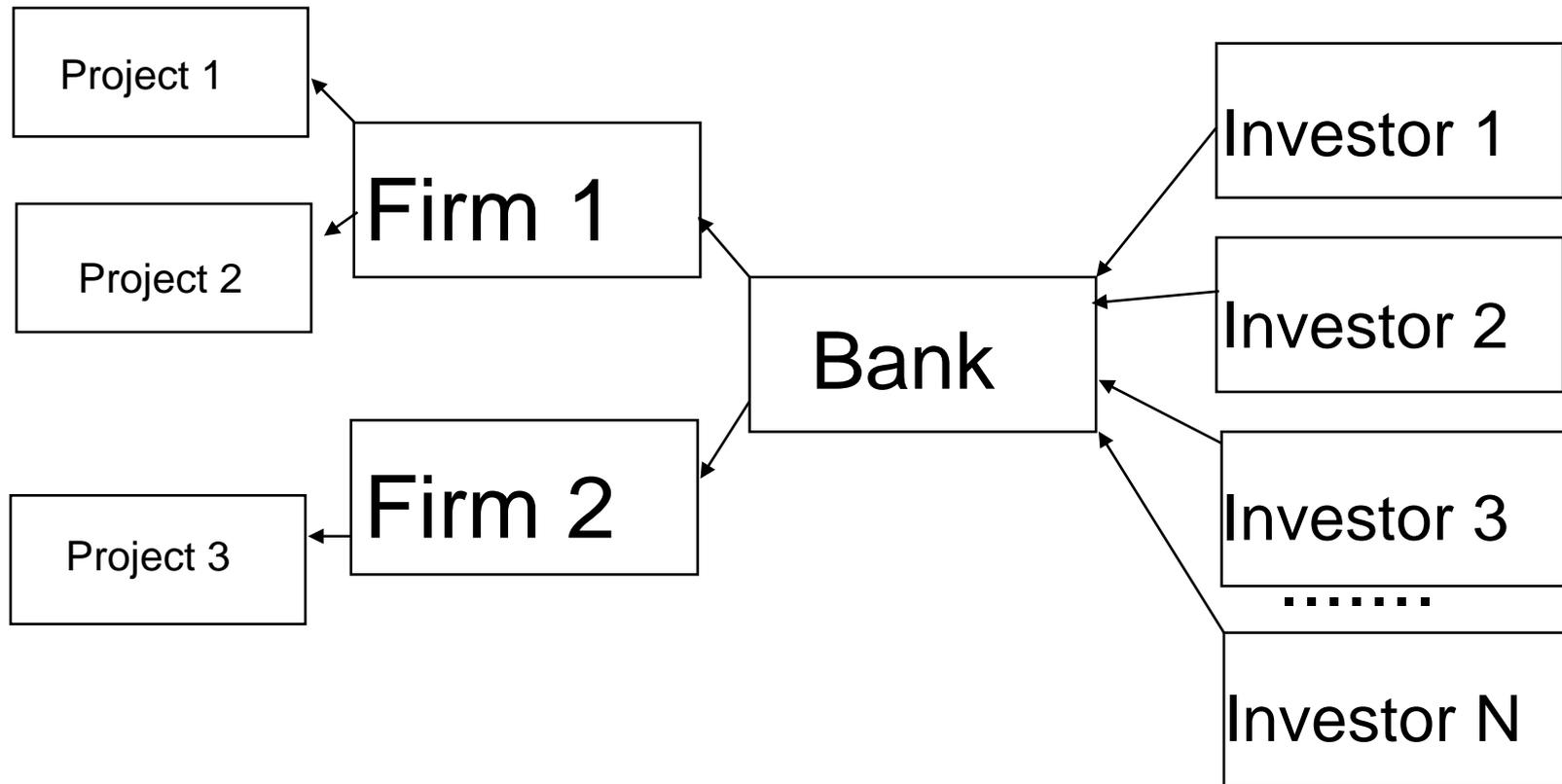


Delegated Monitoring, Legal Protection, Runs and Commitment

Douglas W. Diamond
MIT (visiting), Chicago Booth and
NBER

FTG Summer School, St. Louis
August 14, 2015

The Public



Why two layers of separation of ownership from control?
How is this related to the use of short-term debt by banks?

Part 1. Monitoring, Delegation and Incentives

- Example 1: Loan Monitoring by a banker
- [uses the basic idea from Diamond (1984, 1996)]
- To avoid duplication of effort or a free rider problem, loan monitoring must be delegated to one agent, who turns out to use (debt deposit) contracts that make him a banker.

How Strong is Legal Protection?

- The description from Diamond [1984, 1986] that I begin with has what I will call *Strong Legal Protection*.
- We will discuss the implications of weaker protection.
- For now let's take *strong protection* to mean that there is an ex-post penalty which can deter observable obvious theft by a borrower.

Costly Enforcement: Based on Outcomes

- Diamond [1984]: consequence of default is legal penalties imposed on the borrower.
- Here, as in Diamond [1996], we assume the consequence is COSTLY liquidation of the borrower's asset that removes the proceeds from diverting cash, but which recovers zero for the lender.

Costly Enforcement: Based on Outcomes...

- Payoff of (Borrower, Lender) = ($\epsilon > 0$, $\epsilon > 0$) if liquidation; this requires either
 - a legal system that allows the lender to commit to this,
 - **or** that the lender have some (or all) bargaining power to extract payment given this threat).
- Obviously, do not want to liquidate too often

Costly Ex-post Information Used to renegotiate loans

- For example, sometimes a lender should take less than is promised because that is all that a borrower must pay. However, the lender should not accept less than the borrower has available to pay.
- If ability to pay is costly to monitor, then without monitoring, the lender must demand a constant payment (Townsend [1979])

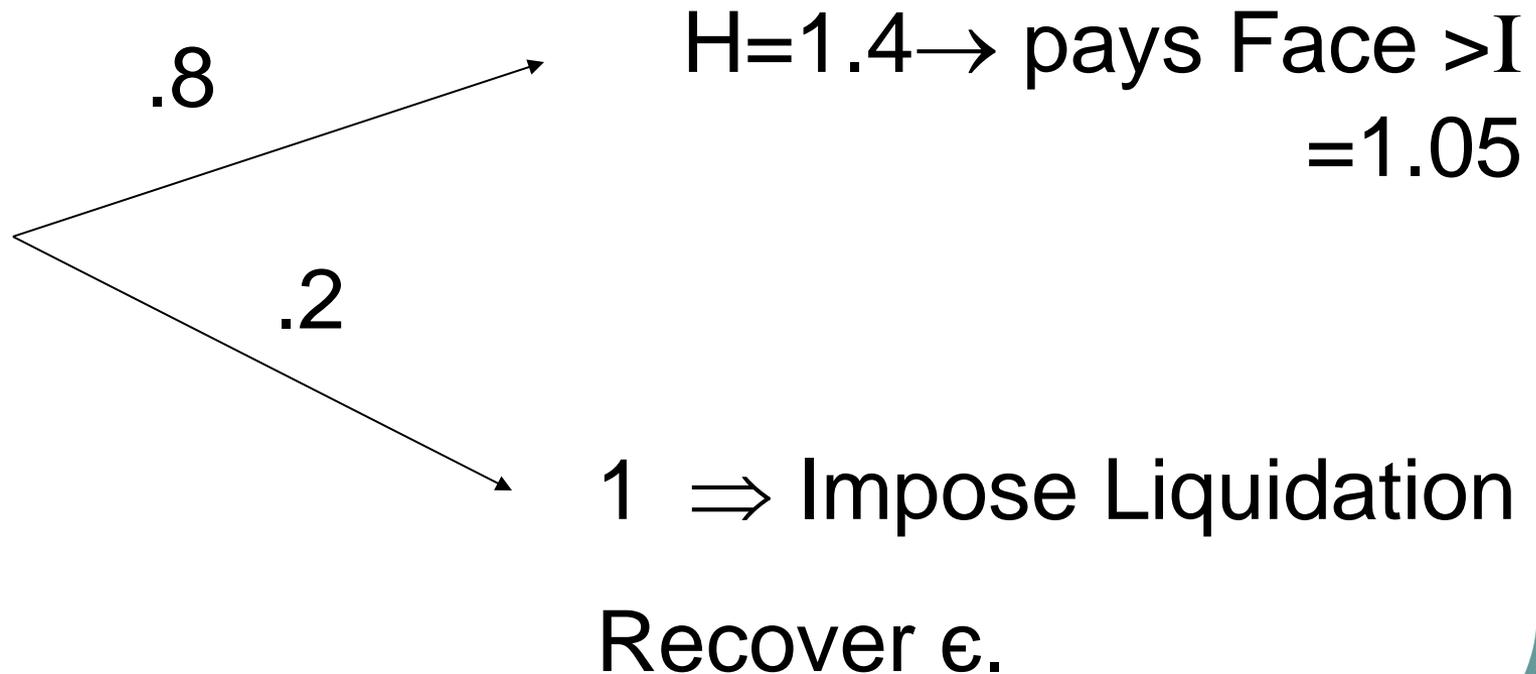
Optimal Contract without monitoring is debt

- Liquidate as a sanction. Use it as a default penalty.
- Borrower, lender risk neutral and have no other assets or collateral.
- Optimal state contingent contract based on observable payment to lender is to impose the sanction for low payments and not for those greater than or equal to F .
- F is interpreted as the face value of one period debt.

The Best Contract Without Monitoring

Lender's expected repayment $\geq I = 1.05$

Actual cash flow not observed by lenders, who observe only the amount repaid.



Two State Example

- Borrower has cash of V , with realizations $L=1$ or $H=1.4$.
- Probability that $H=1.4$ is $P=0.8$.
- Realized cash flow, V , is observed only by borrower
- Borrower can steal or retain any cash not paid to lender.
- Lender requires expected repayment of 1.05 to make the loan.

Debt without monitoring (2)

- Optimal contract is a debt contract with face value F , and liquidation if less is paid.
- What is the optimal face value, F ?
- **Optimal F is $1.05/0.8 = 1.3125$ (31.25%), and a probability of liquidation (destroying 1) of 0.2.**

Loan Monitoring

- If a lender incurs a cost k , he can monitor the borrower
- The simplest interpretation is that the lender can observe the realized cash flow, V , and if $V=1$ he can unilaterally reduce the face value of debt down to $F=1$ (this requires the lender to have all the bargaining power to make concessions)

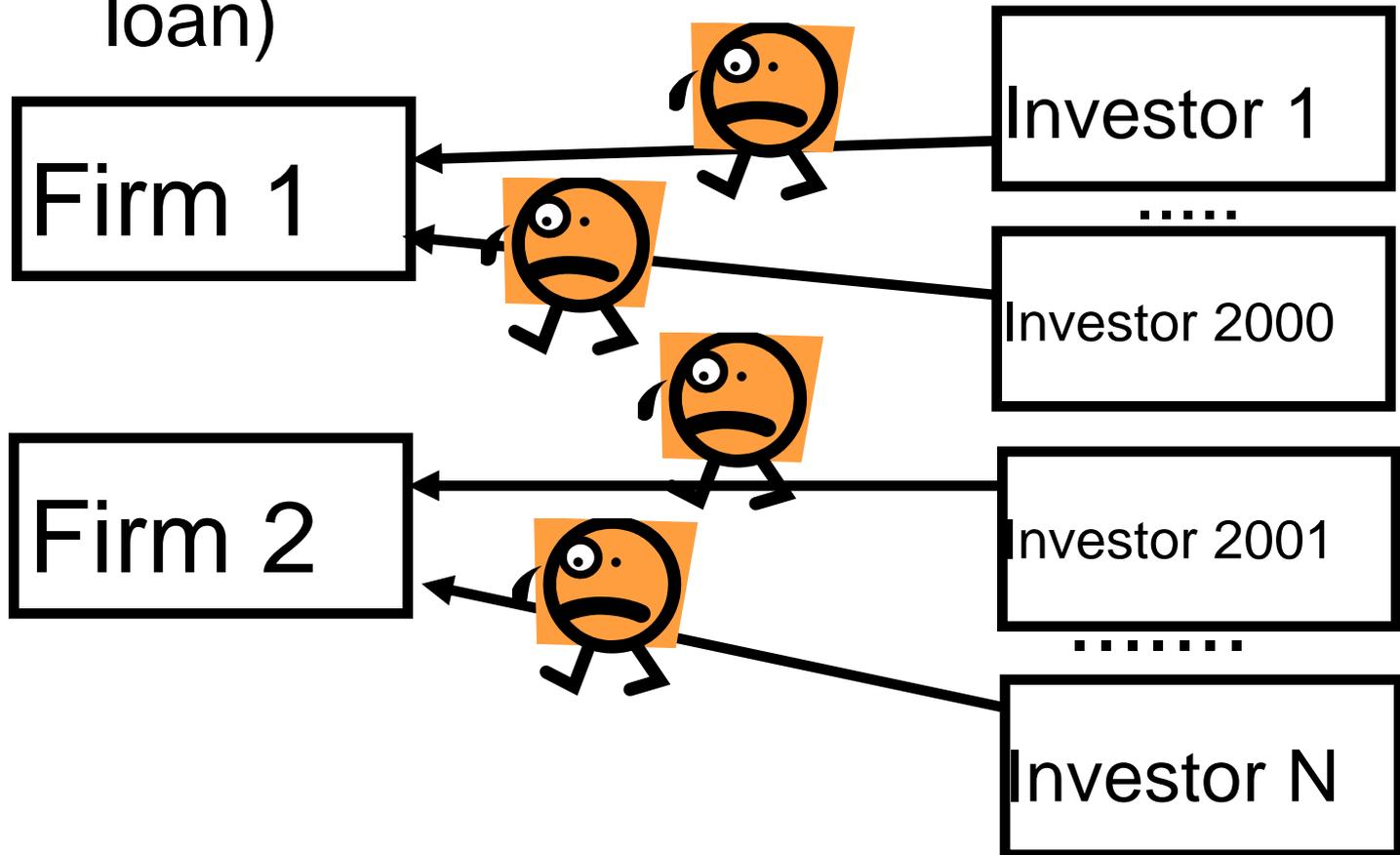
More Details of Monitoring

- With this *strong legal protection*, monitoring is used to decide when to invoke the available legal sanctions.
- The actual outcome of the monitoring is not observable or contractible.
 - This is not a problem for loans owned by the monitor but may be for a delegated monitor who monitors on behalf of “other peoples money”

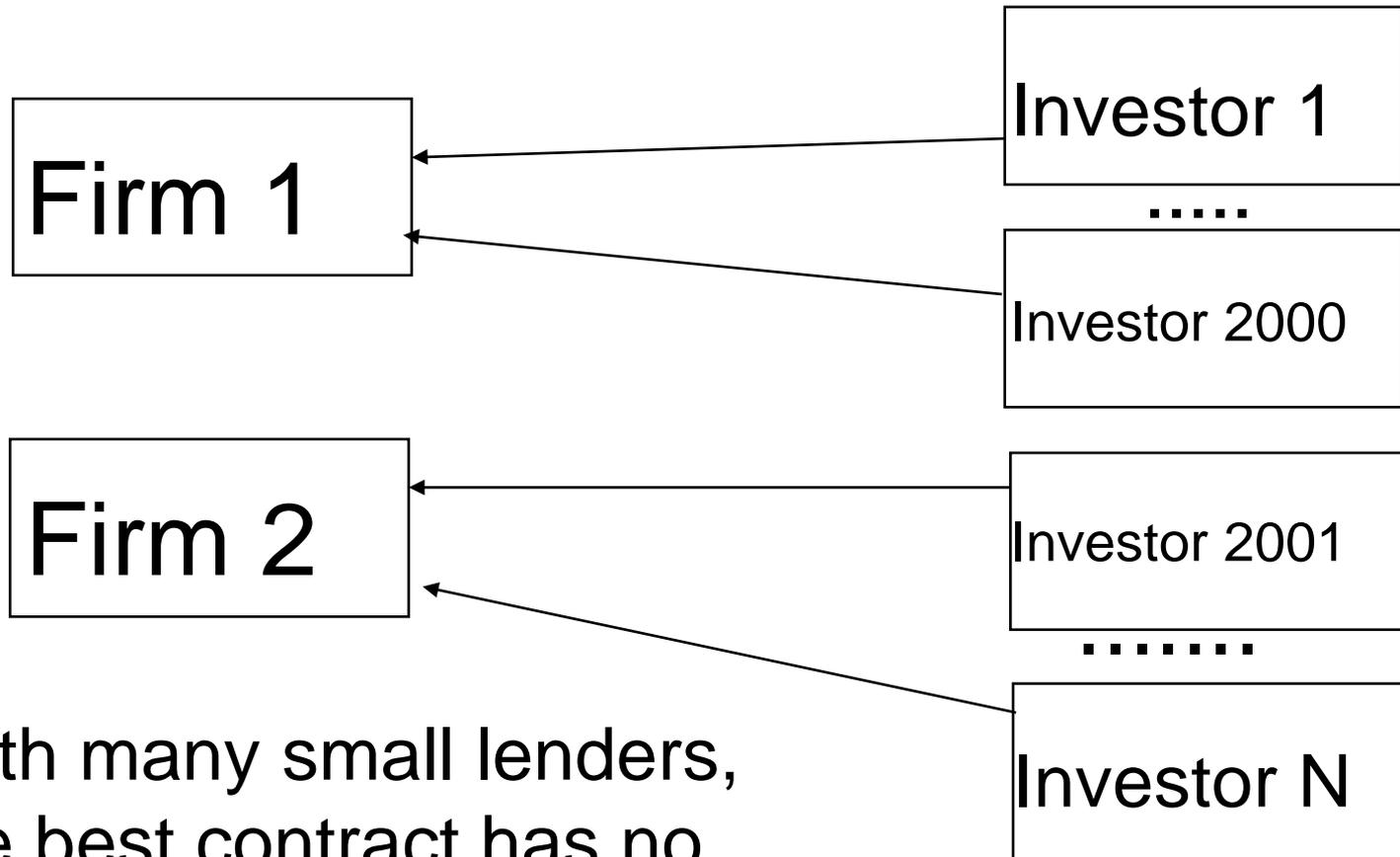
Costly Monitoring

- Without monitoring, the best contract has value destroyed with probability 0.2.
- Monitoring costs $k > 0$.
- If monitoring costs, k , are less than 0.2 (assuming the cost must be paid in advance, by establishing a relationship, for example), it will be better to monitor

Direct Finance with monitoring (each spends k to monitor small part of loan)



With many lenders, the cost of monitoring is too high ($=Nk$)

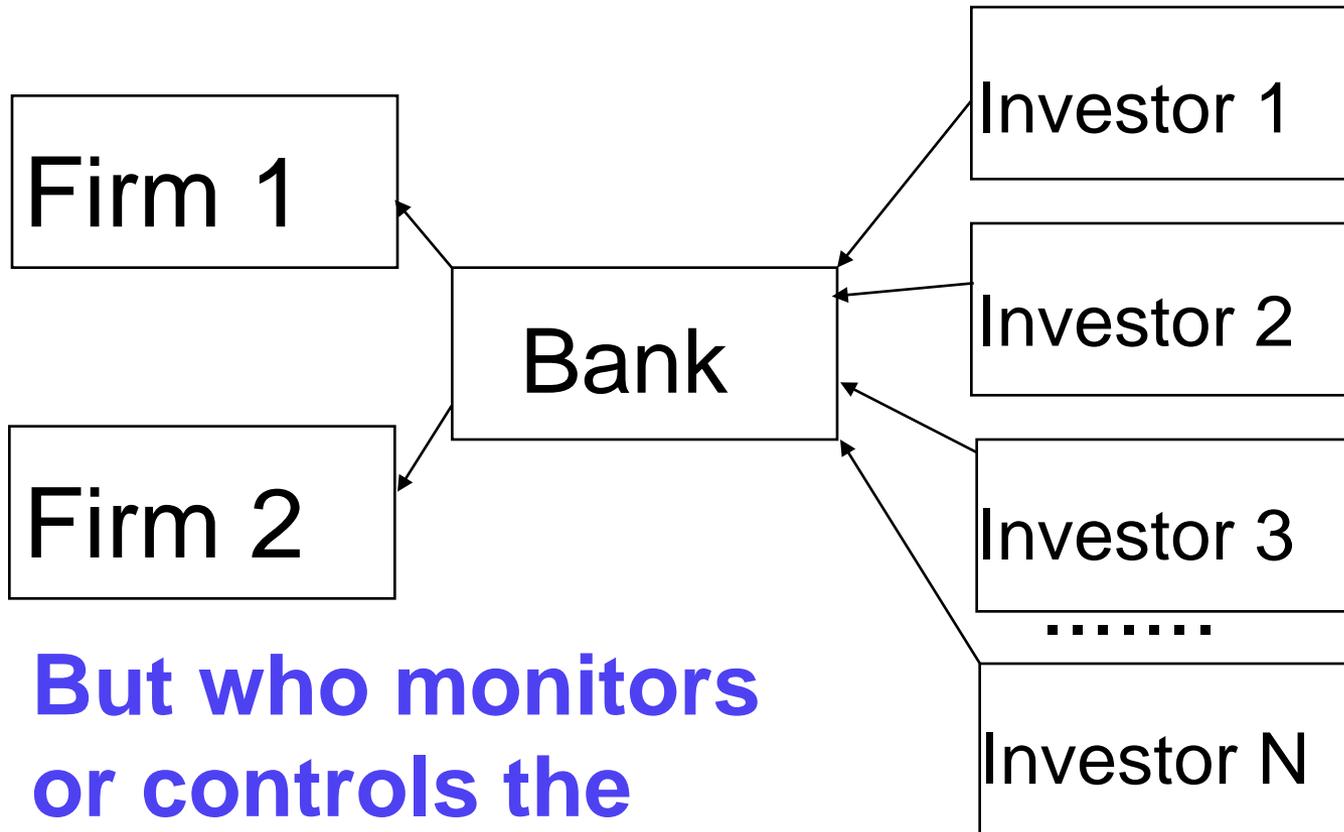


With many small lenders,
the best contract has no
monitoring

Many Small Lenders

- Want to delegate it to one lender.
- But others will not freely observe what was monitored by the monitor.

Intermediation Avoids Duplicated Outside Monitoring and Control



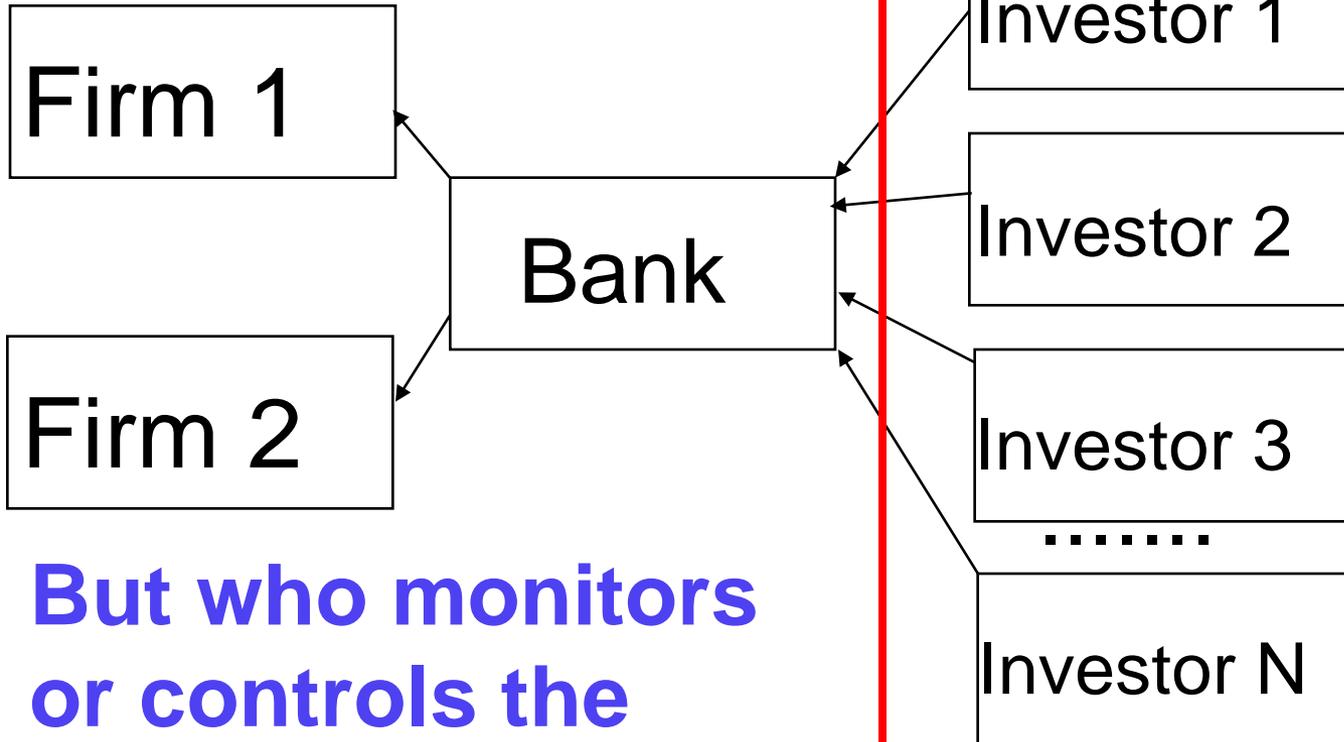
**But who monitors
or controls the
bank?**

Don't Monitor the Monitor...

- To avoid duplication of effort, other lenders do not monitor the monitor
- As a result monitor and borrower might get together, and collude so that the other lenders do not benefit from the monitoring.
- Need to provide incentives for delegated monitoring.

Common Information

No Information

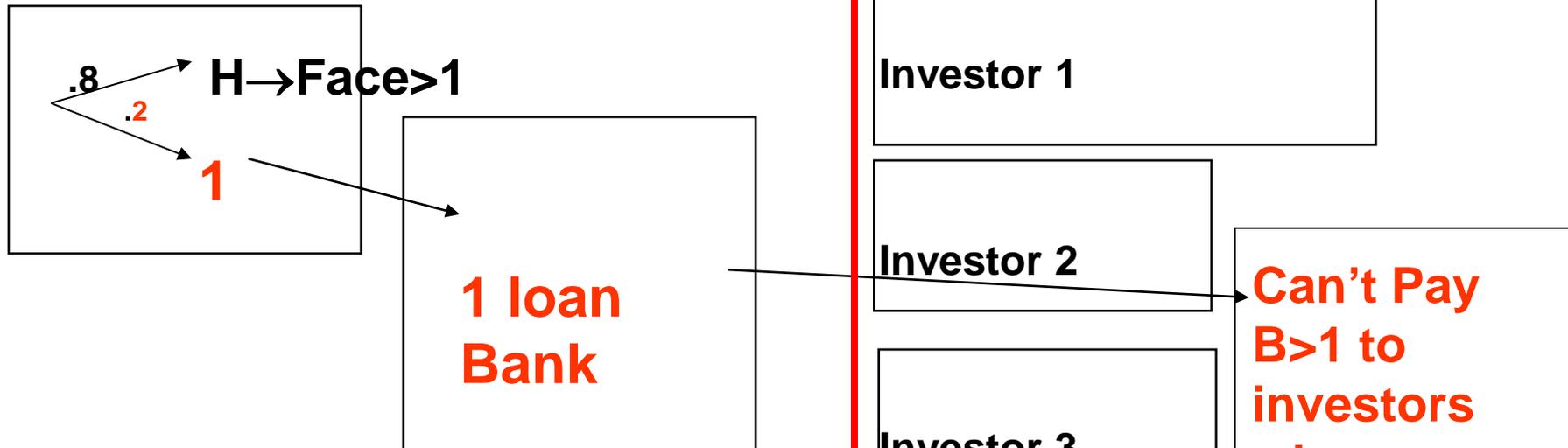


**But who monitors
or controls the
bank?**

Incentives for delegated monitoring

- Liquidate the asset for $\epsilon > 0$ (hurting the monitor) if the monitor pays out too little.
- Or impose legal penalty on monitor (and the borrower) instead.
- Monitor has no assets of his own, and he can extract at most 1 when the lender has just $V=1$ to pay.
- Monitor can pay at most 1 then.
- **Undiversified Monitor is liquidated in same states of nature as the borrower without monitoring.**

The One Loan Bank, with deposits of B (sanctions for smaller payment)



The one loan bank can pay only 1 when that is all the borrower can pay, and defaults on deposits just as often as the borrower would if he borrowed without monitoring.

The One Loan Bank can't survive

- A monitor who is liquidated in exactly the same states of nature (and at the same cost) as the borrower who borrowed directly can't survive.
- The costs of liquidation are the same as borrowing direct, and a monitoring cost is incurred.
- But a diversified monitor can implement delegated monitoring.

Role of Diversification

- As bank becomes well diversified ($N \rightarrow \infty$), it converges to a bank where 80% of loans pay F and 20% pay 1. It (almost) never fails. It just needs to cover its cost of capital (5%) and of monitoring (.02%).
- Let $1 + 0.05 + .0002 = .8F + .2 (1)$, or
 $F = 1.06227$.
- The well diversified bank can make loans at 6.2227% and pay 5% on deposits and earn zero profits.
- Can out compete less diversified banks

Role of diversification:

- Diversified banks as original form of “Financial Engineering.”
- Transform loans that need monitoring into deposits that do not
- Used in securitization today
- (“pooling” (diversification) and “tranching” (selling off only senior claims))

Critical Assumptions

- Borrower assets are risky
- Legal system can impose a **sufficient penalty ex-post** (such as liquidation) which can force the borrower to pay when he has the cash.
- **Contracts can commit to impose the penalty as function of amount actually paid**, even when not in lender's ex-post interest.

Summary

- Use ex-post costly financial distress to force borrowers to pay (or to behave, more generally)
- Due to ex-post cost that is imposed on both borrower and lender, it can be difficult to commit to impose these costs.
- US Federal Trust Indenture Act is an example of a way to commit to them.

What have we learned from “Law and Finance?”

- Cross sectional implications for contracts at the county level
- Based on Law and Finance, starting with La Porta, López de Silanes, Shleifer, Vishny = LLSV(1998) (and ~100 follow ups)
- Cross sectional severity of moral hazard allowed many tests of moral hazard-based views of financial contracting

Weaker Legal Protection

- If there is an upper bound on:
 - The legal sanction that can be imposed,
 - the probability that it will be imposed conditional on some relatively incriminating event, or on
 - The ability of the sanction to reduce the proceeds of diversion, tunneling, etc.
- Borrower (or failed bank) gets more than zero if default
- More need for Monitoring and Bank Lending
- Bank Regulation or demand deposits are Critical to implement Delegating Monitoring

Law and the role of Delegated Monitoring

- How does the strength of legal protection influence optimal financial structure?
- In particular how does the strength of legal protection influence the “delegated monitoring” role of financial intermediaries (banks)?
- How does it relate to the threat of bank runs?

How Strong is Legal Protection?

- For now let's take *strong protection* to mean that it is possible to **deter observable obvious theft by a borrower.**
- A legal sanction that can remove a fraction of the spoils (without recovering them for the lender).
- Let strong protection imply that legal sanctions can remove **all** of the spoils.

Illiquid Financial Assets

- We will use this model to understand why bank loans are illiquid.
- To understand how the assumed illiquidity of assets is related to banks and their role as intermediaries (and see how the Diamond-Dybvig [1983] model applies especially to banks and not just maturity and economy-wide financial crises).

Specific Loan Collection Skill

- Consider the Asset

● T=0	T=1	T=2
-1	1	0
or	0	R

- Suppose that the a lender can collect R from a borrower at date 2 if he monitors the loan, but anyone else could not monitor and could collect only 1, due to the original lender's lending relationship skills. The loan will be illiquid (sell for only 1)

Link to Delegation and Monitoring

- Can the bank commit to collect for others the part of the the loan that only it can collect?
- How is borrowing against loans (financial intermediation) different from selling loans?
- How can the bank borrow the full value of the loan?
- Why first come first served deposits?

If Monitoring Can Be Delegated, Deposits Can Be Liquid

- This links delegated monitoring to liquidity creation.

I refer to all borrower misdeeds as “diversion” (of cash)

- Borrower need to raise outside capital, but the ex-post cash flows are unobservable **and can be made unverifiable**
- If cash flow= H , then $H(1-t)$ can be diverted by the borrower, ($t \geq 0$)
- If not diverted, cash is verifiable and must be used to meet borrower’s contractual payments

One possible interpretation of t

- t can measure investor protection or simple reputation (as opposed to creditor protection or costs of explicit fraud), what does it take to keep the diversion quiet.
- I won't talk about variation of t today.
- Another parameter, ϕ , will measure legal protection in general but can be interpreted as creditor protection.

Contracts contingent on cash payments are enforced by laws

- The actual verifiable cash payments made to investors can be used in contracts, and **allow commitment to impose legal sanctions** contingent on the amount paid, (**sanction low payments < F**)
- Suppose that the sanction can subtract ϕH from the diversion spoils of a borrower who diverts H .

If Weak Legal Protection

- The ability to provide ex-post sanctions is low: $\phi H < (1-t)H$.
- Payoff from diverting H and incurring the legal sanction is:

$$H(1-t-\phi) > 0$$

- **Strong legal protection** would be:

$$\phi H = (1-t)H$$

Weak Legal Protection

- If there is an upper bound on:
 - The legal sanction that can be imposed,
 - the probability that it will be imposed conditional on some relatively incriminating event, or on
 - The ability of the sanction to reduce the proceeds of diversion, tunneling, etc.

Costly Sanctions

- Actually imposing the sanction is costly (e.g., I assume that imposing the sanction destroys output and gives a recovery of X_ϕ)
- Can commit to impose sanctions (weak or strong), but only based on observables.

Certainty and strong protection: No role for monitoring

- Borrower needs to borrow 1 for a project that will return H (and lenders require a payment of $I < H$).
- Costly legal sanction removes any benefit; this could be liquidation or a fraud sanction
- No problem, because the sanction is big enough when less than face value $F=I$ is paid

II. Weak Protection: Enforcement Problems Without Uncertainty

- Suppose again that the borrower's project returns H **for sure**.
- Can impose legal sanction of ϕH .
- If investor/creditor protection is weak, ϕ is low and even observable theft, or diversion will occur if $\text{Face} > H(1 + \phi)$
- Diversion Payoff is: $H(1 - t - \phi) > 0$

Monitoring a crime in progress: Diamond['91], Calomiris-Kahn['91]

- Borrower diverts cash or not.
- If B diverts, monitor can stop crime or not
- If borrower diverts and monitor stops the crime, the payoff of borrower is

$$H(1-t-m-\phi)$$

- E.g, m is so big that the monitor can remove all the spoils.

Monitoring produces private information

- One cannot write a contract based on the outcome of monitoring, the information must be used to (threaten to) stop a crime in progress).
- By the time an observable default has occurred, it is too late to intervene and stop the crime in progress)

All bargaining power to monitor

- The monitor makes take it or leave it offers to the borrower and can reduce diversion proceeds by $mH > 0$.
- This gives **clout** to the monitor and can be used to deter diversion (but also for other things...)
- If bargaining power of monitor is lower, then the **recovery**, X_m , from imposing the sanction will matter (coming later).

Time line of undelegated monitoring (Monitor = Lender)

- Stage 1
 - Borrower diverts.
 -
 -
 -
 -
- | | 2 | 3 |
|--|--|---|
| | Monitor can threaten to stop crime unless a specified payment is made. | All surplus over outside option to the monitor/lender |

$$(B, L) = (H(1 - t - m - \phi), X_m)$$

Borrower's Outside option

Borrower can commit to pay with (undelegated) monitoring

- This means that the borrower can commit to pay an additional mH if monitored (paying all of H if m is large).
- This applies to undelegated monitor such as private family firms.
- What about delegated monitoring?

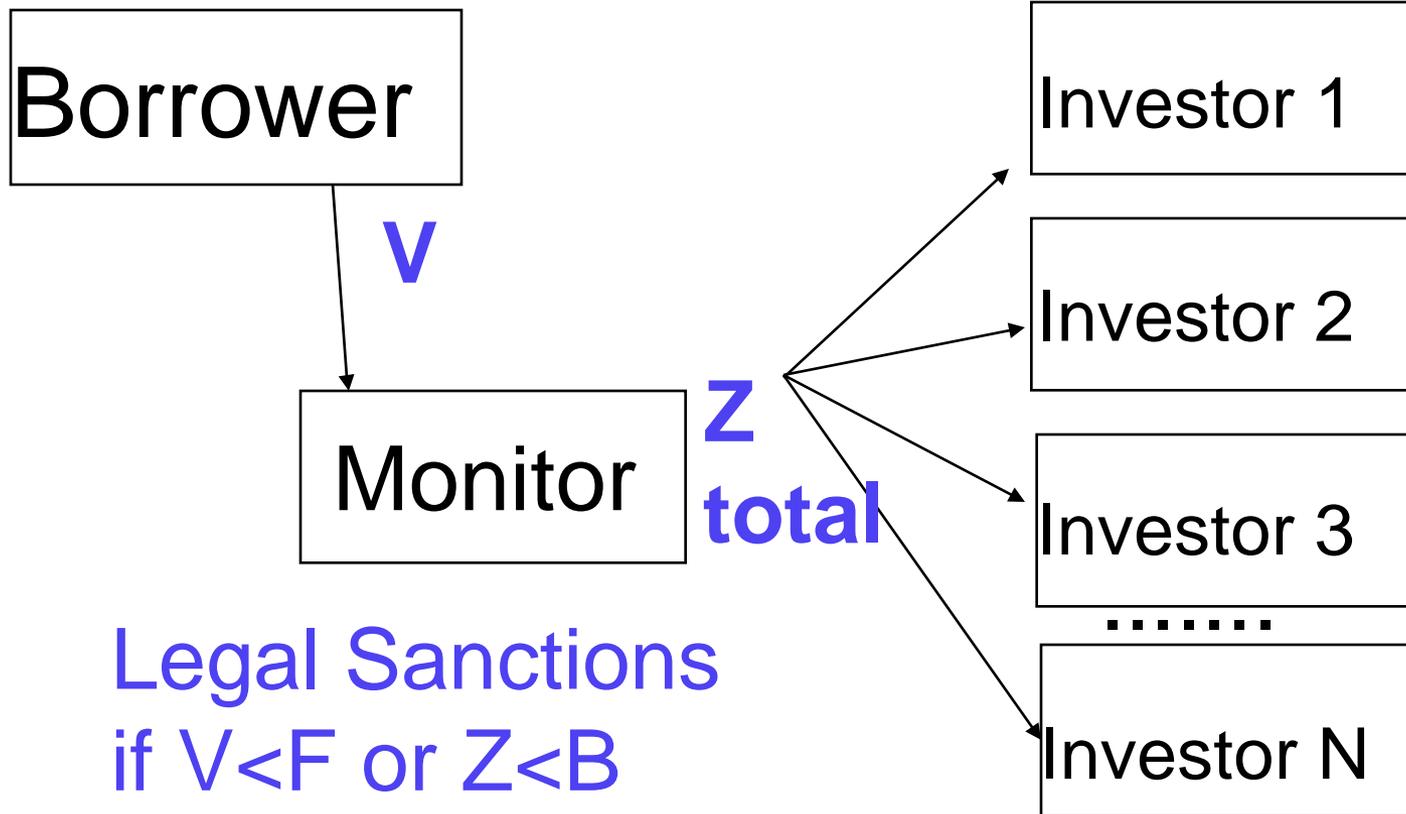
Delegated monitoring?

- If delegated monitor monitors, he won't be viable if he can't commit not to use the power to allow the diversion in return for a share of its proceeds

What contracts can we write?

- Courts and Investors can observe:
 - Verifiable payments, V , made by borrower.
 - Verifiable payments, Z made by monitor.
 - They can **commit to impose limited legal penalties** on monitor and borrower as functions of these payments. Penalize monitor if he pays less than value of deposits B and borrower if pays less than face F .
- If the borrower makes a **verifiable** payment to the monitor, the monitor can't divert it (for example, the payment could be made directly to the investors and the penalty based on the payment to investors).

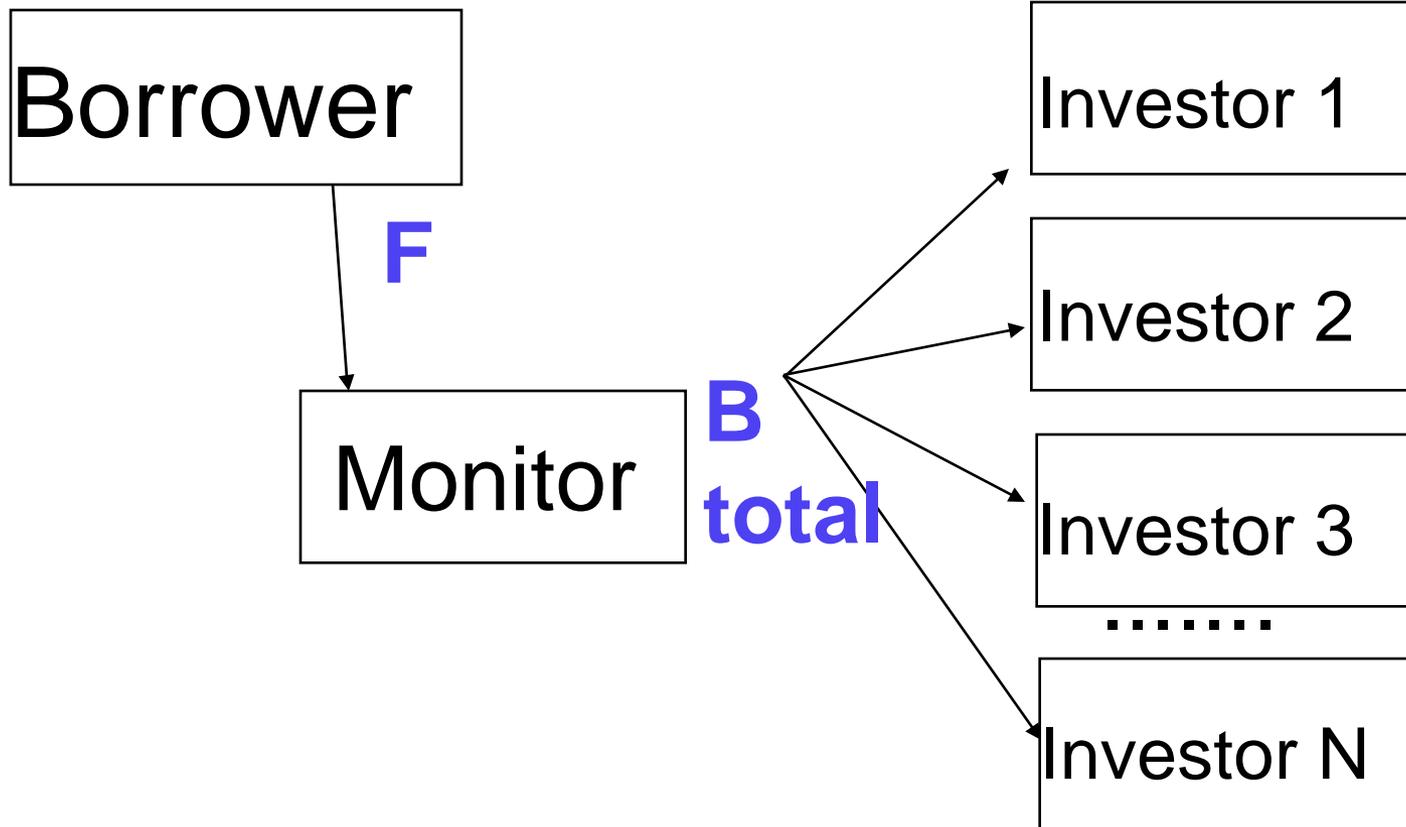
Verifiable payments (V and Z) that determine legal sanctions



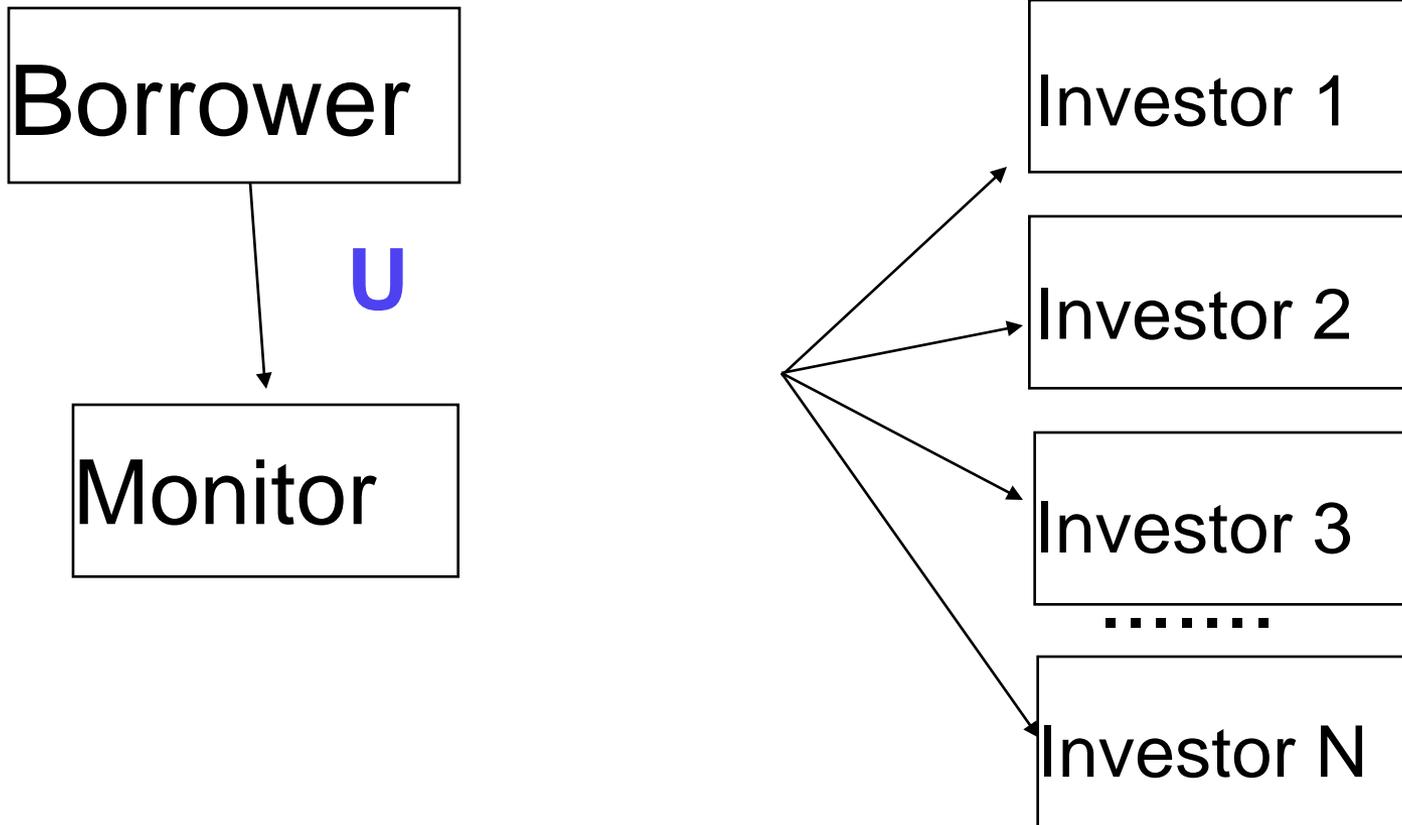
Legal Sanctions
if $V < F$ or $Z < B$

Monitor can't divert verifiable payment, V

Monitor can collect the loan F and pay deposits of B and get $F-B$



Delegated monitor can request part of $H(1-t)$, allowing diversion (accrues directly to the delegated monitor)



Monitor can consume side payment, $U \leq (1-t)H$

Borrower can pay F , or share diversion and pay $U \leq F - H(t+\phi)$

- Borrower can pay F , avoiding default and any penalty.
- $H-F$ is borrower's outside option
- The largest U monitor can extract solves $H-F = H(1-\phi-t) - U$ (applies for **large m**)
- Borrower will be willing to pay a share of

diversion up to
$$U = F - (t+\phi)H$$

Maximum Legal Sanction of the Monitor for default (small payments)

- The legal sanction which can be imposed on the monitor cannot exceed $\phi_M H$..
- This could be $\phi_M H = \phi H$, or differ
- Similar motivation to borrower sanctions

How much improved commitment to pay from delegated monitoring?

- Delegated monitoring adds ability to pay of $\min\{\phi_M H, mH\}$.
- Diversion without monitoring was a problem if the borrower had to pay more than $(t+\phi)H$.

Obvious Implication

- With very weak legal protection/ bank supervision, $\phi_M \rightarrow 0$, then intermediation will not be viable.
- Only family firms and internal finance will exist.

Diversification not needed and incentives are improved

- With two agents who must cooperate, and legal penalties of ϕH , and $\phi_M H$, delegated monitoring can improve the ability to commit to repay outside investors.
- The “group penalty if any misbehave” can allow the delegated monitor’s ability to stop a crime in progress to benefit the outside investors.

Some more results I don't have time for.

- Diversification can be counterproductive with poor bank regulation (creating a too big to fail problem), and particularly if creditor protection is weak.

Short term debt, runs and commitment

- Diamond, “Banks, Runs and Liquidity Creation” surveys and combines various models.
- Here, we drop the assumption that default sanctions are automatically imposed, but must be done voluntarily (allowing the possibility of renegotiation).

Commitment to impose default sanctions

- When default sanctions of default are imposed voluntarily, then absent a commitment device (or negotiation that assigns 100% of surplus to a lender), the amount that a borrower can commit to pay depends on the net recovery to the lender after imposing the sanction.

More bargaining power for borrowers

- Let a borrower get a fraction μ of the surplus over the outside option when negotiating with a monitor or a lender who does not monitor
- (similarly a delegated monitor will get a fraction μ_m when negotiating with depositors)
- Will look at $\mu = \mu_m = 1$.

Monitoring improves recovery

- With all bargaining power to the borrower, can collect X_ϕ from the borrower without monitoring, from the ability to impose the default penalty.
- With monitoring, can collect $X_m > X_\phi$, from the ability to stop the crime in progress.

Loan collections with full borrower bargaining power

- Without monitoring a lender can collect the recovery from default X_ϕ (loan will be renegotiated otherwise)
- An Undelegated monitor can collect $X_m > X_\phi$ by threatening to intervene early
- A delegated monitor will pay no more than X_ϕ to its investors/ depositors (deposits will be renegotiated otherwise)

Loans are Illiquid and delegated monitoring is a problem

- Unless there is a way to commit depositors to impose default sanctions if the bank does not (or will not) pay deposits in full.
- No problem if deposit default sanctions are automatic.

How to make sanctions automatic? Bank runs!

- How can we write a contract where depositors force the default sanctions to be imposed even when it is not in their collective interest?
- Set up a collective action problem (prisoner's dilemma) where there is a private incentive to demand full payment when it is not in the collective interest of lenders.

Example of Runs and Commitment

- Borrower must commit to repay 1 to fund project and $X_m > 1 > X_\phi = 0.5$
- Funded by two small investors who don't monitor
- Monitoring is needed but the bank can't commit sanctions for its default.
- Each depositor promised 0.5, paid first come first served on demand.

Bank commitment and runs (as in Diamond-Rajan [2001])

- To borrow 1.0 to lend to the borrower, the bank must commit to pay it to outside investors.
- Bank can do it by issuing demand deposits of 1.0 in total, collateralized by the bank loans on a **first come first served basis**, to many small depositors (two is enough in example)

What happens during a run?

- A depositor can take loans from the original lender (banker) on a first-come first served basis if the banker does not deliver the promised payment, or attempts to renegotiate **(and will do so if he expects a loss)**
- ***Equivalently, if the bank does not have cash to pay depositors, it must sell loans at the illiquid market price sufficient to repay depositors as they arrive.***

If the bank threatens not to pay in full

- The depositor at the front of the “line” can seize sufficient bank loans to make whole the payment he has been promised.
- Because the value of loans without the bank is $X_\phi = 0.5$ and less than 1, only a fraction of depositors will succeed in seizing loans as collateral. Eventually all will be gone (bank will be fully disintermediated).

Two depositors, with deposits of 0.5 each. If bank renegotiates and offers 0.4 each (0.8 in total).

	#2 Do not Run	#2 Run
#1 Do not run	(0.4, 0.4)	(0, 0.5)
#1 Run	(0.5, 0)	(0.25, 0.25)

If either runs, the entire loan must be sold/liquidated to pay 0.5. If both run, (run, run) shows the expected value over the place in line.

Two depositors, with deposits of 0.5 each. If bank renegotiates and offers 0.4 each (0.8 in total).

		#2 Do not Run	#2 Run
Dominated	#1 Do not run	(0.4, 0.4)	(0, 0.5)
	#1 Run	(0.5, 0)	(0.25, 0.25)

If either runs, the entire loan must be sold/ liquidated to pay 0.5. If both run, (run,run) shows the expected value over the place in line.

Two depositors, with deposits of 0.5 each. If bank renegotiates and offers 0.4 each (0.8 in total).

		#2 Do not Run	#2 Run
Dominated	#1 Do not run	(0.4, 0.4)	(0, 0.5)
	#1 Run	(0.5, 0)	(0.25, 0.25)

If either runs, the entire loan must be sold/ liquidated to pay 0.5. If both run, (run,run) shows the expected value over the place in line.

Two depositors, with deposits of 0.5 each. If bank renegotiates and offers 0.4 each (0.8 in total).

Dominated

		#2 Do not Run	#2 Run
Dominated	#1 Do not run	(0.4, 0.4)	(0, 0.5)
	#1 Run	(0.5, 0)	(0.25, 0.25)

If Bank Will Not Pay in Full, All Depositors Run and An Observable Default Occurs, Imposing Legal Sanctions

Two depositor example, with deposits of 0.5 each. If bank sticks by original deal.

	#2 Do not Run	#2 Run
#1 Do not run	(0.5, 0.5)	(0, 0.5)
#1 Run	(0.5, 0)	(0.25, 0.25)

If either runs, the entire loan must be sold/liquidated to pay 0.5. If both run, (run,run) shows the expected value over the place in line. Multiple Nash equilibria as in (Diamond-Dybvig (1983)).

Two depositor example, with deposits of 0.5 each. If bank sticks by original deal.

	#2 Do not Run	#2 Run
#1 Do not run	(0.5, 0.5)	(0, 0.5)
#1 Run	(0.5, 0)	(0.25, 0.25)

A green arrow points to the top-left cell (0.5, 0.5). Another green arrow points to the top-right cell (0, 0.5).

If neither runs, That is a Nash Equilibrium when the bank will fully repay deposits. But.... Multiple Nash equilibria.

Two depositor example, with deposits of 0.5 each. If bank sticks by original deal.

	#2 Do not Run	#2 Run
#1 Do not run	(0.5, 0.5)	(0, 0.5)
#1 Run	(0.5, 0)	(0.25, 0.25)

A green arrow points to the first column header, and another green arrow points to the second column header. The payoffs (0.5, 0) and (0.25, 0.25) are circled in green.

It remains true that (run,run) is Nash.
Multiple Nash equilibria.

Commitment role of demand deposits

- The way for (the bank) to borrow more than the illiquid value of its loans and **create liquidity**, is for the bank to issue **demand deposits** as a commitment device
- If bank will not (**or can not**) pay full value to depositors, a run occurs
- The threat of a run commits the banker to collect enough to repay the deposits.

Short term debt and the threat of runs synthesizes automatic sanctions

- This can be used as a theory of the entire economy's capital structure as a function of legal protection
- If they would be able borrow directly if **default sanctions were automatic**, then firms use short-term debt and are subject to crises (stronger protection)
- If not, monitoring is needed

Interesting trade offs due to need for commitment to force payment

- Too much long-term funding (equity) can limit bank's ability to create liquidity (borrow more than value of collateral X_ϕ).
- Full Deposit insurance puts all the burden on regulation, which can ruin incentives.
- With risky assets, too little equity leads to inefficient runs and reduced liquidity creation.

More interesting tradeoffs

- If the goal is creating safe and liquid assets (as in Diamond-Dybvig [1983]), there may be problems with the unregulated sector using the commitment role of runs to provide commitment for themselves, because runs on them limit the common pool of liquidity (Diamond-Rajan [2005]).