Several of the results in this paper were in a previous version of Diamond [2007], presented at the Princeton Lectures in Finance in June 2005.

Abstract

This paper develops a theory of financial structure based on the degree of legal protection of creditors and on legal enforcement costs. It has implications for the structure of debt, the threat of financial crises, and the role of monitoring by banks. When legal protection of creditors is weak, monitored lending is required and this leads either to bank-oriented financial systems or family firms. The legal environment to discipline banks (e.g., bank regulation) is a key to the success of the financial system. When legal enforcement is costly or corrupt, financing must be short-term. The strength of legal protection and the costs of enforcement determine whether banks or firms issue the short-term debt.

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This paper develops a theory of financial structure based on the degree of legal protection of creditors and investors and on the enforcement costs of the legal system. The model has implications for the debt structure, the threat of runs and financial crises, and the role of monitoring by financial intermediaries for countries with different legal systems. The research area of law and finance, largely initiated by Shleifer and Vishny [1997], has produced many empirical and theoretical insights. The key empirical results are cross sectional predictions across countries about the effects of the legal system on the access to finance and the financial contracts used. Very little of this research has examined the structure and contracts of financial intermediaries. Legal systems vary in creditor property rights, and the consequences of fraud, misappropriation of investors’ funds, or default on a debt contract. In addition to varying consequences, the costs of accessing courts and the level of corruption in the legal system differ across countries.

Diamond [1984] focuses on the role of diversification and on the use of debt contracts by borrowers and intermediaries, but assumes that legal protection is very strong. It assumes that it is possible to write and enforce a contract to deter a borrower’s self-interested action, such as diverting funds, as long the diversion can be detected at no cost. The role of intermediaries when legal protection is strong is to reduce the cost of giving borrowers incentives not to divert funds when information about diversion is costly. Diversification within intermediaries is essential in this environment of strong but costly legal protection. When legal protection is weak, then even when there is certainty, or more generally if a borrower’s self-interested actions can be exactly detected without cost, it may not be possible to deter borrower theft (or other misdeeds). This occurs because the penalty is less than the spoils of the crime. In this environment, the role and structure of intermediaries and in the optimal form of their contracts is quite different from that with strong legal protection.

The model examines the separate effects on financial contracting of two aspects of legal interaction between borrowers and lenders or investors. The first aspect I refer to as legal
protection, which measures the ability of a contractual legal sanction to reduce the payoff from borrower diversion or other misbehavior. The second aspect is legal recovery, which measures the amount that a lender obtains from the process of actually imposing the legal sanction. If legal protection is weak, then there is an upper bound on the strength of such sanctions, and contracts will not be able to deter diversion in some circumstances. If legal recovery is low, then the costs of imposing legal sanctions are large and the issue of committing lenders to impose the sanctions becomes important. Because protection and recovery influence different aspects of contracting and monitoring, the analysis begins in section 2 under assumptions where recovery does not matter to the achievable set of outcomes (and only protection matters) when there is certainty. The assumptions that lead to this are the ability to commit to impose legal sanctions based on observed outcomes (such as the amount paid by a borrower) and the ability of a monitor to capture the entire surplus when bargaining with a borrower.

The analysis in this paper assumes that all cash flows are certain and that legal protection is weak. Diamond [2007] generalizes the model to include uncertainty and stronger legal protection. However, most of the model’s insights can be obtained under this paper’s environment.

The balance of this paper proceeds as follows. Section 2 describes financial contracts without monitoring and it defines the strength of legal protection. Section 3 examines the role of monitoring and shows how to provide banks with incentives for delegated monitoring. Section 4 compares contracts that provide banks with incentives to act as delegated monitors with contracts that impose joint liability on several borrowers (e.g., conglomerates). The analysis in Sections 2, 3, and 4 is done under assumptions where the degree of legal recovery is irrelevant. The borrower has no bargaining power and legal sanctions are imposed based on observable debt payments (sanctions are automatic). Section 5 allows borrowers some bargaining power and legal sanctions that must be imposed voluntarily by lenders or monitors (allowing for sanctions that are not automatically triggered by a default). Demand deposits provide depositors (or lenders more generally) an incentive to invoke sanctions that synthesize automatic sanctions. Section 6
examines the financial structure of an economy where investors can lend directly with or without monitoring, where monitoring can be delegated. It describes the use of short-term demandable debt by firms or banks. Section 7 presents conclusions.

Section 2: What is monitoring and how does it relate to the legal environment?

2.1 Contracts without monitoring.

To understand how monitoring can resolve incentive problems between borrowers and lenders, I begin by examining the best contracts without monitoring. Assume that borrowers receive cash flows from business operations and must voluntarily turn them over to investors. In the course of business, the borrower deals with customers and suppliers, and this allows the possibility of diverting cash flow to himself. To be concrete, if the borrower receives a cash flow, $H$, and if he does not divert any of it, the cash flow is verifiable and investors have access to $H$, up to the amount that they are contractually owed, $F$. If the borrower diverts, the diverted amount is unavailable and unverifiable to investors or courts. Because diverting cash can be costly due to covering one’s tracks, a fraction $t \geq 0$ of the amount diverted is destroyed. If $t=0$, as in Diamond [1984], the borrower can steal at no cost. If $t>0$, the costs of diverting may include payoffs to accomplices, such as suppliers (as in Lacker-Weinberg [1989] and Calomiris-Kahn [1991].

The legal system allows borrowers and investors to write contracts which depend on verifiable quantities, such as the amount of cash actually paid by the borrower to the investors. This amount is observed after the borrower has had the opportunity to divert an unverifiable amount of cash. Because the cash payment to lenders can be used in a contract, legal actions contingent on the payment can be specified. These legal actions or sanctions on the borrower reduce the borrower’s payoff by $\phi H \geq 0$. Until section 5 it is assumed that these contracts are written in a way that prevents their renegotiation. Proposition 1 describes how the strength of legal protection influences a borrower’s incentive to repay or to divert funds.
**Proposition 1**  If the borrower has a cash flow of \( H \) and is supposed to pay an amount \( F \) to the lender, and if there is sanction of \( \phi H \) for all payments less than \( F \), then he will make the payment if and only if it costs him less to pay investors than to incur the legal sanctions and the costs of diversion, \( F \leq (t+\phi)H \). This implies that his payoff after paying investors, \( H-F \), weakly exceeds his payoff from diversion, \( H(1-t-\phi) \). If \( F > (t+\phi)H \), the borrower will divert funds and default on the debt.

The ex-post sanctions can be thought of in several ways. First, they may represent a legal penalty for fraud or for default. Second, they may represent the value of lost reputation such as the value of lost rents from future business due to revelations of diversion. Finally, they may represent ex-post interventions that reduce the borrower’s proceeds from diversion. All of these are useful to deter diversion.

Sections 2, 3, and 4 address legal protection issues by assuming full commitment to impose the sanction, not matter how low the lender’s recovery. Section 5 considers the discretionary imposition of costly legal sanctions. The lender recovers \( X \phi \) if the legal sanction is imposed and the borrower’s payoff is \( H(1-t-\phi) \). The sanction is costly and legal recovery is low if these sum to less than \( H \).

Actual cash payments are observable and can be written into contracts. As a result, in the case where cash flows are certain, any payment of less then the promised amount \( F \) (which is assumed to be less than or equal to \( H \)) indicates diversion. I define strong legal protection as that which can deter all diversion, or \( \phi + t = 1 \). In contrast, when there is weak legal protection, \( \phi + t < 1 \), it may not be possible to deter diversion even when it can be detected ex-post.

Proposition 1 shows that with strong legal protection, \( t + \phi = 1 \), diversion by the borrower can be deterred by imposing the penalty if less than \( F \) is paid. Most obviously this is interpreted as a debt contract with face value \( F \). As long as there is a court system that will enforce the penalty when too little is paid, the borrower will not divert. When cash flow is certain, the penalty need not be imposed because its prospect deters diversion. Therefore, the costs of
imposing the sanction need not be incurred and there are no consequences of a low recovery. However, once there is uncertainty about the unobservable amount of cash obtained by the borrower, the costly penalty may need to be imposed to deter the borrower from claiming that cash is low. Monitoring of a borrower’s ability to pay (or other aspects of the borrower’s situation that cannot be written into a contract) allows the costly imposition of penalties to be fine tuned. However, costly monitoring is expensive if the borrower must borrow from many lenders and there are many lenders per borrower. Delegating the monitoring to one lender economizes on these costs. Diamond [1984] characterizes the optimal way to delegate monitoring for this case with strong legal protection.

Section 3. Weak Legal Protection and Small Sanctions

If the legal system provides sanctions which are too weak to deter some borrowers from diverting funds, then more detailed ex-ante monitoring of actions and cash flows may be needed. Responding to an actual default, which occurs at the end of a period, is too late. Early monitoring is needed in order to quickly intervene to reduce the borrower’s payoff from diversion, stopping a crime in progress, as in Calomiris-Kahn [1991] and Diamond [1991]. The value of early monitoring can be due to knowledge of the location of diverted funds, the ability to expose secret side deals or just the ability to impose costs on the borrower if and only if he is diverting funds. This ability to reduce the spoils of a crime in progress gives the monitor the ability to extract a larger cash payment from the borrower. Section 3.1.1 looks at the case where monitoring is not delegated and the monitor is the investor. This could be thought of as lending by a wealthy family. Section 3.1.2 examines delegated monitoring with weak legal protection. The weak legal sanctions that lead to the need for ex-ante monitoring can complicate the delegation of monitoring. For simplicity, I suppress the cost of monitoring from the analysis of all of the cases with weak legal protection.

3.1 A Model of monitoring with weak legal protection.

The borrower cash flows and the time line of borrower and monitor actions are the same for undelegated and delegated monitoring.
Legal sanctions can reduce the borrower’s payoff from diversion by \( \phi H \) and in addition, if the borrower diverts the cash flow \( H \), he can only obtain proceeds \( H(1-t) \), where \( t \) is the fraction of cash destroyed by covering one’s tracks. Therefore, imposing legal sanctions on a diverting borrower reduces the proceeds available to the borrower to \( H(1-t-\phi) \). I examine the case of weak legal protection, implying \( \phi < 1-t \). In monitoring the borrower, if the monitor observes the act of diversion sufficiently early, he can intervene and stop the crime in progress (the details of timing are discussed below). This reduces the borrower’s diversion proceeds by \( H_m \). Monitoring is useful for eliminating or reducing the borrower’s spoils of diversion. This ability to reduce the borrower’s diversion proceeds gives clout to the monitor. If \( m = 1-t \), monitoring eliminates all of the borrower’s spoils. If \( m < 1-t \), the spoils are reduced and the additional effects of the legal sanctions for default, \( \phi H \), are relevant. This implies that the cash available to the borrower is \( H(1-t-m-\phi) \) if the borrower diverts, the monitor stops the crime in progress, and legal sanctions are incurred.

The time line of borrow and monitor actions is as follows. First, the borrower chooses whether to divert cash. If the borrower does not divert cash, it is available to the lender, and the borrower will use it to make the promised loan payment, \( F \leq H \). If the borrower diverts the cash, there is not a verifiable default or a full payment of \( F \) at this stage. However, the monitor observes the borrower’s action. If the borrower is in the process of diverting cash, the monitor can commit to stop the crime in progress (reducing the diversion proceeds by \( H_m \)) unless the borrower makes a payment specified by the monitor. Then the borrower accepts or rejects the monitor’s offer. For simplicity, until section 5, I continue to assume that the monitor has all the bargaining power and can make this brief commitment to stop the crime in progress if the borrower rejects his offer.\(^2\) Stopping the crime will reduce the diversion proceeds to \( H(1-t-m) \); the borrower defaults and is still subject to the legal penalty, \( \phi H \). The borrower’s payoff if the

\(^2\) Due to this ability to commit and obtain all surplus, the amount of the payoff to the monitor from actually stopping the crime matters very little (only in off the equilibrium path payoffs). I could instead assume that stopping the crime in progress gives a payment of \( mH \) to the monitor. This would remove the need for short-term commitment to the stop the crime if the offer was rejected.
monitor actually stops the crime in progress is $H(1-t-m-\phi)$. The borrower’s outside option, his payoff if he rejects the offer, is at least this amount.

There is a subtlety in the time line regarding the timing of the borrower’s act of diversion relative to when the monitor must appear in order to be effective. The primary focus is on the case where the monitor appears before the crime is actually completed. In this case, the diversion is about to occur, but the borrower can rethink his decision to divert after the monitor threatens to stop the crime in progress. This is referred to as the reversible case. The significance of this case is that the borrower has the option of paying $F$, the face value of the loan, rather than suffer the threats and consequences imposed by the monitor. In this case, the borrower’s outside option is the larger of $H-F$ and $H(1-t-m-\phi)$, where $H-F$ is the payoff from reversing diversion and $H(1-t-m-\phi)$ represents the payoff if the crime is actually stopped. This reversible case is more realistic than the irreversible case, because it allows negotiation between the banker and the borrower, letting them decide how to split the spoils. It includes the situation of irreversible diversion where the bank and the borrower negotiate a deal before the diversion has occurred.

The less interesting case is when the monitor appears just after the crime (diversion) has occurred. After diverting funds, the borrower has cash of only $H(1-t)$, thus his outside option to fully repay gives him a payoff of $H(1-t)-F$. If he does not fully repay, the borrower remains subject to the threats and consequences imposed by the monitor. This is referred to as the irreversible case. The borrower’s outside option is the larger of $H(1-t)-F$ and $H(1-t-m-\phi)$.

The undelegated monitoring section and the delegated monitoring section analyze both the reversible and irreversible cases. It turns out that they are identical for undelegated monitoring, and the reversible case is more compelling for delegated monitoring.

### 3.1.1 Undelegated Monitoring

Proposition 1 showed that an unmonitored borrower with cash flow $H$ diverts funds and defaults on his debt whenever the face value of $F$ of his debt exceeds $H(t+\phi)$. If $H(t+\phi)$ is less than $I$, the borrower cannot finance his project. Now suppose that a lender is ex-ante monitoring
the actions of a borrower whose loan he alone financed directly. With this undelegated monitoring, I will show that the borrower diverts funds and defaults on his debt only when \( F > H(t+m+\phi) \). In other words, because monitoring reduces the proceeds from diversion by \( mH \), borrowers are willing to pay this larger face value to lenders. Undelegated monitoring increases the amount of financing available to borrowers by \( Hm \).

For the reversible case, if the monitor observes diversion by the borrower, he will demand a payment that drives the borrower’s payoff down to the borrower’s outside option. The borrower’s outside option is the larger of \( H-F \) and \( H(1-t-m-\phi) \), as shown above. Anticipating this payoff if he attempts to divert versus a payoff of \( H-F \) if he does not attempt to divert, he will not attempt to divert if \( H-F \geq H(1-t-m-\phi) \), or \( F \leq H(t+m+\phi) \).

For the irreversible case, the only difference is that if the monitor observes diversion by the borrower, the borrower’s outside option is the larger of \( H(1-t)-F \) and \( H(1-t-m-\phi) \), as shown above. Anticipating this payoff if he attempts to divert versus a payoff of \( H-F \) if he does not attempt to divert, he will not attempt to divert if \( H-F \geq H(1-t-m-\phi) \), or \( F \leq H(t+m+\phi) \). This is identical to the reversible case.

In the case of reversible diversion, if the monitor observes attempted diversion, he demands a payment of the smaller of \( F \) and \( H(t+m+\phi) \), forcing the borrower to reverse the diversion. The monitor could instead require a borrower who has diverted funds not to reverse the diversion and pay the monitor a share of diversion proceeds \( H(1-t) \). However, the monitor is never better off doing so when he is the only lender (he owns the loan). It will turn out to be relevant in the case of delegated monitoring.

3.1.2 Delegated Monitoring with Weak Protection.

If all lenders are wealthy enough and willing to lend the entire amount needed by each borrower, then there is one loan per borrower (\( n=1 \)) and each lender can serve as an undelegated monitor for his own loan. However, if there are not enough large lenders to satisfy borrowers’ demands for financing, borrowers must borrow from \( n>1 \) small lenders. The lenders require a
repayment of $I$ to fund the indivisible investment of the borrower, and each lender has $I/n$ to invest. If small investors cannot delegate monitoring and each monitors at a cost $K>0$, the total monitoring cost is $nK$ and prohibitive if $n$ is large. Delegating monitoring to one agent avoids duplication of effort, but causes incentive problems for the agent delegated the monitoring task. Small lenders will not observe the information monitored by the agent, and they may not even observe that any effort was put into monitoring. The agent (called "the banker") has a conflict of interest with the small lenders. The conflict is similar to the conflict of interest between the borrower and the small lenders. How can the monitoring task be delegated without the need for each lender to monitor the monitor at a prohibitive cost? The solution is for the banker to face sanctions as a function of the amount paid to the $n$ small lenders (depositors). This works well under the assumption of strong legal protection in Diamond [1984] and also Diamond [1996] and Holmström-Tirole [1997] where the monitoring expenditure of a delegated monitor is unobservable.

In a weak legal environment, borrowers are more likely to divert funds, making monitoring more important. However, delegated monitoring is less effective than in a strong legal system. This is because the borrower and monitor may find collusion attractive. The information monitored is unobservable and unverifiable by other lenders, and the monitor needs to raise all funding from many small investors (I do not explicitly analyze the costs of monitoring). The borrower and monitor can share the diversion proceeds if they wish. Outside investors do not monitor the monitor, so they will not be able to stop this joint crime while in progress. Outside investors provide all capital and require a repayment of $I$. Investors can write contracts which impose legal sanctions on the borrower and the monitor as a function of observable cash payments. The key difference is that legal sanctions may be insufficient to deter diversion and/or collusion. As seen in the case of undelegated monitoring with weak legal protection, ex-ante monitoring to allow the stopping a crime in progress is needed to deter borrower diversion. Also, in a strong legal environment, delegated monitoring relied on strong sanctions to deter collusion. Weak legal sanctions are less able to deter collusion.
The borrower and the monitor (but no others) observe any act of diversion by the borrower. If the borrower does not divert funds, he can make a verifiable payment, \( V \leq H \), to the monitor. If a verifiable payment is made, the monitor cannot divert it. The monitor can make a verifiable payment to lenders, \( Z \), up to the amount, \( V \), which is paid by the borrower. Investors can write contracts where the imposition of a penalty of up to \( \phi H \) on the borrower and \( \phi_M H \) on the monitor, is contingent on the amount of the payments \( Z \) and \( V \). If there is a fixed maximum sanction the legal system imposes, then these two sanctions are equal (\( \phi = \phi_M \)), but in general they could be different. As before, let \( F \) be the face value of a debt contract (loan) owed by the borrower to the monitor (bank). Payments of \( V \) less than \( F \) trigger a legal penalty \( \phi H \) and give the monitor the right to stop a crime in progress. Let \( B \) be the face value of a debt contract (bank deposits) owed by the delegated monitor (bank) to the outside investors, where a legal penalty of \( \phi_M H \) is imposed on the monitor for payments of \( Z \) smaller than \( B \). The bank must collect at least \( B \) from the borrower to avoid bank failure (default on deposits).

If the borrower diverts funds, the borrower can make either unverifiable side payments, denoted by \( U \), to the monitor up to the diversion proceeds, \( H(1-t) \), or verifiable loan payments, \( V \), up to \( H \) if diversion is reversible and up to \( H(1-t) \) if it is irreversible.

If the monitor observes diversion, he can threaten to stop it and reduce the proceeds from diversion by \( mH \) unless the borrower makes a specified payment to the monitor. The monitor sets the specified payment to make the borrower indifferent between making the payment and letting the monitor actually stop the crime in progress. The monitor can specify either a verifiable payment, \( V \), or an unverifiable payment, \( U \), from the diversion proceeds. All of the unverifiable payment \( U \) will accrue to the delegated monitor. If the monitor receives a verifiable payment \( V \) from the borrower that satisfies \( V \geq F \geq B \), neither is penalized and the monitor’s payoff is \( V-B \) and the borrower’s is \( H-V \). If the monitor receives a side payment \( U \) from the diversion proceeds, the delegated monitor’s payoff is \( U-\phi_M H \) and the borrower’s is \( H(1-t-\phi)-U \). Legal sanctions, \( \phi H \) and

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\(^3\) If we changed the contract slightly to require the monitor to force a payment, \( V=B \), to be made directly by borrower to outside investors, we could allow the legal sanctions to depend only on \( V \).
\( \phi_M H \), are incurred because the borrower and monitor default when they share the proceeds of diversion.

The amount of financing available to the borrower is limited by the largest amount that he will pay investors instead of diverting and defaulting. The limit is the largest incentive-compatible value of \( F \). With no monitoring, \( F \leq H(t + \phi) \), as shown in Proposition 1. Section 3.1.1 shows that with undelegated monitoring, \( F \leq H(t + m + \phi) \), an increase of \( Hm \). \( Hm \) is the amount by which a monitor can reduce the borrower’s diversion proceeds. \( Hm \) represents the clout the monitor has over the borrower. In these two cases, since there is no intermediary (bank) involved, the payment \( F \) is made directly to investors. For delegated monitoring, the payment to investors is what depositors receive from their deposits with face value \( B \). Proposition 2 characterizes the largest values of \( B \) that the bank will pay without default. It shows that for reversible diversion by the borrower, this maximum value exceeds the amount an unmonitored borrower is willing to pay by the smaller of \( Hm \) and \( H\phi_M \). The bank’s clout, \( Hm \), can be used for good or evil purposes. The bank can force the borrower to make a larger verifiable loan payment (good) or force the borrower to share diversion proceeds (evil). If the legal sanctions, \( \phi_M H \), on the bank are too low, the bank will collude and use its clout for evil purposes. If diversion is irreversible, this largest value of \( B \) exceeds the maximum payment of an unmonitored borrower by \( Hm \), just like for undelegated monitoring.

**Proposition 2** A delegated monitor can reduce a borrower’s diversion proceeds by \( Hm \) and can monitor extract all surplus in negotiation with a borrower. If diversion is reversible and, the delegated monitor will collude with the borrower, allow diversion and default on deposits with face value \( B \) if \( B \geq \min \{ H(t + \phi + \phi_M), H(t + m + \phi) \} \). If diversion is irreversible, the delegated monitor will collude, allow diversion and default on deposits with face value \( B \) if \( B \geq H(t + m + \phi) \).

The case of reversible diversion is most relevant because it does not artificially restrict the borrower and the bank from reaching a mutually beneficial deal. The borrower can negotiate
a deal with the bank when he can still use all of his cash flow to avoid a default. This implies that if the bank and borrower negotiate a deal to jointly divert, only some of the spoils will go to the bank. In this case, Proposition 2 implies that with very weak legal protection, $\phi_M=0$, delegated monitoring does not work. If diversion is irreversible, the borrower will not divert in the first place because all of the spoils would go to the banker. Therefore, the borrower repays the bank loan with a verifiable payment, $V$, which accrues to depositors. In this case even when $\phi_M=0$, delegated monitoring works as well as undelegated monitoring, but only because the borrower and the monitor cannot reach a deal to their joint benefit.

**Proof of Proposition 2:**

For the cases of reversible and irreversible diversion, the borrower’s payoff from not diverting at all is $H-F$ and the monitor’s payoff is $F-B$. If diversion is irreversible, the borrower can pay at most $H(1-t)$ once he diverts. If $F > H(1-t)$, and the monitor commits to stop the crime if his offer is rejected, the borrower’s outside option is $H(1-t-m-\phi)$ because he receives a legal penalty. The borrower will not divert if $F \leq H(t+m+\phi)$. If $t+m+\phi \geq 1$, irreversible diversion is always unattractive to the borrower, who will not attempt to divert, so long as it is possible to fully repay ($F \leq H$).

Similarly, if diversion is irreversible and $F \leq H(1-t)$, borrower’s outside option after diversion includes the right to fully repay $F$ after initially diverting funds and is $\max\{H(1-t)-F, H(1-t-m-\phi), 0\}$. Only in the case where the larger expression is $H(1-t)-F$ is this different from the previous paragraph. In this case, the borrower’s payoff from diversion is $H(1-t)-F$. However, the borrower will prefer not to divert in the first place because it yields the payoff $F > H(1-t)-F$.

If diversion can be reversed after it is detected, the borrower’s outside option given diversion is at least $H-F$, because the borrower can still fully repay $F$ and remove the monitor’s right to stop the crime. The borrower can find it advantageous to negotiate with the delegated monitor to share diversion proceeds. The borrower and monitor will choose a diversion decision that maximizes their total joint payoff. If the borrower diverts, the delegated monitor can propose
a verifiable payment of up to F or a non-verifiable payment U (which will accrue to the monitor) from the diversion proceeds of H(1-t). The borrower’s outside option is max{H-F, H(1-t-m-ϕ)}, because if cash remains diverted, the borrower will receive the legal sanction ϕH. If the outside option is the second term, H(1-t-m-ϕ), then F > H(t+m+ϕ), and default and diversion are unavoidable because the monitor cannot force the borrower to make a verifiable payment in excess of H(t+m+ϕ). If instead the outside option is H-F (F ≤ H(t+m+ϕ)), the borrower’s payoff from shared diversion is H(1-t-ϕ)-P, and he will reject any offer of U>F-H(t+ϕ). The monitor’s payoff from receiving a diversion share U=F-H(t+ϕ) (which leaves the borrower’s payoff equal to his outside option) is U-ϕMH=F-H(t+ϕ+ϕM). The monitor’s payoff from a verifiable payment of F is F-B. The monitor prefers a verifiable payment of F if F-B ≥ F-H(t+ϕ+ϕM), or B ≤ (t+ϕ+ϕM)H. Instead, if B exceeds H (t+ϕ+ϕM), the monitor shares in the diversion proceeds and delegating monitoring does not succeed.

Q.E.D.

Bank contracts (delegated monitoring contracts) impose consequences on the monitor for default on deposits, and these defaults are caused by defaults on the borrower’s loans. This is similar to joint liability of several borrowers for each other’s default. I explore this in the next section.

Section 4: The Link to Joint Liability: Differential Payoffs from Diversion

Financial intermediary contracts subject both borrower and delegated monitor to sanctions when the borrower defaults. This is similar to a group penalty sometimes used in the military, where all soldiers are punished if any of them perform poorly. Even more similar is debt with joint liability, sometimes used in village economies or by the Grameen bank, where all borrowers are sanctioned if any default.

It is helpful to compare the results on delegated monitoring under weak legal protection in the previous section with a model of joint liability for two borrowers, neither a pure monitor, who are subject to joint liability. The joint liability is a penalty of ϕH on each if either default on
their individual obligations to each pay F to lenders. This is useful to understand the difference between diversified banks (delegated monitors) and conglomerates (joint liability of multiple operating divisions). It also illustrates advantages of separating banking from commerce, so that banks as delegated monitors do not have operating divisions with large potential for independent diversion. As a result, they are more likely to use their clout to extract verifiable payments instead of colluding to jointly divert cash.

One important way that joint liability is thought to work is by the diversification effect illustrated in the section on strong legal protection: it allows cross subsidy from successful to unsuccessful borrowers which avoids default and its costs, see Diamond (1984), Beasley and Coate (1995), Guinnane and Ghatak (1999), Prescott (1997) and Bond (2004). In the model of delegated monitoring in the previous section, there is no uncertainty, and thus no role for diversification. Despite this, joint liability of borrower and delegated monitor matters because if the borrower diverts cash and the bank fails, a sanction is imposed not just on the borrower but also on the delegated monitor, whose incentive to divert is less than the borrower’s. Suppose that joint liability is imposed instead on two identical borrowers each with a project delivering a riskless cash flow of H. Each can use reversible diversion, and each can monitor the other (possessing a threat to reduce the other’s diversion proceeds). In this case, joint liability would not provide increased incentives not to divert. Each alone could commit to pay H(t+\phi) and together they can pay twice as much. If their total joint obligation, 2F, exceeds 2H(t+\phi), and each diverts, they will agree to share the proceeds of diversion, and jointly incur the penalty because diverting increases their shared total payoff (“total surplus”) because 2F>2H(t+\phi).

However, if the two borrowers have very different incentives to divert funds, then joint liability and mutual monitoring can allow a borrower with a very low incentive to divert to convince the other not to divert, because diversion does not increase their total surplus. The increased incentive to pay without diversion is even stronger when diversion is irreversible (as it was for the delegated monitor in Proposition 2). Joint liability allows the incentive to divert to be
eliminated when the party who would not divert unilaterally has sufficient bargaining power and monitoring is sufficiently effective.

Single liability is each borrower borrowing individually, with sanctions imposed only for one’s own default. Joint liability is defined as subjecting each borrower to a penalty of $\phi H$ unless each pays $F$. In addition, the borrowers are allowed but not required to pay off each other’s obligations (this means that if a borrower has paid his loan of $F$ he can always keep any remaining verifiable cash flow if he chooses). I assume that each borrower can monitor the other and can reduce the other’s payoff from diversion by $H_m$. This is sufficiently large to deter diversion if desired ($H_m$ is sufficiently large).

**Proposition 3** Consider two borrowers, A and B, who each need to provide a return of $I$ to investors to finance their projects. Their projects each produce a cash flow of $H$, but they have with different incentives to divert ($t_A < t_B$). Under single liability and without monitoring, only A would divert funds if $F=I$, that is $I \geq H(t_A+\phi)$ but $I \leq \min\{H(t_B+\phi),H\}$. Imposing joint liability on A and B if either pays less than $F=I$ has the following effects.

i) If diversion is reversible, borrowers make diversion decisions which maximize their joint payoff. If $I=F<\min\{H(t_A+2\phi), H\left(\frac{t_A+t_B}{2} + \phi\right)\}$, then neither divert;

\[
\text{if } H\left(\frac{t_A+t_B}{2} + \phi\right) \leq I \leq H(t_A+2\phi), \text{ then only A diverts (identical to single liability)};
\]

\[
\text{if } I=F>\max\{H(t_A+2\phi), H\left(\frac{t_A+t_B}{2} + \phi\right)\}, \text{ then both divert.}
\]

ii) If diversion is irreversible and B has a sufficient fraction of the bargaining power, there is no diversion by either borrower.

iii) If diversion is irreversible and A has a sufficient fraction of the bargaining power, then A will divert but B will not (as with single liability).\(^4\)

\(^4\) If a borrower were required to pay all of $H$ (not just $F$) to lenders whenever the other borrower did not pay $F$, and not simply be subject to penalty under those circumstances, then joint liability can lead B to divert when he would not under single liability if A has sufficient bargaining power.
A financial intermediary has no diversion opportunities independent of those of its borrowers, which is equivalent to the intermediary being borrower B with $t_B = 1$. A borrower with a low ability to divert unilaterally (a high value of $t_B$) is better able to commit to deter another borrower from diversion. If banking and commerce are not separated, or if we consider joint liability in conglomerates, then the value of $t_B$ will low, and joint liability may not reduce diversion and may even increase it. In weak legal environments, separating banking from commerce increases the amount of funding that is available to borrowers by deterring diversion.

Section 5. Monitoring, Limited Commitment and Bargaining

The delegated monitoring model in sections 2 through 4 assumes contracts that automatically impose legal sanctions contingent on low payments to lenders or depositors. In addition, monitors have all the bargaining power over borrowers: they capture the entire surplus when they use their monitoring to threaten to stop a crime in progress. As a result, monitoring is effective in deterring diversion if stopping a crime in progress can sufficiently reduce the spoils of diversion. This section allows for voluntary legal sanctions on (allowing for sanctions that are not automatically triggered by a default). This generalization shows how delegating monitoring may require the first-come-first-served demand deposit contracts that were assumed in the Diamond-Dybvig (1983) model, or short-term debt issued directly by firms as in Diamond (2004). These short-term demandable debt contracts can provide depositors (or lenders more generally) an incentive to invoke sanctions that synthesize automatic sanctions. In addition, this section separately gives borrowers some bargaining power (so they get some surplus in negotiations with lenders or monitors), whether or not sanctions for default are automatic. This implies that skills other than the ability to observe a borrower are important to be an effective monitor (asset redeployment skills matter).

Because only the monitor observes diversion, the monitor must initiate discretionary actions or negotiations based on attempted diversion. Intervention must be a voluntary choice of the monitor’s; there is no way to specify automatic intervention. As a result, his asset
redeployment skills are important if the borrower has any bargaining power, even if sanctions for subsequent default are automatic.

When the borrower has some bargaining power, the effectiveness of a monitor is an increasing function of the recovery achieved if he actually intervenes: an effective monitor needs a high outside option in the bargaining. This required high recovery or outside option can be interpreted as skill in asset redeployment or liquidation or more generally as a specific skill possessed by a relationship lender. As a result, monitoring ability is lender specific and monitored loans are illiquid.

Section 5.1 examines monitoring by an undelegated monitor with no bargaining power, when automatic legal sanctions are imposed for default, but where the monitor can choose to intervene to stop a crime in progress. This is followed by an analysis of delegated monitoring in the case where depositors and lenders have no bargaining power and where automatic sanctions for default on deposits are also possible. Section 5.2 examines the consequences of making all sanctions, including those for default, voluntary, for both undelegated and delegated monitors when depositors and lenders have no bargaining power.

5.1 Monitoring when there are Automatic Legal Sanctions for default and the borrower has all the bargaining power

To illustrate the importance of a monitor’s redeployment skills when the borrower has some bargaining power, consider an undelegated monitor with no bargaining power (where the borrower gets the entire surplus from negotiations). The borrower’s debt has a face value of F. If automatic legal sanctions are triggered for payments less than F (and these cannot be renegotiated), we saw in Proposition 1 that the borrower, in order to avoid the sanctions, will pay up to \( H(t + \phi) \) without diverting if there is not monitoring. If legal protection is weak (low \( \phi \)), this will be too low an amount to make lending profitable. Suppose that the face value of debt, F, exceeds \( H(t + \phi) \) and the borrower diverts. If the monitor threatens to stop the crime in progress, the borrower will offer the monitor a payment to refrain from stopping the crime. Because the borrower has all the bargaining power, the monitor will accept an amount that gives him a total
payoff equal to what he can obtain by rejecting the offer (his outside option). The monitor’s outside option is the larger of two amounts: the recovery achieved from intervening immediately to stop the crime (e.g., redeploying assets immediately), which is $X_m$, and the recovery, $X_\phi$, from allowing the crime in progress to proceed, leading to a subsequent default and automatic sanction. The monitor will prefer to intervene unless offered a payment of at least $\max\{X_m - X_\phi, 0\}$.

Stopping the crime in progress would reduce the borrower’s diversion proceeds by more than this payment, so the borrower will prefer to pay the monitor to not intervene. The borrower’s offer of $\max\{X_m - X_\phi, 0\}$ gives him a payoff of $H(1-t-\phi) - \max\{X_m - X_\phi, 0\}$.\(^5\) If the borrower does not divert and pays $F$, his payoff is $H - F$. As a result, if $F$ exceeds $H(t+\phi) + \max\{X_m - X_\phi, 0\}$, diversion remains attractive even if monitored.

When sanctions on default are automatic, an undelegated monitor with no bargaining power can force the borrower to pay up as much as $F \leq H(t+\phi) + \max\{X_m - X_\phi, 0\}$. The monitor’s redeployment skill, reflected in a high value of $X_m$, is essential to be effective at deterring diversion. If $X_m \leq X_\phi$, an undelegated monitor with no bargaining power is no better at deterring diversion than a lender who does not monitor. This is in marked contrast to an undelegated monitor who has all the bargaining power (as in chapter 1), who can induce the borrower to repay a face value $F$ up to $H(t+\phi+m)$ without diverting, by capturing all the surplus from threatening to stop a crime in progress.

A skilled monitor, one with $X_m - X_\phi > 0$, can serve as a delegated monitor when structured as a bank if automatic legal sanctions are triggered by default on deposits (as in section 3). A delegated monitor who issues deposits with face value $B$ will monitor loans and pay depositors up to $B = H(t+\phi) + \min\{H_\phi M, \max\{X_m - X_\phi, 0\}\}$ without allowing diversion.\(^6\) This is identical to the case of automatic legal sanctions in section 3, except that the monitor’s redeployment skill, $X_m$, is important. The final part of the next section shows a very different result when legal sanctions

---

\(^5\) The borrower could also offer no payment when $X_m - X_\phi > 0$ and allow the monitor to stop the crime in progress, giving the borrower a payoff of $H(1-t-\phi-m)$. Because $Hm \geq X_m$ and $X_\phi \geq 0$, this is dominated.

\(^6\) The legal sanction on the bank is $H_\phi M$ if it defaults.
for default are not automatic.

5.2 Monitoring when Legal Sanctions for default are voluntarily imposed and the borrower has all the bargaining power

When legal sanctions are not automatic, a contract will be renegotiated to avoid inefficiently imposing voluntary sanctions. This can reduce or remove the ability to use sanctions to provide incentives. If the threat of sanctions is needed to deter diversion, bargaining power and asset redeployment skills will be important even for lenders (or depositors) who do not monitor. As in the previous section, consider a borrower with all of the bargaining power (who can successfully offer a lender the recovery from imposing the legal sanction). A lender who does not monitor recovers $X\phi$ from imposing the legal sanction. If the face value of debt exceeds $X\phi$, the borrower will divert and threaten to reverse the diversion only if the face value is reduced to $X\phi$. The lender will accept. Therefore, the most that the lender who does not monitor will receive is $X\phi$.

A lender who is an undelegated monitor can get a recovery of $X_m$ if he stops a crime in progress. The borrower can successfully induce him to neither stop the crime nor impose the legal penalty for default by offering a payment of $\max\{X_m, X\phi\}$. Stopping the crime in progress will also reduce the borrower’s diversion proceeds by $Hm\geq X_m$, but the monitor cannot use this threat to get the borrower to pay more than $\max\{X_m, X\phi\}$. As in the previous section, effective monitoring also requires asset redeployment skills: a high value of $X_m$. If the monitor’s recovery is not larger than $X\phi$, monitoring will have no deterrent effect. If the skills to achieve a high value of $X_m$ are lender specific, then effective undelegated monitoring will be lender specific.

When no automatic sanctions are possible and the depositors have no bargaining power, the delegation of monitoring will not be possible. The delegated monitor can threaten not to use his monitoring skills to collect the loan and leave the depositors to collect the loan without monitoring. A depositor who does not monitor achieves a recovery of $X\phi$ from imposing the legal penalty if the monitor does not intervene to stop a borrower from diverting. This is the same
recovery achieved when there is direct lending to the borrower, without a monitor. If the delegated monitor issues deposits (that are not first-come-first served demand deposits) and the depositors have no bargaining power, the coalition of the delegated monitor and the borrower will pay the depositors no more than $X_\phi$. Monitoring will allow the monitor to collect larger payments from the borrower but they will not be paid to depositors. This implies that delegated monitoring requires a way to commit depositors not to accept payments as low as $X_\phi$. The absence of automatic sanctions will make delegated monitoring unviable.

Depositors need to commit not to renegotiate to accept less than $B$, and this can be achieved by demand deposits paid on a first-come-first-served basis. This will be a self-enforcing equivalent to contracts that achieve automatic sanctions and thus will automatically deter renegotiation. The next section shows that delegated monitoring is viable for a delegated monitor who can freely renegotiate the face value of loans, $F$, but who faces automatic sanctions from default on deposits. This motivates results shown thereafter where first-come-first-served demand deposits will work as effectively as automatic sanctions to provide incentives for delegated monitoring.

### 5.2.1 Automatic Sanctions for deposit defaults when the delegated monitor has all the bargaining power

When depositors can negotiate to remove their threat to impose the legal sanctions for payments less than $B$, and have no bargaining power, they receive no more than $X_\phi$, the amount that they recover from imposing the sanction. If instead there are automatic sanctions for all payments less than $B$ (made by the delegated monitor to depositors), the delegated monitor will choose to pay $B$ to depositors unless the legal sanctions are insufficient. In addition, automatic sanctions imposed on deposit defaults can allow a delegated monitor to collect an incentive compatible payment from the borrower that exceeds $X_m$, the amount that an undelegated monitor could collect.
Proposition 4. A delegated monitor with deposits with face value B who faces automatic legal sanctions for deposit default and who monitors a loan with a sufficiently high face value F with voluntary sanctions for loan payments below F will be willing to pay depositors up to B for all \( B \leq H(t+\phi) + \min\{\max\{0,X_m-X_{\phi}\}, \phi_MH\} \equiv \bar{B} \). A delegated monitor with deposits of \( B \leq \bar{B} \) can enforce an incentive compatible payment from the borrower of up to \( B + \max\{0, X_m - X_{\phi} - \phi_MH\} \) if \( B \geq X_m \) and \( \min\{X_m,X_{\phi}\} \) if \( B < X_m \).

Proof: See Appendix.

An undelegated monitor without bargaining power collects a loan for his own account and can collect only his outside option, \( X_m \), while a delegated monitor who owes deposits \( B > X_m \) faces default penalties for making payments less than B to depositors. This discussion assumes that \( X_m > X_{\phi} \), so the monitor can collect more than a lender who does not monitor. The delegated monitor will find it unattractive to accept a low verifiable loan payment less than B from the borrower because the payment accrues to depositors (because it is verifiable) and triggers default penalties on the delegated monitor (because it is less than B). The only way to induce the delegated monitor to accept a payment of less than B and not intervene is to offer to share diversion proceeds which is costly and which triggers deposit default sanctions. As a result, when deposits exceed \( X_m \) but do not exceed \( \bar{B} \) (given in Proposition 4), the borrower will be willing to make verifiable payments in excess of \( X_m \) to the delegated monitor, and the delegated monitor will accept them and repay deposits. The automatic sanctions on deposit defaults allow the delegated monitor to collect as much as an undelegated monitor monitoring a loan that has automatic sanctions for loan defaults. In addition, the delegated monitor can collect more than \( X_m \) and more than the value of its deposits when its outside option is positive (\( X_m - X_{\phi} - \phi_MH > 0 \)). The delegated monitor’s use of deposits with automatic sanctions affects its ability to bargain with its borrower and to commit to pay its deposits. This illustrates the role of preexisting non-renegotiable debt as a way of committing to turn down low offers, as in Brander and Lewis (1998), Spier and Perotti (1993), or Diamond –Rajan [2000].
The ability to renegotiate contracts to avoid the sanctions adds a role for demand deposits to commit depositors not to renegotiate. Diamond-Rajan [2001] presents the idea that the threat of bank runs on demand deposits can commit depositors not to renegotiate. The model in Diamond-Rajan [2001] is based on Hart and Moore [1994] and thus is somewhat different from that in this section. I compare the models below, and their relation to the threat of runs on firms in Diamond [2004] and Von Thadden, Berglof, and Roland [2003] in Sections 5.3.1.

5.3 Demand deposits commit depositors to not make concessions

When the imposition of legal sanctions for default is voluntary, a delegated monitor who raises funds from depositors with no bargaining power will be able to deter them from imposing legal sanctions for default by offering them their outside option: the recovery from imposing default sanctions, $X_{\phi}$. If the borrower and monitor collude to divert and offer to reverse the diversion in return for a reduction in the face value of total deposits, the depositors will accept any reduction to a total value of at least $X_{\phi}$. This assumes that the outside option of each depositor is his pro-rata share of the recovery from declaring a default, $X_{\phi}$. First-come-first-served demand deposits can provide important externalities that increase individual outside options sufficiently to induce depositors to reject offers greater than $X_{\phi}$ from the delegated monitor and to impose the legal sanction instead. This works because each depositor has an incentive to run to the bank, demanding full payment of his deposit, whenever a loss in the future is anticipated. If the delegated monitor does not intervene after the borrower diverts, the total value of the bank will be $X_{\phi}$.

If demand deposits are issued to the depositors and if any depositors demand payment, the bank must pay them in full or an observable default will occur, triggering legal sanctions. Those who withdraw first get paid in full, until the bank fails and sanctions are triggered. As a result, any call for reductions in the amount owed to depositors will cause the bank to fail, even though a successful forgiveness of debt (reduction in the amount owed to depositors) would have avoided the failure and legal sanctions. Bank runs reward those who get out first and demand full
payment, and they punish those who instead reduce their claims and leave their money in the
bank. Alternatively, if the bank takes an action that will impose a future loss on depositors, but
does not ask for debt forgiveness, each depositor will demand payment immediately. No one will
leave their money in the bank if all anticipate a loss.

The incentive effects of potential runs on demand deposits are most easily demonstrated
by a bank with two identical depositors who hold demand deposits with total face value of B
(each has face value of ½B). Each depositor’s payoff depends on his own decision (accept the
delegated monitor’s offer of less than ½B or withdraw, demanding payment of ½B) and on the
decision of the other depositor. The new face values offered by the bank need not be equal for
the two depositors; that is, the new face values for depositors 1 and 2 are B_1 and B_2 respectively,
such that B_1 + B_2 = B’ (if they are equal B_1 = B_2 = ½B’). If the monitor offers depositors a
revised total face value B’=B that is at least X_φ, it is in their ex-post collective interest to accept.
However, if B<2X_φ, the only Nash equilibrium is for both depositors to withdraw, which forces
the legal sanctions with recovery X_φ to be imposed. This is Proposition 5.

**Proposition 5.** If there are two depositors with first-come-first-served demand deposits
with face value of ½B each, such that B> X_φ and B ≤ 2X_φ, where X_φ is the recovery from imposing
the legal sanction for default, then if offered any reduction in payments (which sum to less than
B) in return for not imposing the legal sanction, the unique Nash equilibrium is for each to
demand payment of ½B, forcing the legal sanction to be imposed.

*Proof:* Their individual payoffs are:

<table>
<thead>
<tr>
<th>#1 Accepts</th>
<th>#2 Accepts</th>
<th>#2 Withdraws</th>
</tr>
</thead>
<tbody>
<tr>
<td>B_1, B_2</td>
<td>(B_1', B_2')</td>
<td>(min{B_1', max{0, X_φ - ½B}}, min{X_φ, ½B})</td>
</tr>
<tr>
<td>B_1, B_2</td>
<td>(min{X_φ - ½B}, min{B_2', max{0, X_φ - ½B}})</td>
<td>(½X_φ, ½X_φ)</td>
</tr>
</tbody>
</table>

If a lender believes that the other will withdraw, the best response is to do the same
because B> X_φ implies ½X_φ ≥ X_φ - ½B . If both believe that the other will accept, the best
response for a depositor offered less than his original claim, ½B, is to withdraw because X_φ> ½B,
and withdrawing will allow full payment. If the offer reduces total debt to less than \( B \), so \( B_1 + B_2 = B' < B \), then either \( B_1 \) or \( B_2 \) must be less than \( \frac{1}{2}B \). Thus at least one depositor has a dominant strategy to withdraw and the unique Nash equilibrium is for both to withdraw.

Q.E.D.

A depositor anticipating a loss from the delegated monitor’s offer (or from the delegated monitors’s lack of intervention) will choose to run to demand payment if the other depositor is anticipated not to do so. Depositors who get out early when a loss is anticipated become senior to those who do not demand payment. If other depositors are anticipated to withdraw, a depositor will still want to withdraw immediately because when paid first-come-first served, withdrawing immediately gives either full payment (if one succeeds in getting to the bank before other depositors) or results in the bank running out of assets (in which case one is no worse off than leaving money in the bank). This commits depositors to run, which invokes the legal penalty for default by the delegated monitor.

5.3.1 The required number of depositors to deter all concessions

If \( X_\phi \geq \frac{1}{2} B \), then with two depositors each depositor will run rather than make any concession at all; if the other depositor is anticipated to make a concession, a depositor can avoid any loss by withdrawing. If \( X_\phi < \frac{1}{2} B \), then two depositors are not enough for this to be true. However, as shown in Diamond [2004], if \( X_\phi > 0 \) then a number of depositors \( N \geq B/X_\phi \) will suffice to induce each depositor to run rather than make any concession, because if \( X_\phi \geq B/N \), then it never pays to make a concession if other deposits will make concessions. A depositor’s payoff from being the first to withdraw is \( \min\{B/N, X_\phi\} \) if his deposit has face value \( B/N \) and if all others are expected to accept. In addition, it will be better to withdraw rather than make a concession if any other depositors are expected to withdraw. Because deposits must be paid on demand if default is to be avoided, if leaving money in the bank has a positive value, one can achieve full payment by withdrawing, and this exceeds the payoff from making a concession. If, instead,
leaving money in the bank has no value, it will clearly be better to withdraw (quickly before the
money runs out).

5.3.2 Should Banks or Borrowers Issue Short-Term Demandable Debt?

The payoffs from first-come-first-served short-term deposits can replicate automatic
sanctions because for any offer less than face value B, it is a dominant strategy for all depositors
to run. Because a run will cause an observable default, running invokes the voluntary legal
sanction, making its imposition effectively automatic. This was illustrated here by first-come-
first-served short-term deposits of a delegated monitor.

The importance of monitoring is illustrated by considering what would happen if a
borrower issued first-come-first-served short-term debt directly to lenders who do not monitor.
This short-term debt would replicate unmonitored debt with automatic imposition of legal
sanctions. This will not be a viable financing choice under the assumptions used in sections 5.1
and 5.2 because there is weak legal protection. Monitoring is needed because the legal sanction
for default is too small to deter diversion, even if automatically imposed.\footnote{The borrower needs to commit to pay I to lenders without diverting, and it is assumed that $H(t+\phi)\prec I$.} Instead, demand
deposits issued by the delegated monitor allow depositors to commit to impose default penalties
on the delegated monitor. As in section 3, these penalties provide incentives to monitor loans on
behalf of depositors. When legal protection is weak and automatic sanctions are not possible, a
delegated monitor can commit to not allowing diversion by a borrower by financing itself with
demand deposits from multiple depositors. This will also remove the problem of illiquidity
which would be present if there were an undelegated monitor. The deposits of the delegated
monitor will be liquid when its loans are not.

In contrast, when the legal environment is strong but enforcement is costly (and $X_b$ is
low), unmonitored short-term demandable debt is a viable means of direct financing for
borrowers. Diamond [2004], which analyzes this case (albeit in a different setup), can be
illustrated with this model. Suppose that legal protection is strong but legal penalties for default
are voluntary and offer lenders a low recovery. Monitoring would not be needed if default sanctions were automatic. If default sanctions are not automatic, monitoring remains unnecessary if the borrower synthesizes automatic sanctions by issuing short-term demandable debt. This induces lenders to voluntarily impose the sanctions for default. Without the incentives from the demandable debt, lenders without bargaining power could not force the borrower to pay more than what they recover from imposing the legal penalty.

More generally, first-come-first-served short-term debt can synthesize automatic default sanctions, but only monitoring can provide a borrower with a stronger incentive to pay than the incentive provided by automatic default sanctions. When sanctions are voluntary, short-term debt will be used by a borrower or a delegated monitor who needs to synthesize a contract with automatic sanctions. This has interesting predictions about when monitoring is used and when first-come-first-served short-term debt is used. Section V describes more generally the amounts that can be committed to pay to lenders or depositors through the use of monitoring and of short-term debt.

**Section 6. Incentive compatible payments with given bargaining power, with and without automatic sanctions.**

The maximum amount that a borrower will choose to pay without diversion depends on how large his payoff is from diverting or threatening to divert if a lender does not reduce the required payment. The borrower’s payoff depends on the strength of default sanctions, their application (either voluntary, automatic or effectively automatic due to short-term debt) as well as the possible added deterrence of monitoring. Sections 2, 3 and 4 describe what happens when all sanctions are automatic and the borrower gets none of the surplus in negotiation, and the previous section describes voluntary and automatic sanctions where the borrower gets the entire surplus in negotiations. This section describes the intermediate cases, where the surplus is shared by the borrowers and lenders (and in the case of delegated monitoring, the depositors negotiating with the monitor).

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8 Formally, \(H(t+\phi) \geq I\), default penalties are voluntary and give a low recovery, \(X_\phi < I\).
I introduce a parameter, \( \mu \), between zero and one, which measures the bargaining power of a borrower (or \( \mu_{DM} \), measuring the power of a delegated monitor bargaining with depositors). Each party to negotiation gets at least his outside option, the payoff if no agreement is reached. In addition, a borrower gets a fraction \( \mu \) of the increased surplus in negotiation with a lender or monitoring lender. For example, a lender who does not monitor and threatens to impose the default sanction gets the remaining fraction, \( 1 - \mu \), of the surplus. Likewise, a lender who monitors and observes a crime in progress and threatens to intervene obtains a fraction \( 1 - \mu \) of the surplus from removing this threat. Similarly, a depositor negotiating with a delegated monitor gets a fraction \( 1 - \mu_{DM} \) of the surplus in negotiating whether to impose the default sanction on the delegated monitor. The bargaining power of borrowers negotiating with lenders, \( \mu \), could differ from the bargaining power of delegated monitors negotiating with depositors, (e.g., \( \mu_{DM} \neq \mu \)).

These intermediate cases where surplus is shared can be described using the results with \( \mu = 0 \) and \( \mu = 1 \) where one party gets the entire surplus from negotiations and the other receives his outside option. Table 1 describes these cases, using results shown previously. If negotiation breaks down, the legal sanction is imposed, or in the case of a monitor, a crime in progress is stopped. The lender’s recovery from actually imposing the legal sanction without monitoring is \( X_b \), and the recovery from a monitor actually stopping a crime in progress is \( X_m \). The maximum incentive compatible payments for the various regimes of sanctions (automatic or voluntary) with \( \mu = 1 \) and when \( \mu = 0 \) are given in Table 1.
Table 1: Maximum Incentive Compatible Payments that deter both diversion and renegotiation. The borrower gets a fraction $\mu$ of the surplus from renegotiation with a lender (or a delegated monitor gets a fraction $\mu_{DM}$ and depositors get a fraction $1-\mu_{DM}$). This table provides the face values when $\mu$ and $\mu_{M}$ are both either 0 or 1.

<table>
<thead>
<tr>
<th></th>
<th>$\mu=\mu_{DM}=1$ (no automatic sanctions)</th>
<th>$\mu=\mu_{DM}=1$ automatic default sanctions (for deposits and loans)</th>
<th>$\mu=\mu_{DM}=1$ automatic default sanctions on deposits only</th>
<th>$\mu=\mu_{DM}=0$, for all cases of sanctions (automatic or voluntary)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No monitoring</td>
<td>$F_1=X_0$</td>
<td>$F_1=H(t+\phi)$</td>
<td>$F_1=X_0$</td>
<td>$F_0=H(t+\phi)$</td>
</tr>
<tr>
<td>Undelegated Monitoring</td>
<td>$F_1=\max{X_{M}, X_{B}}$</td>
<td>$F_1=H(t+\phi)+\max{X_{M}-X_{B},0}$</td>
<td>$F_1=\max{X_{M}, X_{B}}$</td>
<td>$F_0=H(t+\phi+m)$</td>
</tr>
<tr>
<td>Delegated Monitoring (maximum payment to depositors)</td>
<td>$B_1=X_{B}$</td>
<td>$B_1=H(t+\phi)+\min{\max{X_{M}-X_{B},0},\phi_{M}H}$</td>
<td>$B_1=H(t+\phi)+\min{\max{X_{M}-X_{B},0},\phi_{M}H}$</td>
<td>$B_0=H(t+\phi+\min{\phi_{M}})$</td>
</tr>
</tbody>
</table>

Table 1 is a convenient summary of the maximum incentive compatible payments lenders can receive in the cases involving default sanctions when one party gets the entire bargaining surplus. The payoffs with $\mu=\mu_{DM}=0$ are from Propositions 1 and 2. The payoffs with $\mu=\mu_{DM}=1$ and no automatic sanctions are from Section 5.2, and the payoffs with automatic sanctions for both borrower and delegated monitor defaults are from section 5.1. The payoffs from delegated monitoring with automatic sanctions on deposits only are from section 5.2.1.

The following lemma allows a simple way of describing these payments when the borrower has an intermediate amount of bargaining power.

**Lemma 1**: The maximum incentive compatible payment that a borrower with cash flow of $H$ will make without preferring diversion is the product of $\mu$ and the payment which gives the lender his outside option plus the product of $1-\mu$ and the payment that gives the borrower his outside option.

**Proof**: Let $O_{lender}$ be the lender’s outside option and $O_{borrower}$ be the outside option of the borrower. The borrower’s payoff from diversion is $O_{borrower}+\mu(H- O_{borrower} - O_{lender})$ because the total surplus is $H$ if an agreement not to impose the inefficient sanction is reached while imposing the sanction gives total surplus of $O_{lender}+O_{borrower}$. Let $F_{\mu}$ denote the $F$ such that $H-F$ equals the payoff from threatening diversion, thus $F_{\mu}=\mu O_{lender}+(1-\mu)(H-O_{borrower})$. To show that $F_{\mu}=\mu F_{1}+$
(1-\mu)F_0 note that F_1=O_{lender} and F_0=H-O_{borrower}. The result follows immediately.

QED.

6.1 Feasible financial structures

Borrowers need to raise capital by committing to pay lenders an amount I. A comparison of the amount that must be paid, I, to the largest incentive compatible payment using results in Table 1, Lemma 1, and Proposition 4 determines how lending must be structured. Any structure that will not allow the borrower to commit to pay I is infeasible. Proposition 6 characterizes the maximum incentive compatible payments for general bargaining power. It adds one additional category, for completeness, that up to now has been assumed to be infeasible: an all equity capital structure without rights to impose default penalties. A borrower can get H(1-t) from diverting if there is no default penalty, and therefore he will pay up to Ht without diverting. If investor protection laws are very strong or diversion is very costly, this form of financing will be available.

**Proposition 6:** The possible financial structures and their largest incentive compatible payments to ultimate lenders (lenders when there is not delegated monitoring and depositors when there is delegated monitoring) when the borrower has bargaining power \( \mu \) (over lenders) and the delegated monitor has bargaining power \( \mu_{DM} \) (over depositors) with appropriately selected face values \( F \) (and \( B \) for delegated monitors) are as follows:

a) All equity: \( tH \)

b) Non-demandable unmonitored debt: \( \mu X_{\phi} + (1-\mu) H(t+\phi) \)

c) Demandable unmonitored short-term direct debt: \( H(t+\phi) \)

d) Undelegated monitored debt: \( \mu \max\{X_{\phi}, X_m\} + (1-\mu) H(t+\phi+m) \)

e) Delegated monitor without demandable deposits (maximum payment to depositors):

\[
\mu_{DM} X_{\phi} + (1-\mu_{DM}) H(t+\phi+\min\{m, \phi M\})
\]

f) Delegated monitor with demandable deposits (maximum payment to depositors):

\[
H(t+\phi) + \min\{\phi M H, \mu \max\{X_m, X_{\phi} 0\} + (1-\mu) (mH)\}.
\]
Proof: Parts a through d follow directly from Lemma 1 and the results summarized in Table 1. Part e follows from these results and Proposition 4 because a delegated monitor who monitors a loan with a sufficiently high face value will be able to negotiate with depositors who cannot run to reduce their deposits to $\mu_{DM} X_0^+ (1-\mu_{DM}) H(t+\phi+\min\{m,\phi_M\})$ (the sufficiently high face value of the loan must be at least $H(t+\phi+\min\{m,\phi_M\})$). A delegated monitor with deposits less than or equal to $\mu_{DM} X_0^+ (1-\mu_{DM}) H(t+\phi+\min\{m,\phi_M\})$ will not be able to get concessions from depositors. A delegated monitor with deposits of $\mu_{DM} X_0^+ (1-\mu_{DM}) H(t+\phi+\min\{m,\phi_M\})$ can collect a payment of this amount from a borrower by Proposition 4, independent of $\mu$. Part f follows from Proposition 4 because a bank with this level of demandable deposits cannot get depositors to reduce their face value, and this level of deposits implies that a delegated monitor can collect a loan with this face value independent of $\mu$.

Q.E.D.

The largest incentive compatible payments are ranked as follows: $a \leq b \leq c$, $e \leq f$, and $e \leq d$ if $\mu_{DM} \leq \mu$. These results describe the constraints on available financial structures in the economy. If multiple structures are feasible, then other considerations are needed to deliver a prediction of the choice in an economy. These other considerations include uncertainty, the risk of financial crises, costs of monitoring and providing incentives for delegated monitoring under uncertainty. These are considered in Diamond [2007].

In the case of certainty we consider here, it is useful to show how much a delegated monitor can commit to pay investors when some but not all liabilities are demand deposits. Corollary 1 describes the maximum incentive compatible payments to depositors of financial structures that combine demand deposits with longer term, non-demandable claims.

**Corollary 1.** A delegated monitor with outstanding demandable deposits with face value $B$ such that $B \leq H(t+\phi) + \min\{\phi_M H, \mu \max\{X_m- X_0^+, 0\} + (1-\mu) (mH)\}$, and $B \geq \mu X_0^+ + (1-\mu) H(t+\phi)$ as well as outstanding liabilities to investors that are non-demandable debt or equity can commit to pay total liabilities (including deposits) of up to a maximum of $B + (1-\mu_{DM})(...
Proof: Demandable deposits of this amount imply that deposits cannot be reduced by negotiation. Any negotiation about payments from the delegated monitor takes place with the owners of non-demandable capital. The outside option of the delegated monitor (if he follows through with his threat not to stop the borrower from diverting) is to default and incur penalties. A total verifiable payment of $H(t+\phi+\min\{m,\phi_M\})$ to depositors and owners of non-demandable capital provides the monitor the identical payoff, because this is the largest verifiable payment the monitor can collect from the borrower without preferring to default and accept an unverifiable side payment from the borrower. The outside option of the owners of non-demandable capital is zero because if the monitor does not intervene they have access only to default penalties $X_\phi$ when negotiating with the borrower. They will collect from the borrower a total of either $\mu X_\phi + (1-\mu)$, if $H(t+\phi) < B$, or $B$, if $B \leq H(t+\phi)$. By lemma 1, the total payment to capital holders is $(1-\mu_{DM})(H(t+\phi+\min\{m,\phi_M\}) - B)$.

Q. E. D.

Corollary 1 provides payoffs to outside investors for capital structures which include both demandable short-term deposits and longer term bank capital. A similar result follows immediately for borrowers who borrow directly without monitoring, issuing both demandable claims and longer term non-demandable debt or equity claims. I do not provide the proof, but a nearly identical argument implies that a borrower with demandable debt $F$ which satisfies $F \leq H(t+\phi)$, and $F \geq \mu X_\phi + (1-\mu) H(t+\phi)$ as well as outside non-demandable capital can commit to pay investors up to a total of $F + (1-\mu)(H(t+\phi) - F)$. Capital structures with these combinations of short and longer term claims are useful under uncertainty. These are analyzed in Diamond [2007].
Section 7  Conclusion

Weak legal protection encourages misbehavior by borrowers and increases the need for monitored lending. If the legal system provides very weak legal protection, then it is impossible to delegate loan monitoring to banks. Banks will always collude with borrowers and will not use any clout they possess over borrowers to collect loans and repay deposits. Small savers anticipate this, and thus banks will not attract deposits. Undelegated direct lending by wealthy family firms will be the main source of finance. If an economy’s legal protection is somewhat stronger, delegated monitoring by banks is feasible. The role played by banks depends on the level of protection provided by the economy’s legal system, once the level surpasses this minimum.

When legal protection is strong, there is no need for monitoring of borrowers with riskless cash flows (Diamond [1984,1996] describes the role of diversified banks with uncertain and privately observed cash flows) When legal protection is weak (in between very weak and strong), ex-ante delegated monitoring can deter borrower misbehavior that legal sanctions cannot, and legal sanctions on banks can provide incentives for banks to use their monitoring clout over borrowers to keep borrowers honest. There is little wiggle room to make this work, due to the small legal sanctions faced by bankers if they collude with borrowers. With weak legal protection, the details of the structure of the banking system determine if bankers are good (keep borrowers honest) or are evil (encourage borrower misbehavior). It is important to separate banking from commerce lest banks become as evil as a corrupt conglomerate. It is also important that bank anticipates sanctions whenever it defaults on deposits. When legal recovery is low (and bank loans are illiquid), this requires that the bank issue demand deposits unless regulators can be relied on to automatically close and sanction poorly performing banks. Demand deposits issued by the bank build in an externality (a manufactured collective action problem) which commits depositors to run whenever they anticipate any loss of value, as in Diamond-Rajan [2001].

Short-term debt can be important at the firm level (to induce the threat of firm runs that
impose ex-post legal sanctions for default) when legal protection is relatively strong but legal recovery is low (and courts are costly or corrupt). Monitoring is not needed once investors can commit to impose legal penalties for default. In contrast, if there is weak legal protection, the monitoring of banks is required (and it is banks who must issue short-term deposits if recovery is low). Detailed analysis of enforcement of contracts, the strength of legal protection, and the incentives to use the legal system delivers a simple theory of financial structure which delivers its predictions based on the characteristics of the legal system. Two related aspects of the determination of financial structure are missing from the analysis: the roles of uncertainty and of financial crises with causes other then panics. These are analyzed in Diamond [2007].
Appendix

Proof of Proposition 3.

If a borrower does not divert he must pay $F$ to lenders. If the first borrower pays $F$ but the other does not pay $F$ (and the first borrower does not pay on his behalf), then both get the penalty $\phi H$, giving the party who does not divert a payoff of $H(1-\phi)-F$. If neither divert, the payoffs are $(A,B)=(H-F,H-F)$. By assumption, under single liability only $A$ will divert.

With reversible diversion, each borrower’s outside option if he initially diverts and the other investor can reduce his diversion proceeds by $mH$ and the other can commit himself to divert is $H(1-\phi)-F = \max\{H(1-\phi)-F, H(1-t_A-m-\phi)\}$ for borrower $A$ and $H(1-\phi)-F = \max\{H(1-\phi)-F, H(1-t_B-m-\phi)\}$ for borrower $B$, by the assumption that monitoring can deter $A$ diversion, $H-F > H(1-t_A-m) \geq H(1-t_B-m)$. Each borrower’s outside option is fixed at $H(1-\phi)-F$, so a borrower taking a fixed fraction of the surplus over the outside option will choose the jointly efficient diversion choice: If the bargaining power is such that $A$ gets a $\mu_A$ fraction of the surplus over the outside option, the surplus is shared as $(A,B) = (\mu (\text{total surplus} - H(1-\phi)-F) + (1-\mu) H(1-\phi)-F, (1-\mu)(\text{total surplus} - H(1-\phi)+F) + \mu H(1-\phi)-F$. Maximizing total surplus maximizes the payoff of each borrower.

No diversion by either borrower is jointly efficient if $F < \min\{ H(t_A+2\phi), H(\frac{t_A+t_B}{2}+\phi) \}$. A borrower will obtain a fixed proportion of the increase in total surplus between the joint payoff maximizing level and the disagreement point (which is the outside option). The joint surplus if neither divert is $2(H-F) = 2(H-I)$, if both divert it is $H(2-t_A-t_B-2\phi)$, if only $A$ diverts it is $H(2-t_A-F-2\phi) = H(2-t_A-1-2\phi)$ and if only $B$ diverts it is $H(2-t_B-F-2\phi)$. It never maximizes joint surplus for only $B$ to divert, because by assumption, $t_B \geq t_A$.

Joint liability leads to no diversion when $2(H-F) \geq H(2-t_A-F-2\phi)$ or when competition implies that $F=I$, when $I=2H(t_A+2\phi)$ and $2(H-F) \geq H(2-t_A-t_B-2\phi)$ or: $I=H(\frac{t_A+t_B}{2}+\phi)$, these are jointly true when $I<\min\{ H(t_A+2\phi), H(\frac{t_A+t_B}{2}+\phi) \}$. It leaves diversion identical to individual liability when $H(\frac{t_A+t_B}{2}+\phi) \leq I \leq H(t_A+2\phi)$, which requires $t_B \geq t_A+2\phi$. It leads to joint diversion if $I>\max\{ H(t_A+2\phi), H(\frac{t_A+t_B}{2}+\phi) \}$.

Combined with the initial condition that $H(t_B+\phi) \leq I \leq H(t_A+\phi)$, we have the following. If each borrower would divert alone or would not divert given individual liability, there is no effect of joint liability (in this case when diversification effects are absent). If $t_A=t_B$, then there is no
effect of joint liability because joint diversion is profitable if and only if individual diversion is profitable (and asymmetric diversion is dominated). If the borrowers differ in their payoff from diversion, then joint liability can deter diversion by one or extend diversion to the other. Joint liability is most likely to deter diversion if the B borrower has little scope for his own independent diversion (so \( H\left(\frac{t_A + t_B}{2} + \phi\right) \) is large) and if A’s gain from diversion is not too large (so \( H(t_A + 2\phi) \) is large). If B’s incentive to divert is small, but A’s large, then joint liability will have no effect on incentives (only A will divert), but the costs of applying sanctions to both will make joint liability undesirable. If B’s incentive to divert is not very small, then joint liability with A can induce B to divert under joint liability and incur costly sanctions when he would not under individual liability. This is a particularly undesirable case.

In the case of irreversible diversion, there is another factor, as before. If binding negotiations can occur only after diversion has taken place, and the outside option of a borrower after diverting (e.g., \( H(1-t_A-\phi-m) \) for borrower A) is very low, then a borrower with weak bargaining power can be deterred from diversion by joint liability even when diversion maximizes the joint surplus of the borrowers subject to joint liability.

Consider first the case of irreversible diversion where B has all the bargaining power. The payoffs from this case are in table 2 and are explained below.

**Table 2: Irreversible diversion, B has all bargaining power.**

<table>
<thead>
<tr>
<th>B not Divert=N</th>
<th>B Divert=D</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Not Divert=N</td>
<td>(H-F, H-F)</td>
</tr>
<tr>
<td>A Divert=D</td>
<td>(H(1-t_A-m-(\phi)), H(1+m-(\phi))-F)</td>
</tr>
</tbody>
</table>

The entries in Table 2 are derived as follows (we showed (N,N) above). Consider (D,N) where only A diverts. A’s payoff is his outside option of \( H(1-t_A-m-\phi) \) because if A rejects his offer and B carries through his threat to stop a crime in progress at zero recovery, B would not pay 2F to avoid penalty \( \phi H \) when he could pay \( F \) (because by assumption, \( F \geq H(t_A+\phi) \)). To examine B’s payoff in this case, note that B can use his threat to collect an unverifiable payment of \( H(m) \) which will accrue to B. The payoffs in this case are therefore \( (A,B) = (H(1-t_A-m-\phi), H(1+m-\phi) -F) \).

The payoffs for (D,D) where both divert and B uses his threat to reduce diversion proceeds by Hm to extract a nonverifiable side payment from A of Hm are \( (A,B) = (H(1-t_A-m-\phi), H(1-t_B+m-\phi)) \).
The final case is (N,D) where B alone diverts; in this case B has no threat to use to extract cash from A, we know that A will not pay more than F to avoid the default caused by B’s diversion to avoid a penalty of $\phi H$ (because $(H(1-\phi)-F>2F>\phi H)$, so default and sanctions occur; A’s payoff is $H(1-\phi)-F$. B’s payoff is $H(1-t_B-\phi)$.

Borrower A has a dominant strategy not to divert if monitoring is powerful and $I=F<H(t_A+m)$. This follows because $(N,N)=H-F>H(1-t_A-m-\phi)=(D,N)$ (which is $I=F<H(t_A+m+\phi)$, assumed to be true), and $(N,D)=H(1-\phi)-F>H(1-t_A-m-\phi)=(D,D)$, because with powerful monitoring, $I=F<H(t_A+m)$. Given this, B’s payoff from diversion is $H(1-t_B-\phi)$ and not diverting pays $H-F$. B will not divert because $I=F<H(t_B+\phi)$ (as B would not divert under single liability).

If monitoring is powerful ($F<H(t_A+m)$), and A has a dominant strategy to not divert, then borrower B will not divert. B’s best response to A not diverting is to not divert because B’s payoff from $(N,N)=H-F>H(1-t_B-\phi)=(N,D)$ because $F<H(t_B+\phi)$.

If monitoring is less powerful, then $I=F>H(t_A+m)$, and then A’s best response to B diverting is to divert as well; $(N,D)=H(1-\phi)-F<H(1-t_A-m-\phi)=(D,D)$, because $I=F>H(t_A+m)$. The unique Nash equilibrium will remain as $(N,N)$ if $I=F<H(t_B)$, because then borrower B has a dominant strategy not to divert: B’s payoff from $(N,N)=H-F>H(1-t_B-\phi)=(N,D)$ because $F<H(t_B+\phi)$, and $(D,N)=H(1-\phi)-F>H(1-t_B-\phi)=(D,D)$, if $F<H(t_B)<H(t_B+\phi)$. If instead, monitoring is less powerful $I=F>H(t_A+m)$, and also $H(t_B)<I=F<H(t_B+\phi)$, there are multiple Nash equilibria. B will divert as a best response to A’s diversion and not divert as a best response to B’s non diversion. A will divert as a best response to B’s diversion and not divert as a best response to A’s non diversion.

If instead A has all the bargaining power (receiving a transfer of $mH$ from B if and only if B diverts and never needing to make a transfer to B), then A has a dominant strategy of diverting, and B, who would not divert even when no transfer was paid to a monitor, has a dominant strategy of not diverting if $H(1-\phi)-F>H(1-t_B-m-\phi)$, or $I=F<H(t_B+m)$, which is true because $I=F<H(t_A+m)<H(t_B+m)$.

Table 3: Irreversible diversion, A has all bargaining power.
A has dominant strategy to divert, and B’s best response is not to divert.

<table>
<thead>
<tr>
<th>A not Divert=N</th>
<th>B not Divert=N</th>
<th>B divert=D</th>
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<td>(H(1-\phi)+m-F, H(1-t_B-\phi-m))</td>
</tr>
<tr>
<td>A Divert=D</td>
<td>(H(1-t_A-\phi), H(1-t_B-\phi)-F)</td>
<td>(H(1-t_A+m-\phi), H(1-t_B-m-\phi))</td>
</tr>
</tbody>
</table>

QED.
Proof of Proposition 4.

The delegated monitor is owed a loan with face \( F \leq H \) and owes deposits \( B \leq F \) with automatic default sanctions of \( \phi M \). If the borrower diverts, he will either offer to reverse diversion if the monitor accepts a lower face value \( F' \), or he will offer the monitor an unverifiable side payment \( U \) from the diversion proceeds, if the delegated monitor agrees not to intervene (not stop the crime). If the delegated monitor accepts the new face value, \( F' \), his payoff is \( F' - B \) if \( F' > B \), and is \( -\phi M \) if \( F' < B \). If the borrower offers a share of diversion proceeds \( U \), and the monitor accepts, his payoff is \( U - \phi M \). The delegated monitor’s payoff from rejecting an offer and stopping the crime with recovery \( X_m \) is \( \max \{ X_m - X_\phi, 0 \} - \phi M \), because the recovery from ex-post default, \( X_\phi \), is verifiable and accrues to depositors, but \( \max \{ X_m - X_\phi, 0 \} \) accrues to the delegated monitor (the case of \( B \leq \max \{ X_m, X_\phi \} \) is discussed below). The monitor’s outside option is positive if \( X_m - X_\phi - \phi M > 0 \).

The delegated monitor requires a payoff at least equal to his outside option. The monitor will not stop the crime if the borrower offers either a verifiable payment which satisfies both \( F' \geq B \) and \( F' - B \geq \max \{ X_m - X_\phi, 0 \} - \phi M \), which is \( F' \geq B + \max \{ 0, X_m - X_\phi, \phi M \} \), or an unverifiable side payment which satisfies \( U - \phi M \geq \max \{ 0, X_m - X_\phi - \phi M \} \) or \( U \geq \max \{ 0, X_m - X_\phi \} \).

The borrower will threaten to divert if making one of these payments is attractive or will actually divert if this is best without negotiation. The borrower prefers to pay the original \( F \) rather than get the monitor to reduce it to the lowest \( F' \) a borrower will accept if \( H - F \geq H - (B + \max \{ 0, X_m - X_\phi, \phi M \}) \), or \( F \leq B + \max \{ 0, X_m - X_\phi, \phi M \} \). This gives the borrower a payoff of \( H - (B + \max \{ 0, X_m - X_\phi, \phi M \}) \). Another option is to offer a side payment \( U = \max \{ X_m - X_\phi, 0 \} \) to the delegated monitor giving the borrower a payoff of \( H(1-t-\phi) - \max \{ X_m - X_\phi, 0 \} \). Paying face value lowest face value acceptable to the delegated monitor, \( F' = B + \max \{ 0, X_m - X_\phi, \phi M \} \) is preferable to making this side payment if \( H - [B + \max \{ 0, X_m - X_\phi, \phi M \}] \geq H(1-t-\phi) - \max \{ X_m - X_\phi, 0 \} \), which is true if \( B \) satisfies \( B \leq H(t + \phi) + \min \{ \max \{ 0, X_m - X_\phi \}, \phi M \} \equiv \overline{B} \). \( \overline{B} \) is the maximum incentive compatible \( B \). Without the automatic sanctions on deposit default, only \( X_\phi \) would be paid to
depositors. Actually diverting is not best if \( F' \leq H(t+\phi+m) \), which is assumed.

The delegated monitor can collect a loan with face value \( F \), if it satisfies \( F \leq \bar{B} + \max\{0, X_m - X_\phi - \phi_M H\} \). As a result, if \( X_m - X_\phi > \phi_M H \) the delegated monitor can collect more than \( B \) from the borrower (because the delegated monitor has a positive outside option).

When \( B \leq \min\{X_m, X_\phi\} \), the following applies. The amount that the delegated monitor can commit to pay is at least \( X_\phi \) because this is the depositors’ outside option. If \( X_m > X_\phi \) and \( B \in (X_\phi, X_m) \), the delegated monitor’s payoff from accepting \( F' \geq B \) is \( F' - B \), from accepting a side payment is \( U - \phi_M H \) and the outside option of rejecting one of these offers and stopping the crime is \( \max\{X_m - B, X_m - X_\phi - \phi_M H\} \). If \( B < \min\{X_m, X_\phi\} \leq X_\phi + \phi_M H \), the outside option is \( \min\{X_m, X_\phi\} - B \) and the borrower will pay up to \( F' = \min\{X_m, X_\phi\} \) and with \( B = \min\{X_m, X_\phi\} \), the delegated monitor will pay up to \( B = \min\{X_m, X_\phi\} \) to depositors. If instead \( X_\phi + \phi_M H \leq B < X_m \) or if \( B < X_\phi + \phi_M H < X_m \), the outside option is \( X_m - X_\phi - \phi_M H \) and the borrower will pay up to \( F' = B + X_m - X_\phi - \phi_M H \) instead of \( U = X_m - X_\phi \) if \( H(t+\phi + \phi_M) \geq B \). Setting \( B = H(t+\phi + \phi_M) \) implies that the borrower will pay up to \( F' = H(t+\phi + X_m - X_\phi) \).

QED.
References


