_H > \frac{1}{2}$. Proposition 1 applies, and there is no Nash equilibrium with lender passivity when there is bad news (both demand payment), but there is always a "run" equilibrium in which both lenders demand payment even when the news is good. Adding the possibility of refinancing from new lenders eliminates the run and induces lenders to go to court if and only if there is bad news.

The proof without refinancing is an application of Proposition 1 with $\rho = F = H\overline{P}$. The payoffs (given date 1 news) from being the only lender to demand payment are $\overline{\alpha} = \underline{\alpha} = \frac{F}{2} = \frac{1}{2}\overline{P}H$. If only one lender demands payment, a fraction $1 - \frac{\frac{1}{2}H\overline{P}}{\phi_H HP}$ of the asset must be liquidated and the remainder $\beta = \left(1 - \frac{H\overline{P}/2}{\phi_H HP}\right)HP$ is paid to the other lender on date 2. This implies payoffs given date 1 news of $\underline{\beta} = \left(1 - \frac{H\overline{P}/2}{\phi_H H\underline{P}}\right)H\underline{P} < \frac{1}{2}H\overline{P}$ and $\overline{\beta} = \left(1 - \frac{H\overline{P}/2}{\phi_H H\overline{\overline{P}}}\right)H\overline{P} < \frac{1}{2}H\overline{P}$. As before, refinancing from the new lender will eliminate runs given good news.

In the dilution model, each lender can demand payment of $\frac{F}{2}=\frac{H\overline{P}}{2}$. If only one lender demands payment, the borrower can issue claims to that lender, diluting the other lender, even if no one goes to court. The borrower can refinance from new lenders but this refinancing is not allowed to dilute existing lenders.[2] If both lenders demand payment and the borrower cannot refinance, they go to court. If either lender (say lender 1) is the only one to demand payment and the borrower cannot refinance, he has sufficient bargaining power such that to deter him from going to court, the borrower must transfer value from the other lender to provide him with a claim worth $\frac{H\overline{P}}{2}$. If this transfer is made, no lender will go to court. However, lender 2 will end up with less than lender 1. The first lender gets $\overline{\alpha}=\underline{\alpha}=\frac{H\overline{P}}{2}$ and the total is HP. The payoffs to lender 2 given date 1 news are $\overline{\beta}=\frac{1}{2}H\overline{P}$ and $\underline{\beta}=H\underline{P}-\frac{1}{2}H\overline{P}$. When there is good news, both lenders are paid $\frac{H\overline{P}}{2}$ because the borrower can refinance from new lenders. If there is bad news, and both roll over their claims, each receives $\frac{1}{2}F\underline{P}=\frac{1}{2}(H\overline{P})\underline{P}$. This set of payoffs is identical to payoffs of the "refinancing by the other lender model." As a result, if $(1-\frac{\overline{P}-\underline{P}}{\underline{P}})\leq\phi_H$, the unique Nash equilibrium is for lenders go to court if and only if there is bad news.

V Empirical Implications

The most important empirical implication of the model is that if enforcement costs are large and creditor protection is weak, then borrowers rely more heavily on short-term debt, which is consistent with the results in Demirgüç-Kunt and Maksimovic (1999) and Giannetti (2003). A second prediction is that increases in enforcement costs require an increased externality per lender to induce a lender to deviate from an equilibrium in which all lenders passively roll over their claims. For a fixed externality across lenders, there is a maximum cost of going to court for a given number of lenders (and no lender externality is possible with one lender). The largest possible externality is from driving another lender's claim to zero. This implies that if going to court destroys more than 50% of value, then two lenders will be insufficient to overcome lender passivity. If a fraction $1-\phi_H$ of value is destroyed by going to court, then there must be more than $\frac{1}{\phi_H}$ lenders. This implies that a larger enforcement cost, $1-\phi_H$, requires more lenders (although not a large number of lenders). If the maximum externality cannot reduce other lenders' claims to zero, more than $\frac{1}{\phi_H}$ lenders are needed. In addition, Proposition 2 describes another lower bound (to remove the incentive to personally refinance the borrower), which applies to lenders such as banks and other financial institutions.

Similar to its prediction about the number of lenders, my model predicts that a larger enforcement cost requires larger externalities for a given number of lenders. The size of the externality is the amount that is transferred to the subset of lenders who demand payment. This transfer allows the subset to be weakly better off demanding payment than if everyone passively rolls over their debt (despite the costs that accrue if all demand payment). In addition, the transfer makes it still more unattractive to be one of those who rolls over debt and provides the transfer to those demanding payment. The magnitude of the externality is measured by the amount that the borrower can transfer to other lenders. The methods of transfer include providing superior priority or additional collateral to some but not all lenders. I am not aware of empirical studies of this implication.

Three recent papers find that loan syndicates contain more lenders when enforcement cost is higher. Detragiache, Garella, and Guiso (2000) study Italian bank loan syndicates, Ongena and Smith (2000) study loan syndicates across Europe, and Esty and Megginson (2003) study international syndicates of project finance loans. It is interesting to note that both Detragiache, Garella and Guiso and Ongena and Smith view this result as evidence against the models that they were testing, in which multiple lenders are most useful when the costs of bankruptcy are low. The results in all of these papers are consistent with my model, but more work is needed to establish its predictions. In particular, these papers do not look at the interaction between debt maturity and the number of lenders. My analysis suggests that is the number of lenders is very important for borrowers subject to high costs of intervention who are thereby forced to use short-term debt.

There are empirical studies of the effect of the level of debt on firm performance in emerging markets (e.g, Friedman, Johnson, and Mitton (2003)), but I am aware of none that have examined the effects of maturity and of debt structure (such as the number of lenders), allowing a test of the incentive effects of short-term debt.

These empirical implications are from the general model, not just the basic model used for the exposition up to this point. They are consequences of committing lenders to not be passive. The possibility of bad news even if the borrower does not divert (so lenders sometimes go to court in equilibrium) is the aspect that is present only in the more general model, and this possibility has important implications. The next section describes the results of the general model, where the proofs and details are in the appendix.

VI A More General Model

This section generalizes the results of the basic model. Here, going to court reduces the private benefit from diversion from N_{10} to N_{11}, but it does not necessarily push the private benefit to zero ($N_{11} = 0$), which the basic model does. Likewise, even when there is no diversion, going to court reduces the private benefit from N_{00} to N_{01}. For example, the reputation of the manager could be damaged from being in court or he could be forced to pay a bribe, even though he did not divert. The basic model assumes $N_{00} = N_{01}$. Most important, my generalized model allows for bad news even if there is no diversion, and it allows for good news even if there is diversion. In the basic model, diversion always causes bad news and behaving always leads to good news. Proposition 3 characterizes the optimal policies of going to court given the more general setting described above. The results are essentially the same as in the basic model, with one important exception, that going to court does not necessarily improve incentives. In the proofs in the appendix, I let the payoff in the bad news state be positive (L > 0), but describe here the conditions in the units of the basic model where L=0. This is to make the results easier to understand and compare with those in the basic model where L=0.

The news P at date 1 has two realizations of information. The probability of bad news is increasing if the borrower diverts (because the conditional probabilities of good news satisfy $1 > p_0 > p_1 \geq 0$). The assumption that bad news implies that it is more likely that the borrower diverted (choose D=1) is a version of the monotone likelihood ratio property (MLRP) that is commonly used in standard agency theory. The optimal policy is to go to court after bad news but not good, because that is the news that indicates that diversion was more likely.

PROPOSITION 3**:** Lenders should never go to court given good news if the borrower's incentive constraint can be satisfied by going to court given bad news. The probability of going to court given good news, $\overline{Q}$, is equal to 0 if the borrower's incentive constraint can be satisfied with a probability of going to court given bad news of $\underline{Q} \leq 1$. Going to court is bad for incentives (it increases the relative payoff of diverting (D=1) relative to D=0, implying that the optimal probabilities of going to court are $\underline{Q} = \overline{Q} = 0$) if

$$-(p_0 - p_1)\frac{(1-p_0)(1-\phi_H)H\underline{P}}{p_0} + (1-p_1)(N_{10} - N_{11}) - (1-p_0)(N_{00} - N_{01}) < 0 .$$

Proof: See Appendix A.

I discuss the final condition, such that going to court with any positive probability is bad for incentives, at the end of this section. Proposition 3 implies that the result from the basic model that lenders should go to court given bad news is robust to the possibility that bad news can arrive even though the borrower does not divert. When there are two discrete realizations of news, $\overline{P}$ and $\underline{P}$, providing incentives at minimum cost may require lotteries (or mixed strategies) to set a probability of going to court between zero and 1 (as in Becker (1968) and Mookherjee and Png (1989)). Going to court for sure, given bad news, may be overkill; reducing the probability of going to court can provide sufficent incentives at lower cost. However, if the news has a continuous distribution where the probability distribution of news is smooth, it is true very generally that no lotteries or mixed strategies are part of the optimal policy of going to court. Assuming the MLRP condition that the conditional probability that the borrower diverted is strictly decreasing in the news, P, lenders should go to court for some level of news, $\hat{P}$, and all worse news (lower realizations of P). As a result, I conclude that the general model does not predict that lotteries or mixed strategies should be observed.

When there is one lender, the structure of financial contracts that lead the lender to go to court given bad news is identical to that in the basic model. The borrower still cannot borrow the full value of the project because he must retain a sufficiently large claim to allow the lender to impose the cost of going to court on him. The financial contracts with two lenders that induce the lenders to go to court given bad news are qualitatively the same as in the basic model. As a result, I do not analyze them in the text. In the case of two (or more) lenders, the optimal financial contract is short-term debt with face value F such that it can be refinanced if there is good news, and cannot be refinanced given bad news. With sufficient externalities across lenders (to lead to runs given bad news), this yields a unique equilibrium that implements the optimal policy of going to court.

A. Does Going to Court Punish Misbehavior?

In the basic model, going to court removes the private benefit from diverting (D=1), and lenders go to court if and only if the borrower diverts. This combination allows going to court given bad news to deter diversion. In the general model, going to court reduces but does not eliminate the private benefits of D=1 ($N_{10} > N_{11} \geq 0$) and assumes that bad news could arrive even if the borrower behaves. As a result, the borrower will generally also need to be given cash incentives to deter him from misbehaving. These cash incentives are date-2 cash flows that the borrower retains if and only if there is good news. For incentives, the borrower receives a cash payment of zero when there is bad news (recall that everyone is risk neutral).

Going to court given bad news (which is the optimal policy) will not be able to deter diversion if the reduction in private benefit is too small and if the cash flow retained by the borrower is too small. The retained cash flow is reduced by the expected costs of going to court. If diversion cannot be deterred, lenders will not lend. Because going to court destroys cash flow, a policy of going to court given bad news could actually make diversion (D=1) more attractive. The expected destruction of cash flows could reduce cash incentives, outweighing the incentive effect of reducing private benefits. According to Proposition 3, going to court given good news would make D=1 still more attractive. Proposition 3 quantifies this effect. Going to court given bad news encourages diversion (reduces the payoff from D=0 compared to D=1), if:

$$-(p_0 - p_1)\frac{(1-p_0)(1-\phi_H)H\underline{P}}{p_0} + (1-p_1)(N_{10} - N_{11}) - (1-p_0)(N_{00} - N_{01}) < 0 .$$

This expression assumes L=0, for comparability to the other expressions presented in the basic model (but the proof does not assume this). The last two terms represent the effect of going to court given bad news about the borrower's expected private benefits. The term $(1-p_1)(N_{10} - N_{11})$ is the expected reduction in the private benefit from choosing D=1. Subtracted from this is the reduction in the private benefit from choosing D=0, $(1-p_0)(N_{00} - N_{01})$. This difference is the effect of going to court on the marginal private benefits from diverting. The first term $-(p_0 - p_1)(\frac{(1-p_0)(1-\phi_H)H\underline{P}}{p_0})$ is the effect of going to court on the borrower's cash flow incentives.

If going to court reduces the incentive to divert, but by too small an amount to deter diversion, there is no point in going to court. The situation described above is an extreme case of this where going to court encourages diversion. This extreme possibility has interesting implications when the costs and benefits of going to court vary. The next section addresses this.

VII. Implications of Variation in the Costs and Benefits of Going to Court

If there are sufficient externalities, lenders will go to court whenever the borrower cannot refinance. If the costs and benefits of going to court are constant, choosing the proper amount of short-term debt can provide incentives just as well as if there were a state-contingent contract to send the borrower to court as a function of the news. However, when the costs and the reduction in private benefits from going to court are stochastic, debt contracts cannot replicate the best state contingent policy of going to court. The costs and benefits of going to court are observed after the borrower takes his action D, but before going to court. In a state of nature where the cost of going to court is high and the reduction in private benefit is low, a policy that goes to court in that state of nature increases the borrower's incentive to misbehave. Below, I discuss ways that these costs and benefits could be observed in the context of a financial crisis. Assume for now that there is an observable and contractible state of nature θ that describes the realized costs and benefits.

Suppose that the amount of reduction in private benefit from going to court (given diversion, D=1), $N_{10} - N_{11\theta}$, depends on the state of nature, θ. Only $N_{11\theta}$ is stochastic; N_{10}, N_{01}, N_{00} are constant. For all states of nature, going to court reduces the private benefit from diversion ($N_{11\theta} < N_{10}$) and is costly ($\phi_{L\theta} \le \phi_{H\theta} < 1$). Proposition 4 characterizes the states of nature in which going to court is bad for incentives.

PROPOSITION 4**:** Going to court, in state θ, increases the borrower's incentive to divert (to choose D = 1) if the cost of going to court is sufficiently high and the private benefit reduction is sufficiently low. Going to court provides these bad incentives if and only if

$$-(p_0 - p_1)(\frac{(1-p_0)(1-\phi_{H\theta})H\underline{P}}{p_0}) + (1-p_1)(N_{10} - N_{11\theta}) - (1-p_0)(N_{00} - N_{01}) < 0 .$$

Proof: See Appendix B.

This is the same condition as in Proposition 3, except it describes the costs and benefits of going to court in a particular state of nature. The possibility that the prospect of punishing the borrower in these circumstances can encourage bad behavior has interesting implications.

A. Bailouts and Incentives

Proposition 4 implies that actions that some would consider to be bailouts can improve ex-ante incentives and reduce moral hazard. Suppose that if many firms are in court at once (a financial crisis; 2 firms if that is the total number of firms), the cash flow cost per borrower is higher ($\phi_{H\theta}$ is lower), and the benefit (the ability to reduce private benefits) is lower ($N_{11\theta}$ is higher) than if there is no crisis (just one firm in court). The high cash flow cost could be a general equilibrium problem of asset "fire sales" discussed in Shleifer and Vishny (1992). Both high costs and low benefits could come from limited human capital in court. A large number of firms in court indicates very high costs and very low benefits.

If there are (two) firms with bad news (a financial crisis), the best ex-ante incentives result from randomly allowing one firm to continue, but enforcing the costly implications of going to court for the other. This will avoid the high costs and low benefits of having both go to court at the same time. This provides better incentives than letting both go to court ("no bailout policy, no matter what the cost") or letting neither go to court (which we might call "the 1990s in Japan"). This "bailout" of one borrower reduces ex-ante moral hazard; its anticipation actually improves the borrower's ex-ante incentives to behave. A complete contract would include the number of other firm defaults and allow a third party to decide whether to take the borrower to court. A discretionary policy that does the same would be beneficial if a firm's debt contract were not this complete. Of course, discretionary policy could be used (and would be used) for many other things that would not be good for ex-ante incentives.

The discretionary policy described above might be described by some as a bailout policy. However, an actual bailout (in the sense of an outside subsidy) is not needed. It is sufficient to remove the lenders' immediate ability to run, and then let them either negotiate or take a majority rule vote. This is sometimes called a "bail-in" and is similar to the "collective action clauses" advocated by the International Monetary Fund (2002) for sovereign debt. In emerging market nonsovereign bond contracts, my analysis implies that it would be bad to require collective action clauses that stop runs and force lenders to negotiate or vote. It would remove the run externalities needed for lenders to commit to commit. However, if such clauses apply only when there is a systemic crisis and then only to a subset of firms, they could be beneficial. This is the situation when many firms are in default, and the costs of going to court are high and the benefits low.

This particular result applies to firms, banks, and “bank-like firms” such as securities dealers or hedge funds. This type of forced negotiation without outside subsidy might be a description of what the New York Federal Reserve Bank did to help resolve the Long Term Capital Management (LTCM) crisis. It does not appear to have been a bailout, because it simply forced the margin lenders to negotiate to agree to recapitalize the nearly empty shell of LTCM in order to avoid hurting each other by liquidating assets very rapidly.

The LTCM example does not fit my model perfectly, but the “runs” aspect of my model seems appropriate, and, in addition, the cost to lenders of enforcement (liquidation of all positions) was unexpectedly high. It is very much like having two firms in court at once, implying that ϕ_H is very low. The New York Federal Reserve Bank’s actions seemed very wise to me at the time. Maybe this model will help change the minds of my many friends in academics and central banks who were quite unhappy with the New York Fed’s actions. They think that the New York Fed caused moral hazard by setting a bad precedent. My approach suggests that it is possible that instead the precedent reduced moral hazard.

VIII Negotiations between Lenders

This section addresses the possibility that two lenders can negotiate to agree not to go to court. For a reasonable specification of the negotiation process, the two lenders will not refrain from going to court. I also analyze an alternative arrangement among lenders, where there is one “active” lender who can dilute the other “passive” lender, but not vice versa. This can also commit the active lender to go to court if and only if there is bad news, but unlike in the case of two active lenders, it is not robust to a reasonable specification of negotiations between lenders. This alternative contract structure is described after the analysis of negotiation between two active lenders.

A. A Brief Chance for Lenders to Negotiate

There is a window of time when lenders can negotiate among themselves or go to court immediately. Lenders receive their information just before date 1 and can go to court then or on date 1. If a lender stops to negotiate just before date 1, he cannot go to court immediately.

Suppose there are two active lenders with the possibility of being diluted if the other lender goes to court first. Each lender will compare the payoff from going to court just before date 1 with that of stopping to negotiate first. If he expects the other to stop to negotiate, he will compare the payoff from negotiation to that of going to court first. I assume initially that if both negotiate to not go to court, each receives $\frac{1}{2}HP$. If lender 1 goes to court just before date 1 and lender 2 does not, lender 1 receives a senior claim that dilutes the other lender because he is the only lender to go to court. If he expects the other to go to court immediately, he will compare the payoff from going to court immediately and arrive at the same time with the other lender versus stopping to attempt to negotiate, finding no one with whom to negotiate, and then going to court only after the other lender. Table IV shows the payoffs for each lender's decision.

Insert Table IV about here.

These payoffs are the same as going to court without negotiation, implying that for $\varepsilon > (1-\phi_H)\frac{H}{2}$, neither lender will stop to negotiate, just as both would choose to go to court instead of roll over. (See Section III.C.)

The assumed payoff to each lender if both negotiate, $\frac{1}{2}HP$, assumes that they split the surplus from not going to court equally. If their bargaining power is not equal, for example, if lender 1 gets a fraction $Z \in (0,1)$ of the surplus, all the payoffs are the same except that the negotiate-negotiate payoff for lenders 1 and 2 respectively is now $([\frac{\phi_H}{2} + Z\,((1-\phi_H)]HP, [\frac{\phi_H}{2} + (1-Z)\,(1-\phi_H)]HP)$. This follows because the outside option of each lender if no agreement is reached is his Nash equilibrium payoff of $\frac{1}{2}\phi_H HP$, and the total surplus from reaching an agreement to not go to court is $(1-\phi_H)HP$. The equilibrium remains the same, because the party with the weaker bargaining power (Z<1/2) will not choose to negotiate. If one party is known not to negotiate, then the other will also not negotiate, because both are needed to reach a deal. Similarly, if the refinancing option is added and the borrower cannot refinance given bad news, there will not be negotiation.

B. A Passive Junior Lender Who Must Never Negotiate

If there is a way to prevent lenders from reaching a deal among themselves, then there is another way to provide incentives for one of two lenders to go to court. An active lender (lender 1) chooses whether to go to court. He owns a claim on a fraction ϕ_H of the assets if he does not go to court and on all the assets if he goes to court. There is a passive investor (lender 2) who has no right to go to court and whose claim on a fraction $1-\phi_H$ is diluted if the active lender goes to court. Both provide capital. As long as they can never negotiate, trade, or form a coalition, this allows the active lender to commit to go to court and assign all of the cash flows to lenders.

This sharing rule provides incentives for the active lender to go to court when there is bad news. However, it is very easy for the active lender and passive lenders to reach a deal to undo these incentives. The lenders can choose to negotiate and neither will worry about the passive lender's action should the negotiations break down. For any amount of bargaining power between the lenders, an agreement will be reached, and no one will go to court.

IX Conclusion

Short-term debt can solve the problem of lender passivity. In countries where borrowers can take actions that hurt lenders with little fear of prosecution, it is essential for lenders to commit to enforce their contracts. Yet the legal systems in these countries may have high costs or weak creditor rights, implying that contract enforcement does not benefit lenders. Properly structured short-term debt provides incentives for each short-term lender to enforce his contract even when it hurts lenders collectively. Externalities across lenders cause the difference between the individual and collective incentives. Short-term debt eliminates lender passivity because it is subject to runs. Without the lender commitment arising from the threat of these runs, borrowers could only borrow much smaller amounts.

Short-term debt should be structured so that lenders stop lending whenever there is sufficiently bad news. The possibility of refinancing from new lenders allows the commitment benefits of short-term debt, without the problem of panics, defined as runs without bad news. It would be useful to integrate this idea with the results in Diamond and Rajan (forthcoming) that suggest that in economies where banks make most of the loans, a bad aggregate shock can dramatically reduce the supply of funds available for refinancing. A full understanding of the 1997 crisis in East Asia may require this integration. Radelet and Sachs (2000) argue that the crisis was largely due to panic-based runs on short-term debt. This is a difficult diagnosis to make because the commitment role of short-term debt in emerging markets requires painful runs given bad news.

To overcome lender passivity, lenders must be able to impose externalities on each other, and the number of short-term lenders determines the effect of these externalities. More lenders are needed when enforcement costs are higher. It is unlikely that short-term lenders will negotiate away their commitment to run. They each have the right to demand payment without much delay, and each fears that if the negotiations break down, the others will exercise their option to demand payment first. This can deter such negotiations from starting.

Short-term debt causes runs given bad news, but it is not a state-contingent contract in which lenders enforce contracts only when it provides good incentives at minimum cost. Lenders will demand payment given bad news even in states of nature when this hurts lenders, but does not provide useful punishment to borrowers. Enforcement in such extreme circumstances hurts a borrower's ex-ante incentives. If enforcement is eliminated in such circumstances, the borrower will have better incentives, ex-ante. In such cases, there exist useful interventions without public subsidy, where lenders negotiate while their right to demand payment is temporarily suspended. One example may be the New York Federal Reserve's intervention into the LTCM crisis. The precedent set by this intervention may have improved the ex-ante incentives of borrowers.

Borrowing a large fraction of a project's value with short-term debt provides very strong discipline. Because this capital structure causes lenders to hurt themselves at times, the structure of the contracts is very important. I hope that my analysis provides additional insights that may be useful to those attempting to understand short-term capital structures, to construct them, or to those tempted to regulate them.

Appendix A: Proof of Proposition 3

Definitions

The borrower receives a share of cash flow , $b_v(G)$ and the lender receives a share $s_v(G)$, which depend on the decision about whether to go to court, G, and the realization of date 2 cash flow (v=H or v=L, implying cash flows H and L, respectively if G=0, and $H' = \phi_H H$ and $L' = \phi_L L$, respectively if G=1). The fraction of value lost from going to court $(1-\phi_v)$ when cash flow will be high is weakly larger than when cash flows will turn out to be low, or $\phi_H \le \phi_L < 1$.

In order to determine the policy of going to court that lenders should implement, I assume that it is possible to go to court as a direct function of the news $P \in \{\overline{P}, \underline{P}\}$, and I allow lotteries where $\overline{Q}$ and $\underline{Q}$ denote the conditional probability of going to court given good and bad news, respectively.

Define the borrower's expected cash compensation conditional on good news as:

$$\overline{B} \equiv \overline{Q}\{b_H(G=1)\phi_H H\overline{P} + b_L(G=1)\phi_L L(1-\overline{P})\} + (1-\overline{Q})\{b_H(G=0)H\overline{P} + b_L(G=0)L(1-\overline{P})\},$$

and conditional on bad news as:

$$\underline{B} \equiv \underline{Q}\{b_H(G=1)\phi_H H\underline{P} + b_L(G=1)\phi_L L(1-\underline{P})\} + (1-\underline{Q})\{b_H(G=0)H\underline{P} + b_L(G=0)L(1-\underline{P})\}.$$

The borrower seeks a news contingent policy of going to court that will commit him to choose D=0 (so the lender will lend), but that allows him to retain as much of the project's expected cash flow as possible. He solves:

$$Max\ p_0\overline{B} + (1-p_0)\underline{B} + (p_0(1-\overline{Q}) + (1-p_0)(1-\underline{Q}))N_{00} + (p_0\overline{Q} + (1-p_0)\underline{Q})N_{01},$$

subject to:

$p_0\overline{B}+(1-p_0)\underline{B}\geq 0$, (Borrower Individual Rationality)

$$p_0[\overline{P}\{\overline{Q}s_H(1)\phi_H H+(1-\overline{Q})s_H(0)H\}+(1-\overline{P})\{\overline{Q}s_L(1)\phi_L L+(1-\overline{Q})s_L(0)L\}]$$
$$+(1-p_0)[\underline{P}\{\underline{Q}s_H(1)\phi_H H+(1-\overline{Q})s_H(0)H\}+(1-\underline{P})\{\underline{Q}s_L(1)\phi_L L+(1-\underline{Q})s_L(0)L\}\}\geq R=1,$$
(Lender Individual Rationality)

$b_v(G), b_v(G)\geq 0$ for all v and G, (Borrower Limited liability)

$s_v(G)+b_v(G)=1$ for all v and G. (Resource constraint)

The borrower's payoff from choosing D=0 is given by:

$$\Gamma_0\equiv p_0[\overline{B}+\overline{Q}N_{01}+(1-\overline{Q})N_{00}]+(1-p_0)[\underline{B}+\underline{Q}N_{01}+(1-\underline{Q})N_{00}].$$

The borrower's payoff from choosing D=1 is given by:

$$\Gamma_1\equiv p_1[\overline{B}+\overline{Q}N_{11}+(1-\overline{Q})N_{10}]+(1-p_1)[\underline{B}+\underline{Q}N_{11}+(1-\underline{Q})N_{10}].$$

The incentive constraint for D=0 is $\Gamma_0-\Gamma_1\geq 0$. (Incentive Compatibility; IC)

I do a change of variable to $\overline{q}=p_0\overline{Q}$, the unconditional probability of going to court given that the borrower selects D=0 when lenders go to court with probability $\overline{Q}$ conditional on good news, and to $\underline{q}=(1-p_0)\underline{Q}$, the unconditional probability of going to court given D=0 if lenders go to court with probability $\underline{Q}$ conditional on bad news.

Define V as the total present value of the project, given D=0 and G=0.

$$V=p_0\{\overline{P}H+(1-\overline{P})L\}+(1-p_0)\{\underline{P}H+(1-\underline{P})L\}.$$

Define the expected costs of going to court given good and bad news respectively as:

$\overline{\Delta}_V=\overline{P}(1-\phi_H)H+(1-\overline{P})(1-\phi_L)L$, and $\underline{\Delta}_V=\underline{P}(1-\phi_H)H+(1-\underline{P})(1-\phi_L)L$.

The total present value of the project, net of enforcement costs, is given by

$$V-p_0\overline{Q}\overline{\Delta}_V+(1-p_0)\underline{Q}\underline{\Delta}_V=\mathrm{V}-\overline{q}\overline{\Delta}_V-\underline{q}\underline{\Delta}_V.$$

The lender's individual rationality constraint is not satisfied even if he receives all of the project's cash flow given bad news. We can loosen the borrower's incentive constraint without over-satisfying that constraint by setting $\underline{B} = 0$ and setting $\overline{B}$ as the residual payment after the lender's expected return constraint holds with equality. Because the information contingent decision to go to court can be specified, there is no incentive constraint for lenders, and the lender's expected return constraint will hold with equality. The payment to the borrower when there is good news is:

$$\overline{B} = \frac{V - R - p_0 \overline{Q}\overline{\Delta}_V - (1-p_0)\underline{Q}\underline{\Delta}_V}{p_0} = \frac{V - 1 - \overline{q}\overline{\Delta}_V - \underline{q}\underline{\Delta}_V}{p_0}.$$

This satisfies all of the limited liability and individual rationality constraints.

The decision problem becomes to maximize the borrower's payoff:

$$Max\ V - 1 - \overline{q}\overline{\Delta}_V - \underline{q}\underline{\Delta}_V + (1 - \overline{q} - \underline{q})N_{00} + (\overline{q} + \underline{q})N_{01},$$

subject to the borrower's incentive constraint:

$$\Gamma_0 - \Gamma_1 = \frac{(p_0 - p_1)}{p_0}[V - 1 - \overline{q}\overline{\Delta}_V - \underline{q}\underline{\Delta}_V] +$$
$$(1 - \overline{q} - \underline{q})N_{00} + (\overline{q} + \underline{q})N_{01}]$$
$$-[(1 - \frac{p_1}{p_0}\overline{q} - \frac{1-p_1}{1-p_0}\underline{q})N_{10} + (\frac{p_1}{p_0}\overline{q} + \frac{1-p_1}{1-p_0}\underline{q})N_{11}] \geq 0$$

and the constraints imposed by the definitions of the unconditional probabilities $\overline{q} \in [0, p_0]$ and $\underline{q} \in [0, 1 - p_0]$.

I characterize the optimal values of $\overline{q}$ and $\underline{q}$.

Forming the Lagrangian Υ,

$$Max\ \Upsilon = V - 1 - \overline{q}\overline{\Delta}_V - \underline{q}\underline{\Delta}_V + (1 - \overline{q} - \underline{q})N_{00} + (\overline{q} + \underline{q})N_{01} + \mu(\Gamma_0 - \Gamma_1).$$

The first order conditions are:

$$\frac{\partial \Upsilon}{\partial \overline{q}} = -\overline{\Delta}_V + N_{01} - N_{00} + \mu \frac{\partial(\Gamma_0 - \Gamma_1)}{\partial \overline{q}}$$

$$= -\overline{\Delta}_V + N_{01} - N_{00} + \mu \left\{ -\frac{(p_0 - p_1)}{p_0} \overline{\Delta}_V + \frac{p_1}{p_0}(N_{10} - N_{11}) - (N_{00} - N_{01}) \right\},$$

$$\frac{\partial \Upsilon}{\partial \underline{q}} = -\underline{\Delta}_V + N_{01} - N_{00} + \mu \frac{\partial(\Gamma_0 - \Gamma_1)}{\partial \underline{q}}$$

$$= -\underline{\Delta}_V + N_{01} - N_{00} + \mu \left\{ -\frac{(p_0 - p_1)}{p_0} \underline{\Delta}_V + \frac{1-p_1}{1-p_0}(N_{10} - N_{11}) - (N_{00} - N_{01}) \right\},$$

$$\frac{\partial \Upsilon}{\partial \mu} = \Gamma_0 - \Gamma_1 \geq 0 .$$

From the constraints on q, $\frac{\partial \Upsilon}{\partial \underline{q}} = 0$ if $\underline{q} \in (0,1)$, $\frac{\partial \Upsilon}{\partial \underline{q}} > 0$ if $\underline{q} = 1$, $\frac{\partial \Upsilon}{\partial \underline{q}} < 0$ if $\underline{q} = 0$ (with similar conditions for $\overline{q}$). $\frac{\partial \Upsilon}{\partial \underline{q}} > \frac{\partial \Upsilon}{\partial \overline{q}}$ because $p_0 > p_1$, $(N_{10} - N_{11}) < 0$, and $\underline{\Delta}_V < \overline{\Delta}_V$. As a result, an increase in the probability of going to court given bad news increases the incentive to choose D=0 by more than the same increase in the probability of going to court given good news, and it has a lower cost, $\overline{\Delta}_V > \underline{\Delta}_V$. If there is an interior optimum value of $\underline{q} \in (0,1-p_0)$, then $\frac{\partial \Upsilon}{\partial \underline{q}} = 0$, implying that $\frac{\partial \Upsilon}{\partial \overline{q}} < 0$, and the lenders should not go to court given good news. If instead the incentive constraint cannot be satisfied by going to court for sure when there is bad news, $\underline{q} = 1 - p_0$, then $\frac{\partial \Upsilon}{\partial \underline{q}} > 0$, and only then can going to court given good news be desirable (i.e., it is possible that $\frac{\partial \Upsilon}{\partial \overline{q}} \geq 0$). Finally, going to court provides bad incentives, increasing the incentive for D=1, when $\frac{\partial(\Gamma_0 - \Gamma_1)}{\partial \underline{q}} < 0$ (because $\frac{\partial(\Gamma_0 - \Gamma_1)}{\partial \overline{q}} < \frac{\partial(\Gamma_0 - \Gamma_1)}{\partial \underline{q}}$). This condition is

$$\frac{\partial(\Gamma_0-\Gamma_1)}{\partial \underline{q}} = -\frac{(p_0-p_1)}{p_0}\underline{\Delta}_V + \frac{1-p_1}{1-p_0}(N_{10}-N_{11})-(N_{00}-N_{01})<0$$, or multiplying by

$(1-p_0)$ and assuming that L=0, so $\underline{\Delta}_V = (1-\phi_H)H\underline{P}$,

yields the expression in the proposition or:

$$-(p_0-p_1)\frac{(1-p_0)(1-\phi_H)H\underline{P}}{p_0} + (1-p_1)(N_{10}-N_{11})-(1-p_0)(N_{00}-N_{01})<0.$$ Q.E.D.

Appendix B: Proof of Proposition 4.

The problem of determining the optimal policy to go to court as a function of the state of nature θ and the news $P \in \{\overline{P}, \overline{P}\}$ is very similar to that in Proposition 3, where there was no uncertainty about the state ex-ante. I assume that θ has a discrete distribution and denote the probability of realization θ by $\Pr(\theta)$. Define

$\overline{\Delta}_{V\theta} = \overline{P}(1-\phi_{H\theta})H + (1-\overline{P})(1-\phi_{L\theta})L$ and $\underline{\Delta}_{V\theta} = \underline{P}(1-\phi_{H\theta})H + (1-\underline{P})(1-\phi_{L\theta})L$.

The borrower's problem is to maximize:

$Max\ V-1-E_\theta\{\overline{q}_\theta\overline{\Delta}_{V\theta} - \underline{q}\underline{\Delta}_{V\theta} + (1-\overline{q}_\theta-\underline{q}_\theta)N_{00} + (\overline{q}_\theta+\underline{q}_\theta)N_{01}\}$,

subject to $E_\theta\{\Gamma_{0\theta}-\Gamma_{1\theta}\} \geq 0$.

Forming the Lagrangian Υ, as in the case of fixed costs and benefits,

$Max\ \Upsilon = V-1-E_\theta\{\overline{q}_\theta\overline{\Delta}_{V\theta} + \underline{q}_\theta\underline{\Delta}_{V\theta}\} + E_\theta\{(1-\overline{q}_\theta-\underline{q}_\theta)N_{00} + (\overline{q}_\theta+\underline{q}_\theta)N_{01}\} + \mu E_\theta(\Gamma_{0\theta}-\Gamma_{1\theta})$.

The definition of the relevant expected values are: $E_\theta\{\overline{q}_\theta\overline{\Delta}_{V\theta}\} = \sum_\theta \Pr(\theta)\overline{q}_\theta\overline{\Delta}_{V\theta}$,

$E_\theta\{\underline{q}_\theta\underline{\Delta}_{V\theta}\} = \sum_\theta \Pr(\theta)\underline{q}_\theta\underline{\Delta}_{V\theta}$,

$\overline{B} = V-1-\sum_\theta \Pr(\theta)\left\{\overline{q}_\theta\overline{\Delta}_{V\theta} + \underline{q}_\theta\underline{\Delta}_{V\theta}\right\}$ and

$$E_\theta[\Gamma_{0\theta}-\Gamma_{1\theta}]=\frac{(p_0-p_1)}{p_0}[\overline{B}]+$$

$$\sum_\theta \Pr(\theta)\left\{[(1-\overline{q}_\theta-\underline{q}_\theta)N_{00}+(\overline{q}_\theta+\underline{q}_\theta)N_{01}+(1-\frac{p_1}{p_0}\overline{q}_\theta-\frac{1-p_1}{1-p_0}\underline{q}_\theta)N_{01}+(\frac{p_1}{p_0}\overline{q}_\theta+\frac{1-p_1}{1-p_0}\underline{q}_\theta)N_{11\theta}]\right\}.$$

The first order conditions are:

$$\frac{\partial\Upsilon}{\partial\overline{q}_\theta}=\Pr(\theta)\left\{-\overline{\Delta}_{V_\theta}+N_{01}-N_{00}+\mu\left\{-\frac{(p_0-p_1)}{p_0}\overline{\Delta}_{V\theta}+\frac{p_1}{p_0}(N_{10}-N_{11\theta})-(N_{00}-N_{01})\right\}\right\},$$

$$\frac{\partial\Upsilon}{\partial\underline{q}_\theta}=\Pr(\theta)\left\{-\underline{\Delta}_{V\theta}+N_{01}-N_{00}+\mu\left\{-\frac{(p_0-p_1)}{p_0}\underline{\Delta}_{V\theta}+\frac{1-p_1}{1-p_0}(N_{10}-N_{11\theta})-(N_{00}-N_{01})\right\}\right\},$$

$$\frac{\partial\Upsilon}{\partial\mu}=E_\theta(\Gamma_{0\theta}-\Gamma_{1\theta})\geq 0\,.$$

These state-by-state conditions are essentially the same as those in Proposition 3, and as in that case, $\frac{\partial\Upsilon}{\partial\underline{q}_\theta}>\frac{\partial\Upsilon}{\partial\overline{q}_\theta}$ or going to court given bad news is more effective in providing incentives. Going to court actually reduces the incentive to choose D=0 if

$$\frac{\partial E_\theta(\Gamma_{0\theta}-\Gamma_{1\theta})}{\partial\underline{q}_\theta}=\Pr(\theta)\left\{-\frac{(p_0-p_1)}{p_0}\underline{\Delta}_{V\theta}+\frac{1-p_1}{1-p_0}(N_{10}-N_{11\theta})-(N_{00}-N_{01})\right\}<0\,.$$

Multiplying by $1-p_0$ (and assuming that L=0 so $\underline{\Delta}_{V\theta}=(1-\phi_{H\theta})H\underline{P}$) provides the condition stated in the Proposition, which is easier to interpret.

QED.

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[1] If the lender who refinances the other obtains a claim of $F = H\overline{P} < H$, because this is equivalent to both rolling over their claims, refinancing is somewhat less desirable and will be deterred for a still lower ϕ_H than in the text.

[2] It turns out that the results are identical when the borrower can issue new claims that dilute old lenders, as long as the amount raised is at the competitive market price, given the dilution.

Table I
Lender Payoffs Given Arbitrary Functions of ρ, α, and β

The function α is the payoff to a lender if only he goes to court; β is the payoff to a lender if only the other lender goes to court. Both α and β are functions of P. The constant ρ is the payment to the two lenders in total, if neither go to court. It is received with probability P and the expected payoff in total is ρP, with each lender receiving half of this. If both go to court, the total payoff to the two lenders is $\phi_H H$, and the expected payoff is $\phi_H HP$, with each lender receiving half of this.

	#2 *Rolls Over* $G = 0$	#2 *Goes to Court* $G = 1$
#1 *Rolls Over* $G = 0$	$(\frac{1}{2}\rho P, \frac{1}{2}\rho P)$	(β, α)
#1 *Goes to Court* $G = 1$	(α, β)	$(\frac{1}{2}\phi_H HP, \frac{1}{2}\phi_H HP)$

Table II

Payoffs in the Example Where $\phi_H = \frac{3}{4}$ and $\rho = H = 2$, Where if One Lender Goes to Court, His Claim of 1 is Senior to the Other Lender

The payoffs to each lender assume that each has a claim of one half of H=2, the total cash flow on date 2, a claim of 1. They retain this claim if both roll over their claims. If only one lender goes to court, that lender's claim is senior to the other's. If at least one lender goes to court, the total date 2 cash flow is reduced to $\phi_H H = \frac{3}{2}$. The lender who goes to court gets a claim of 1, the other a claim of $\frac{1}{2}$. If both go to court, they divide the cash flow of $\frac{3}{2}$ equally. All cash flows are received with probability P, and the expected cash flows are given in the table.

	#2 *Rolls Over* G=0	#2 *Goes To Court* $G = 1$
#1 *Rolls Over* $G = 0$	(P, P)	$(\frac{1}{2}P, P)$
#1 *Goes to Court* $G = 1$	$(P, \frac{1}{2}P)$	$(\frac{3}{4}P, \frac{3}{4}P)$

Table III

Lender Payoffs if the Borrower Can Refinance His Debt of F

The payoffs to each lender assume that each has a short-term debt claim that is due on date 1 with face value of $\frac{1}{2}F$. It assumes that the face value does not exceed the cash flow on date 2, or $F \leq H$. They retain this claim on cash flow at date 2 if both roll over their debt. Cash flows are received with probability P, and the expected cash flows are given in the table. The payoffs are for the case where the borrower can refinance the debt on date 1 from new lenders if either or both of the lenders demand payment. The expected payoff from demanding payment is $\frac{1}{2}F$, no matter what decision the other borrower chooses.

	#2 *Rolls Over* $G=0$	#2 *Demands Payment* $G=1$
#1 *Rolls Over* $G=0$	$(\frac{1}{2}FP, \frac{1}{2}FP)$	$(\frac{1}{2}FP, \frac{F}{2})$
#1 *Demands Payment* $G=1$	$(\frac{F}{2}, \frac{1}{2}FP)$	$(\frac{1}{2}F, \frac{1}{2}F)$

Table IV
Lender Payoffs Given a Chance to Negotiate

The payoffs assume that each lender has a claim of $\frac{1}{2}H$. If both lenders negotiate, neither will go to court, even if the news is bad. Both lenders have equal bargaining power, implying that negotiations result in each retain an equal claim of $\frac{1}{2}H$. If either lender goes to court, the cash flow is reduced to $\phi_H H$. If one lender goes to court but the other stops first to attempt to negotiate, the lender who goes to court gets ε more than one half of the total cash flow of $\phi_H H$, at the expense of the other lender. If both go to court, each receives one half of $\phi_H H$. All cash flows are received with probability P, and the expected cash flows are given in the table.

	#2 *Negotiates*	#2 *Goes to Court before Date* 1
#1 *Negotiates*	$(\frac{1}{2}HP, \frac{1}{2}HP)$	$(\frac{1}{2}\phi_H H-\varepsilon)P, (\frac{1}{2}\phi_H H+\varepsilon)P)$
#1 *Goes to Court before Date* 1	$(\frac{1}{2}\phi_H H+\varepsilon)P), (\frac{1}{2}\phi_H H-\varepsilon)P$	$(\frac{1}{2}\phi_H HP, \frac{1}{2}\phi_H HP)$