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Notes on

"Insiders and Outsiders: The Choice between Informed and Arm's-Length Debt"

by Raghuram G. Rajan, *Journal of Finance*, September 1992

What is special about bank lending, vs. outsider lending? If banks gather information allowing them to monitor loans, (and in particular to cut off credit when the project is no longer viable) then banks ought to have an efficiency advantage in lending. Nonetheless, banks and outside lenders both provide loans, thus it must be the case that some sort of inherent disadvantage to bank lending in some cases offsets its inherent advantages.

The hypothesis of this paper is the monopoly position of an informed bank causes it to be able to extract rents from a borrower once that borrower is in a relationship with it—and unable to commit not to do so. But of course this is not enough by itself, since banks could simply offer better terms up front to offset this later rent extraction. However combining this lack of commitment by the banks with a moral hazard problem by the firms leads to real costs to bank loans. Since firms know that rents will be extracted by the bank if their project is successful, they have less incentive to work hard to make the project successful.

The model

There are three dates, 0, 1, and 2, a single entrepreneur and multiple potential lenders. All are risk neutral and there is no time discounting.

The entrepreneur has a single project, which requires two inputs at date 0: a fixed amount of investment I (which must be provide by a lender) and a level of private effort β provided by the entrepreneur at a disutility of 1 per unit of effort. The entrepreneur can choose any nonnegative level of effort. If the project is successful it yields a payoff of $X > I$ in period 2; if unsuccessful the payoff is 0. The project can be liquidated at time 1; if this is done then the payoff is $L \leq I$ with certainty.

Before the liquidation decision is made, the entrepreneur receives an imperfect signal as to the likelihood of success of the project. With probability q the signal is G, which means that the project will be successful with probability 1. Otherwise the signal is B, which means that the project will be successful with (fixed) probability p_B. It is assumed that $p_B X < L$, so that the efficient thing to do in the event of a bad signal is to liquidate the project, and the efficient thing to do in the event of a good signal is not to liquidate the project.

The probability of success depends on effort. It is also assumed to depend on a second, exogenous, publicly known "quality" parameter, which is only used for comparative statics exercises. We will omit that parameter from the description of the model, as it plays no other role. The q function is assumed to be increasing and concave and to satisfy the Inada conditions.

The financiers are of two varieties. *Arm's-length* investors lend at date 0 and return to collect payment at date 2. It is assumed that they cannot observe activity at date 1—this means that they cannot observe any signals that the entrepreneur receives or any actions the entrepreneur takes.

Banks can also lend in period 0. If they do, they are able costlessly to observe the entrepreneur's actions and the signal received, but are not allowed to write contracts based on this information (intuitively, this is interpreted as being able to look at the books and the bank accounts of the entrepreneur). It is *assumed* impossible for more than one bank to gather information in the first period on the firm.

Contracts are assumed to be restricted to simple debt contracts (not a particularly significant restriction, since there are only two values for output), requiring payment at least equal to I in every circumstance (justified by the possibility of "fly-by-night" companies. The justification seems plausible at first glance: if a company can receive I and pay back less than I in some circumstance, it will be happy to set up without actually producing anything. But in fact, if fly-by-night companies exist, then they can take

the money and declare liquidation, leaving the creditors a worthless shell. Any explanation as to why they cannot do this is probably an explanation as to why a lower payment contract might work).

More controversially, it also means that the contract is not permitted to be contingent on an announcement by the entrepreneur at date 1 and the amount paid to the lender is not permitted to depend on the liquidation decision in a manner agreed to ahead of time.

Whatever contract is agreed to, banks and borrowers are assumed to be able to renegotiate it as of period 1. In other words, renegotiation takes place after effort has been fixed and after the imperfect signal has been revealed. Both parties to the renegotiation have full information. Thus if the terms in the contract are efficient, there is no room for renegotiation. However, if the terms are inefficient, renegotiation will allow the two parties to move to an outcome that both agree is superior. The bargaining process is assumed to give each party their threat amount (the amount they would receive if the renegotiation were to fail) plus a set fraction of the increase in total surplus from moving from the inefficient to the efficient outcome (a popular method of modeling gains from renegotiation in full information, risk neutral contexts). The fraction that goes to the borrower is denoted μ, an exogenous constant. By assumption, outside lenders do not renegotiate their loans.

<u>The model with "lock-in"</u>

The social surplus from the project is

$q(X-I) + (1-q)(L-I) - \beta$ and the first-best β is determined by: $q_1(\beta) = 1 / (X-L)$.

We want the owner to get the entire surplus so he chooses beta correctly. We want the project shut down in the bad state. Given limited liability, owner will never liquidate in bad state unless bribed or coerced. So can't do both. Competition and rationality imply zero npv lending. So inefficiencies cost the project owner.

Arm's-length contract
In an arm's-length contract with promised second period repayment D (which has to be greater than I), the profits are

$q (X - D) + (1 - q) (p_B (X - D)) - \beta$

Since the rewards to success are lower and the rewards to failure are higher (positive, where they are negative under efficiency), effort is less. The exact first order condition depends on D, which will be set by zero expected profits in competition.

Short term bank contract
In a short term bank contract, the bank requires a repayment in period 1. (The actual level of the repayment is immaterial, since the borrower can't afford to pay, anyway). Instead, the contract is renegotiated in period 1 based on period 1 information. If renegotiation does not occur the payoffs are (0, L). Renegotiation does not occur if the state is B, but it does occur if the state is G. Thus the payoff to a borrower is

$q \mu (X - L) + (1 - q) 0 - \beta.$

The difference between the amount received in the good state and the amount received in the bad state is less than the difference in social surplus, thus effort is too low. However the project is shut down in the bad state.

If the owner has too much bargaining power bank wont lend. If too low, owner won't put in effort (so bank wont lend again) Thus would only expect to see a short term contract at intermediate levels of bargaining power. (Could sometimes achieve first best with commitment to re-lend at particular interest rate if at all?)

Long term bank contract
In a long term bank contract, a second period payment D is specified. Now the terms of the contract (continuing the project) are efficient in the good state, and renegotiation occurs in the bad state, moving from the threat point (p_B (X-D), p_B D) to the efficient outcome

$(\mu (L - p_B X) + p_B (X - D), \ (1 - \mu) \ (L - p_B X) \ + p_B D).$

Borrower expected profits are

$q (X - D) + (1 - q)(\mu (L - p_B X) + p_B (X - D)) - \beta.$

Again, the difference between the good and bad states is less than it would be under efficiency, so effort is too low, and again the bank is shut down in the bad state.

As the owner's bargaining power increases, the face value of the loan increases (bank gets lower share in bad states, but has to have same expected value. A fortiori, increasing owner's bargaining power, decreases his effort, because owner's share goes up in *bad* state)

Comparative statics
How does bargaining power affect the choice of contract? In short term contract, giving owner more power decreases investment distortion. In long term contract giving owner more power increases distortion. In arm's-length contract power doesn't matter. Roughly, therefore, we might expect that owners with high power use short term contracts, owners with low power use long term contracts, and owners with intermediate power use arm's-length contracts. Rajan also examines relative advantages of contract type as function of loan quality.

The Model with Multi Sourcing

So far we have assumed that bargaining power is exogenous. This might be reasonable if lock-in itself were exogenous. But it is more likely that ex post competition among banks limits bargaining power. If so an incumbent bank's power will stem only from its informational advantage. In the second part of the paper, Rajan examines this possibility.

To do so, he makes several simplifications. First, L=I. This means that short term loans are riskless. He drops consideration of long term bank lending. And he assumes $p_B = 0$—that is, signals are perfect. All of these simplifications ease calculations, but none appear crucial.

Now the informed bank makes a short term loan in period 0, and there is competition from (one) uninformed lender for the right to continue the loan in the second period. (Limiting to one uninformed lender is without loss of generality).

The assumption is that each of the two prospective lenders submits a bid for the second period loan, the low bid winning. The uninformed bidder's bid is independent of the signal. The informed bidder withdraws from competition (or makes an arbitrarily high, uncompetitive bid) if the signal is bad, and makes a real bid if the signal is good. Both the uninformed bidder and the active informed bidder randomly pick bids according to a continuous distribution.

Rajan investigates by starting from a general strategy. Equilibrium bids have identical support. The uninformed outsider makes zero profits. He mixes between all bids in such a way as to be indifferent among them. In general he may also have a positive probability of not bidding at all.

In the equilibrium, the incumbent bank's profits are reduced relative to the situation of lock-in. However, the control the bank exercises is less efficient, since an inefficient firm may be continued by receiving a loan from an uninformed bidder.

The owner can reduce the value of the incumbent bank's information advantage by reducing the amount to be rolled over, that is by borrowing at arm's length. If we make the bank the senior claimant the calculations go straight through.

Evaluation and implications

The paper does explain the problems that a monopoly banking relationship can impose on the borrower. But that implies that the problem could be solved by generating a relationship with more than one bank. Presumably any borrower sufficiently large would find it advantageous to do this. This has led to examinations of the difference in profitability of having single versus multiple banking relationships.

The model takes only the first step at examining the relationship between active and passive lenders to the same borrower. In Rajan's model, borrowers borrow from *either* an informed bank or an uninformed passive investor; in reality many firms borrow from both. These joint arrangements would be expected to lead to more complex, complementary relations than those described here.

The paper has led to empirical work examining the time patterns of profitability of lending by banks, and effects of competition. It also leads one to further consideration of the large empirical literature on the signaling effects of bank loans or of ending banking relationships