Credit Rationing, Bankruptcy Cost, and Optimal Debt Contract for Small Business

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ABSTRACT

This paper examines the relationship between debt contract and the process of resolving financial distress, through either debt restructuring or bankruptcy procedure. It effectively justifies the popularity of the standard debt contract by demonstrating that the standard debt contract is the optimal debt contract for small business with the costly random verification scheme. Although this result is quite different from Townsend (1979) and Williamson (1986,1987), it is compatible with their results and serves as a good supplement.

This paper relates credit rationing directly to bankruptcy cost. It is shown that credit rationing, characterized as a loan amount granted less than requested, becomes more severe as bankruptcy cost rises. This result supports 1994 amendments to the Bankruptcy Code since it shows that simplifying bankruptcy procedure for small business reduces credit rationing, therefore, enhance lending.

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1. Introduction

The most commonly observed debt contract is the so-called standard debt contract, which calls for non-contingent repayment of principal plus interest. Whenever this repayment does not occur, bankruptcy proceedings are initiated and all resources related are transferred to the lender. The most often raised question is why this simple form of the debt contract is more popular than the complicated contingent debt contract suggested by economic theory. Whether the standard debt contract is optimal and under what conditions it is optimal have been the focus of researchers for many years. This paper, along with other papers, tries to justify standard debt contract's popularity by proving its optimality.[1]

Some papers have analyzed the strategic behavior of borrowers and lenders in an asymmetric information setting during financial distress.[2] Haugen and Senbet (1988) argue that once a loan is outstanding, rational creditors will avoid bankruptcy costs by informally restructuring loans. Giammarino (1989) shows that despite the possibility of costless reorganization, it is rational for lenders to incur bankruptcy costs when there is asymmetric information and court has judicial discretion to impose reorganizations. The common problem among these papers is that they ignore how the bankruptcy process affects lenders' initial credit decision.

In the credit rationing literature, Williamson (1986, 1987) views the credit rationing problem from a macroeconomic perspective, where the aggregate supply of funds is short of

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[1] See Townsend (1979), Williamson (1986, 1987), and Boyd and Smith (1994).

[2] See Haugen and Senbet (1978, 1988), Brown (1989), Giammarino (1989), Gertner and Scharfstein (1991), Asquith, Gertner and Scharfstein (1994), and Diamond (1993) to review the financial distress literature.

the aggregate demand at the market interest rate. In his model, credit rationing stems from an ex-post information asymmetry.[3] Raising the interest rate on loans increase the expected return but also increase the probability of bankruptcy, and hence increase the expected bankruptcy cost. Since Williamson (1986, 1987) does not allow a bank to restructure the debt, the bank always forces bankruptcy to verify reported incomes whenever borrowers default. In contrast, this paper considers both debt restructuring and a more sophisticated strategic bankruptcy process.

This paper relates credit rationing to bankruptcy procedures and debt restructuring. The direct linkage between credit rationing and bankruptcy cost is not found in previous research. In contrast to the credit rationing defined by Stiglitz and Weiss (1981) and Williamson (1986, 1987), this paper focuses on the type of credit rationing defined by Jaffe and Russell (1976) and Gale and Hellwig (1985), where credit rationing is characterized by the actual loan size granted being smaller than requested. This paper also focuses on the issue of optimal debt contract for small businesses with the costly random verification scheme. However, it should be noted that the optimal contract derived in this paper is *within the framework of debt*, comparing to an optimal contract to induce the truthful reporting. In order to induce true reporting in asymmetric information setting, Border and Sobel (1987) and Mookerjee and Png (1989) show that the optimal contract is characterized by a low probability of verification and a large reward for truthful reporting. Both papers mention that

[3] Some credit rationing literature follows Stiglitz and Weiss (1981) in the sense that credit rationing stems from ex-ante information asymmetry. Banks set interest rates below the market clearing level to increase the quality of loan portfolio.

this characterization does not apply to debt contracts since borrowers are not rewarded for truthful reporting.

The purpose of this paper is to find the optimal debt contract with small business, regarding the issues of randomized costly verification, debt restructuring, and credit rationing. In this model, the bankruptcy decision is modeled as a strategic choice of the borrower. It is found that the bank would not randomized the costly verification even if it could, due to the asymmetric information. Any ramdomized verification will induce some type of borrowers to claim default strategically. The bank considers the bankruptcy cost in the initial credit decisions. The results show that high bankruptcy cost causes credit rationing. The optimal size of the loan decreases as bankruptcy cost increases when the bankruptcy cost is high.

It is found that the standard debt contract is the optimal contract, within the framework of debt, for small business even in the present of the randomized costly verification. This conclusion is quite different from Townsend (1979) and Williamson (1986, 1987). They conclude that the standard debt contract is optimal only with non-random costly verification. Their conclusion follows, because in their model, that the borrower is the residual claimant. In this model, however, when the small business borrowers face local non-competitive financial market, the lender is the residual claimant. Our conclusion is also the result of assuming a continuous payoff distribution, which is more realistic than the discrete payoff distribution assumed in Townsend (1979).[4] Our result shows that strict enforcement

[4] In Townsend (1979), there are only two possible payoffs. Thus, it is possible to decrease the verification probability slightly from 1 without changing the borrower's incentives to report truthfully. But with a continuous payoff distribution, any decrease in verification probability from 1 will attract additional solvent borrowers to underreport the payoff no matter how small that decrease in verification probability is.

of the debt collection law will increase banks' expected profits, which in turn facilitates lending. The higher the bankruptcy cost is, the higher the inefficiency of the lending market is. This conclusion is different from Giammarino and Nosal (1994), who suggest actions such as judicial discretion, which increase the bankruptcy cost, are beneficial because they lower the incidence of inefficient bankruptcy. This paper's result is also much stronger than that of Boyd and Smith (1994), which concludes that the standard debt contract is *close to* optimal because the welfare loss of imposing the standard debt contract is small.

The borrower in this model does not have initial wealth, reflecting the simplified feature of small business entrepreneurs in reality. According to a Savings and Community Banker Association survey, an appreciable number of small business loans, about 42%, fail. Banks' loss exposure to small business loans is very significant.[5] The result of this paper supports Bankruptcy Reform Act of 1994 in a way to show that the simplified bankruptcy procedure for small business has great meanings in reducing credit rationing, and consequently, enhancing lending.[6]

This paper is organized as follows. Section 2 describes the model and its environment. The resolution of financial distress is provided in Section 3. The issues of

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[5] Creditor losses from business and consumer bankruptcies have risen more than $12 billion per year, prompting lenders to cut off the riskiest borrowers. See Marshall (1992).

[6] In April 1994, the Senate proposed amendments to Chapter 11 of the Bankruptcy Code, referred to as Chapter 10, that are intended to provide a less costly process for small business bankruptcies. Chapter 10's intent is to speed up the reorganization process in order to both reduce legal and accounting fees for small business firms involved in Chapter 11 proceedings and to facilitate the reorganizations.

optimal debt contract and credit rationing are addressed in Section 4. The conclusions and empirical implications are summarized in Section 5.

2. The Environment

One of the features of small business entrepreneurs is their low elasticity of demand and low collateral. They usually lack of financial expertise and credit history. However, they usually have to face some big bank that has a lot of local market power. Thus, the local financial market for those small business entrepreneurs could be approximated as a monopoly market. The bank attempts to set high rates to extract the maximum surplus associated with the relatively inelastic demand of the small business borrowers. Existence of the usury laws, which place explicit maximums on the rate of interest that may be charged on a particular type of loans or borrowers, is consistent with the above argument.[7]

In this model, a risk neutral entrepreneur, who needs to raise external capital to fund an investment project, and a risk neutral bank is used to capture the agency relationship between a small business borrower and a monopoly lender. The borrower has no initial wealth or tradable collateral. The project payoff is normalized by its highest possible payoff and follows the uniform distribution on the interval [0,1]. The distribution of the payoff is a public knowledge. However, the realization of the payoff, denoted by r, is observable only to the borrower. The bank can observe the realized payoff by incurring a monitoring cost.

The contract offered by the bank defines the required payment R, which is the amount of interest plus principal. The required payment R is also normalized by the highest possible

[7] See Pettit and McConnell (1991) for the details and effects of the usury laws.

payoff thus it is between 0 and 1. Because of the information asymmetry, the bank verifies the cash flow with a positive probability if the borrower claims bankruptcy. This model also allows the bank to credibly commit to a verification policy before the borrower claims bankruptcy. The bank naturally sets the penalty fee, a general function of the difference between the realized payoff and the reported payoff, as large as possible in order to provide more incentive for truthful reporting. Therefore, if the borrower is found to have under-reported his payoff, the bank will take away all the realized payoff.

Kreps and Wilson's (1982) sequential equilibrium concept is used to analyze the model. The borrower's type is identified by his realized payoff, r. The borrower's reported payoff, $R' \in [0,1]$, might be different from the realized payoff. The probability that the bank verifies the reported payoff when the borrower defaults is denoted by p, $p \in [0,1]$, which is determined endogenously. If p equals to 1, the contract becomes a standard debt contact, under which the bank files bankruptcy to verify the payoff whenever the borrower defaults. If p is less than 1, the bank randomly verifies payoff upon default with probability p.

It is assumed that court observes the realized payoff without error, enforces the terms of the debt contract, and does not exercise judicial discretion.[8] The bankruptcy cost, denoted as L, is determined by legal and other professional fees, administrative fees, and opportunity

[8] The assumed court behavior restricts the cost allocation mechanism, thereby influencing the bank's and the borrower's strategic actions. For example, Giammarino (1989) chooses a cost allocation scheme that eliminates frivolous legal action by the lender. In his paper, an informed court considers the action to be frivolous if the bank refuses to accept a "fair and equitable" offer from the borrower. In this instance, the bank is forced to accept the rejected offer and pay the legal fees. His cost allocation scheme induces the bank to accept settlements that are lower than the face value of the debt. In our model, the bank is not penalized for taking insolvent borrower to court. Judicial discretion or

cost associated with bankruptcy procedure.[9] This cost is initially paid by the bank and then recovered as part of the bank's settlement.

3. The Resolution of Financial Distress

The question to ask first is that whether the bank accepts a payment less than the full amount (called partial payment thereafter) and forgives the remaining portion of the debt. If a partial payment is acceptable, the bankruptcy cost is avoided and it *might* benefit both the bank and the borrower as argued in Haugen and Senbet (1978, 1988). Whether the partial payment is acceptable or not depends on the asymmetric information between private and public knowledge. In Giammarino (1989), the information available to public is more than the information available to public in this model.[10] Thus, it is not surprising to see that debt restructuring is acceptable in his model but not in ours. In our model, when the borrower claims he only has R', R'<R, and cannot make the full payment, the lender could choose verify with probability p(R'), p(R')$\in$[0,1]. When the monitoring is pursued, the lender takes away all the borrower's payoff r but has to pay verification cost L. The borrower gets 0 when the verification is pursued. However, when the lender accepts the partial payment, the

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violations of absolute priority can be estimated as a bankruptcy cost and taken into consideration at the time the borrower requests the loan.

[9] The opportunity cost of delay associated with bankruptcy can be substantial. Franks and Torous (1993) find that the median resolution periods for renegotiations and bankruptcy are 17 months and 26 months, respectively.

[10] There are only two possible states in his model, either solvent or insolvent. However, there are innumerable possible payoffs in this model, each belong to either the solvent or the insolvent category.

borrower keeps r-R', r-R'≥0. The following proposition states that the lender will choose verify with certainty, p(R') =1, if the debt is not paid off in full.

Proposition 1:

Due to the information asymmetry, in equilibrium, the lender chooses to costly verify the borrower's payoff whenever the debt is not paid off in full.

[Proof]: See Appendix.

The proof is done by showing that neither a separating nor a pooling nor a semi-pooling equilibrium exists when the borrower offers partial payment.

It is shown that the bank cannot have a verification probability less than 1, upon default, that induces both solvent and insolvent borrowers to truthfully report their payoffs. The solvent borrowers always have incentive to mimic the insolvent borrowers when the verification probability is less than 1. Therefore, their types cannot be separated.

All the borrowers upon default have incentive to mimic the borrowers with a lower payoff and pool themselves at a lower pooling equilibrium. Therefore, the lowest possible pooling, (0, p(0)) will be the equilibrium result. Any non-zero partial payment will not create a pooling or a semi-pooling equilibrium. Consequently, banks always initiate bankruptcy proceedings in response to partial payment offers. No partial payment is acceptable without verification in equilibrium.

When the borrower defaults, the bank responds by either verifying the payoff through bankruptcy procedure or forgiving the rest part of debt. Two different structures are examined in this model. The first one is signaling and the second one is screening structure. The bank initiates bankruptcy proceedings optimally upon default in the signaling structure

while the bank commits to a verification policy beforehand in the screening structure.[11] For any given verification policy in the two structures, there always exists a marginal borrower r_0 who is indifferent between making the payment and claiming default. If the realized payoff is higher than the marginal borrower, $r \geq r_0$, the borrower makes the payment; otherwise, the borrower claims default.

The Signaling Structure

In the signaling structure, the bank does not make any commitment about the verification policy beforehand. The verification probability is determined optimally upon the borrower's default. The borrower's decision after observing the payoff, whether to make full payment or claim default, is largely depend on the size of the litigation cost. The litigation cost is also the main factor that determines the bank's verification probability. The following lemma reveals the relationship between the marginal borrower and the litigation cost.

Lemma:

1. $r_0 = R$ if and only if $L \leq R/2$.
2. $r_0 > R$ if and only if $L > R/2$.

Notice that when the marginal borrower's payoff is the same as the required payment, $r_0 = R$, the debt contract is self-enforcing (truth-telling). The above lemma reveals that the litigation cost lower than half of the required payment is the sufficient and necessary condition for the debt contract to be self-enforcing. This is because that the realized payoff follows a uniform distribution. When the marginal borrower's payoff is r_0, the expected

[11] This scheme is similar to the mechanism of delegation as commitment in Melumad and Mookherjee (1989).

benefit of the lender from verification is $r_0/2$. As long as the expected benefit exceeds the expected cost, that is $L \leq R/2$, the bank verifies the payoff upon the borrower's default. The bank's expected payoff will decrease if its verification probability is less than 1 in this range. Consequently, solvent borrowers never attempt to claim bankruptcy. When $L > R/2$, however, the bank does not benefit, on average, from verifying payoff with certainty upon default. Hence, verification probability is less than 1. Some solvent borrowers take advantage of this by claiming default and get away with it.

Without lost of generality, the litigation cost is an exogenous variable in this model.[12] The equilibrium marginal borrower r_0^* and the equilibrium verification probability p^* are determined endogenously. The borrower's payoff is taken away whenever the verification is pursued. The marginal borrower is indifferent to make the full payment or default. It is shown in the following proposition that verification probabilities are inversely related to the bankruptcy costs. The higher the marginal borrower's payoff, the more solvent borrowers claim default.

Proposition 2:

The equilibrium solution in the signaling model is as follows:

1. If $L \leq R/2$, then $r_0^* = R$ and $p^* = 1$.
2. If $\frac{1}{2} \geq L > R/2$, then $r_0^* = 2L$ and $p^* = R/2L$.
3. If $L > \frac{1}{2}$, the bank does not lend and the market fails.

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[12] The litigation cost usually varies with the total asset when firm size is big but it does not vary much when the firm size is small. Thus, the exogenous litigation cost does not seems to be an imposition for small business in this model.

[Proof]: With lemma, it is easy to understand that in equilibrium if the litigation cost is less than half of the required payment, $L \leq R/2$, the bank verifies payoff with certainty upon default and the borrower makes the payment whenever he could, that is $r_0^* = R$ and $p^* = 1$. However, if the litigation cost is larger than half of the required payment, $L > R/2$, the bank faces the following problem:

$$\text{Max}_{\ p} \quad \{(1-r_0)R + r_0 p \times (r_0/2 - L)\} \qquad (1)$$

The first term is the expected payoff from the borrower who makes full payment. The second term is the expected payoff from the borrower who claims default and is verified with probability p. The reaction function of the bank, which is the first order condition of equation (1), is $r_0 = 2L$. The borrower's reaction function, which is characterized by the marginal borrower's indifference between make the payment and default, is $r_0 = R/p$. With both parties' reaction functions, a unique equilibrium is reached at $r_0^* = 2L$ and $p^* = R/2L$. Notice p^* cannot be greater than 1, thus $L \geq R/2$. It is obvious that more solvent borrowers claim defaults when the bankruptcy cost rises. With $r_0^* = 2L$ and $p^* = R/2L$, the equation (1) is simplified to $R(1-2L)$. When $L > 1/2$, the expected payoff becomes negative. The bank does not have any incentive to lend. Therefore, the market fails.

Q. E. D.

The equilibrium solution of the problem is determined by the size of the litigation cost. The standard debt contract occurs as the equilibrium strategy and it is self-enforcing when the litigation cost is less than half of the required payment. The randomized verification occurs in equilibrium when the litigation cost is higher than half of the required

payment. However, if the litigation cost is so high that the bank's expected payoff turns negative then the bank stops lending and the market fails.

The Screening Structure

In the screening structure, the bank commits to a verification policy when the debt contract is signed. The verification probability upon default q is chosen optimally ex ante. Thus, the bank has more power to affect the borrower's decision in the screening structure than it does in the signaling structure.[13] The advantage of the bank's first move plays an important role here since the bank takes the borrower's reaction function into consideration when it commits to the verification policy. The equilibrium behavior is as follows:

Proposition 3:

In the screening structure, the standard debt contract occurs as the equilibrium strategy and it is self-enforcing when the litigation cost is low, that is $q^*=1$ and $r_0^*=R$ if $L \leq 1-R/2$. The bank stops lending and the market fail when the litigation cost is high, that occurs when $L>1-R/2$.

[Proof]: The bank faces the following problem:

$$\text{Max}_{\ q} \{(1-r_0)R+r_0 q \times (r_0/2-L)\}$$

$$\text{s.t. } r_0=R/q$$

The first term of the objective function is the expected payoff from the borrower who makes the full payment. The second term of the objective function is the expected payoff from the borrower who defaults and is verified with probability q. However, notice that verification

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[13] It is called first mover advantage in the game theory.

probability q is a probability that takes the borrower's reaction function into consideration. Thus, the borrower's reaction function r_0=R/q needs to be taken into the bank's objective function to solve for q. The objective function, after simplified to R[1-L-R/(2q)], is maximized at q^*=1. Consequently, the equilibrium marginal borrower r_0^* equals the required payment R in this case.

When the litigation cost is higher than 1-R/2, the expected payoff of the bank R[1-L-R/(2q)] turns negative with q^*=1 and r_0^* =R . Therefore, the bank stops lending and the market fails.

Q.E.D.

The main feature of the standard debt contract is that the bank files bankruptcy whenever the borrower defaults. When the litigation cost is in the low range, L≤1-R/2, the bank's commitment q^*=1 is credible and it effectively deters the borrower's falsely announced bankruptcy. However, when the litigation cost is beyond that range this commitment is not credible any more and consequently the market fails. It is fairly important to know what is the optimal strategy for the bank under different litigation cost ranges. This issue is the focus of the next section.

4. The Optimal Debt Contract and Credit Rationing

The optimal contract has been the center of the financial contracting. However, the standard debt contract has never been identified as the optimal contract within the framework of costly random verification before due to the ways the models were setup. In this section, through a non-conventional approach, the standard debt contract is shown to be the optimal *debt* contract with the costly random verifications for small business borrowers.

First, the two structures are compared in the expected payoffs in equilibrium. Second, the optimal required payment is determined for the dominating strategy. Third, the optimality of the standard debt contract is proved with random costly verification. Finally, the credit rationing issue is addressed through the direct relationship between the bankruptcy cost and the optimal required payment.

Proposition 4: The screening structure weakly dominates the signaling structure.

[Proof]: The proof is completed by comparing the equilibrium expected payoff in the three different litigation cost ranges.

When $L \leq R/2$, the equilibrium result is $r_0^*=R$ and $p^*=1$ in the signaling structure. Thus, the expected payoff for the bank is $R[1-R/2-L]$. The screening structure, with equilibrium $r_0^*=R$ and $q^*=1$, has the same expected payoff in this range. This is because the lowest marginal borrower's payoff is the required payment R. Since the signaling structure already achieves the best result, the screening structure cannot do better.

When $1/2 \geq L > R/2$, the equilibrium result is $r_0^*=2L$ and $p^*=R/2L$ in the signaling structure. The corresponding expected payoff for the bank is $R[1-2L]$. In contrast, the equilibrium result is $r_0^*=R$ and $q^*=1$ in the screening structure. The corresponding expected payoff for the bank is $R[1-R/2-L]$. Because of $L>R/2$, the expected payoff from the screening structure is greater than that of the signaling structure.

The market fails in the signaling structure when $L>1/2$. The market fails in the screening structure when $L \geq 1-R/2$. Since $R<1$, $1-R/2>1/2$. The signaling structure fails before the screening structure does when the litigation cost is high. Therefore, the screening structure dominates the signaling structure.

Q. E. D.

The above proposition shows that the screening structure provides higher expected payoff to the bank. Therefore, the bank will choose to commit to a verification policy before bankruptcy occurs. Proposition 3 has shown that if the bank commits a verification policy before bankruptcy, it will commit to the policy of verifying payoff with certainty upon default. The above results lead to the following proposition:

Proposition 5: The standard debt contract is the optimal debt contract for small business with costly random verification.

[Proof]: The feature of the standard debt contract is that the lender files bankruptcy whenever the borrower defaults.

Proposition 4 has shown that the bank prefers commit to a verification policy beforehand instead of afterwards with the costly random verification. Proposition 3 has shown that the equilibrium strategy in the committing verification policy beforehand is that the bank verifies with certainty upon default, which is also the feature of the standard debt contract. Therefore, with Proposition 3 and Proposition 4, it is easy to see that the standard debt contract is the optimal contract for small business with the costly random verification.

Q. E. D.

This result is a primary result in this paper. It is very strong in justifying the popularity of the standard debt contract. This result applies to the small business borrowers due to the reason that the local financial markets they are facing are usually non-competitive. For a competitive financial market, the standard debt contract is only optimal with the non-random costly verification, as shown in Townsend (1979) and Williamson (1986, 1987). Our

result is perfectly compatible with their results and it serves as a good supplement in understanding the standard debt contract.

The approach towards the credit rationing in this paper is also non-conventional. With the required payment being modeling explicitly, the loan size and interest rate are modeled implicitly. The credit rationing occurs implicitly instead of modeled explicitly in this model. The following proposition reveals the direct relationship between the optimal required payment and the size of the litigation cost.

Proposition 6: The optimal required payment is negatively related to the size of the litigation cost. The relationship between them is $R^*=(1-L)$.

[Proof]: With Proposition 3 and 4, the bank maximizes the expected payoff as follows:

$$\text{Max}_R \ \{(1-r_0^*)R+r_0^* q^* \times (r_0^*/2-L)\}$$

$$\text{s.t.} \quad r_0^*=R \ \text{ and } \ q^*=1$$

The expected function is simplified to $R(1-R/2-L)$. The uniqueness of the maximization is proved by showing the second order condition with respect to R is negative. The first order condition gives the condition of maximization as $R^*=1-L$.

Q. E. D.

The negative relationship between the litigation cost and the optimal required payment has important meanings on credit rationing. When the borrower requests a loan in which the required payment is lower than the optimal required payment 1-L, no credit rationing occurs and the bank earns positive profit $R(1-R/2-L)$. When the borrower requests a loan in which the required payment is higher than the optimal required payment, the bank will ration the credit to make the required payment equal to 1-L in order to maximize the

expected profit. It is important to observe that the size of the required payment decreases as bankruptcy cost rises. This means that credit rationing is more likely to occur and probably more severe when the bankruptcy cost is high.

5. Conclusions and Empirical Implications

This paper demonstrates that the standard debt contract is the optimal debt contract for small business with costly random verification scheme. This result is very strong in justifying the popularity of standard debt contract, comparing to the previous results on this issue. Although Townsend (1979) and Williamson (1986,1987) conclude that the standard debt contract is the optimal contract only with non-random costly verification, our result is not conflict with theirs. This is because their results are developed under the competitive financial market condition while ours are derived in the non-competitive financial market condition. This model focus on the issues of local non-competitive financial market that the small business borrowers face.

This paper relates credit rationing to bankruptcy procedures and debt restructuring. This direct linkage between credit rationing and bankruptcy cost is not found in earlier contributions. The important point here is that banks rationally take into account of bankruptcy cost when they make loans. High bankruptcy cost prevents banks to make big loans to small business borrowers due to the high possibility of loan losses. Credit rationing occurs naturally to alleviate loan loss. Due to banks' loss to small business loans is very significant, the credit rationing is also very serious for the small business.[14] Since credit

[14] See Buck, Friedman, and Dunkelberg (1991).

rationing is negatively related to the bankruptcy cost, our results strongly support Bankruptcy Reform Act of 1994, which simplifies the bankruptcy procedure for the small business. According to Holly (1994), 80% of U.S. firms are classified as small businesses. Hence, Bankruptcy Reform Act of 1994, by reducing credit rationing to small business, should have significant positive repercussions on the economy.

The result that the standard debt contract is the optimal contract for small business could be verified empirically by comparing the violations of the absolute priority rules in the small firm bankruptcies to those of big firms'. This work is under going and will be reported in another paper. The negative relationship between bankruptcy cost and the credit rationing can also be tested empirically. To my knowledge, existing studies that test for credit rationing do not consider the relevance of bankruptcy cost or differentiate between large and small firms.[15] Therefore, further empirical results in this area should be very interesting.

[15] See Aghion and Bolton (1991), Aghion, Hart, Moore (1992)& Berkovitch, Israel & Zender (1993), and Berger & Udall (1992).

APPENDIX

PROOF OF PROPOSITION 1

Suppose there exists separating equilibrium (R', p(R')) for R'<R. When the borrower reports the realized payoff is R', he gives the lender R'. The lender verifies with probability p(R'). Suppose the borrowers with realized payoff r=R'+c, c is an arbitrary number with c≥0, will report R' and the bank responds with different p(R') to maximize the expected payoff.[16]

If the separating equilibrium exists, the bank faces the following problem:

$$\text{Max}_{p(R')} [1-p(R')]*R'+p(R')*(R'+c-L)$$

The first term is the expected payoff when the bank does not verify the reported payoff. The second term is the expected payoff when the bank verifies and pays for the bankruptcy cost. This expected payoff could be simplified to R'-p(R')*(L-c). When c<L, the optimal probability for the bank is $p(R')^{*}=0$. However, with verification probability 0, the borrower has no incentive to separate himself from the lower types of borrowers. Therefore, the separating equilibrium breaks down. When c>L, the optimal probability for the bank to maximize the expected payoff is $p(R')^{*}=1$. However, with verification probability 1, all the insolvent borrowers will lose all the payoff. The separating equilibrium can be easily broken down since the borrowers have no incentive to separate themselves.

Suppose there exists two pooling equilibria (R', p(R')) and (R'',p(R'')), where R', R''≠0, R''<R' and p(R'')>p(R'). All the borrowers with realized higher than R' should pool at

[16] c has to been constant across all types of borrowers to make themselves separating from each other.

R'. All the borrowers with realized payoff between R' and R" should pool at R". However, it is shown in the following that is not true: The expected payoff for a borrower with $r = R'+\varepsilon$ pooling at R' is $[1-p(R')][r-R']=[1-p(R')]*\varepsilon$. The expected payoff for this borrower pools at R" is $[1-p(R")][r-R"]=[1-p(R")][R'+\varepsilon-R"]$. If he pools at R', then it must be $[1-p(R')]*\varepsilon > [1-p(R")][R'+\varepsilon-R"]$. That is $[p(R")-p(R')]*\varepsilon > [1-p(R")][R'-R"]$. However, when $\varepsilon \rightarrow 0$, the above inequality will be violated. Therefore, this borrower will mimic other low payoff borrowers by pooling at R" instead of R'. Thus, the pooling equilibrium always breaks down until it is zero.

Q.E.D.

REFERENCES

Aghion, P. and P. Bolton, 1991, An Incomplete Contracts Approach to Financial Contracting, Review of Economic Studies 59, 473-494.

Aghion, P., O. Hart and J. Moore, 1992, The Economics of Bankruptcy Reform, Journal of Law. Economics and Organization 8, 523-546.

Aivazian, V.A. and J. L. Callen, 1983, Reorganization in Bankruptcy and the Issue of Strategic Risk, Journal of Banking and Finance 7, 119-183.

Asquith, P., R. Gertner and D. Scharfstein, 1991, Anatomy of Financial Distress: An Examination of Junk Bond Issuers, Working Paper (MIT, Cambridge, MA).

Baird, D., 1993, Revisiting Auctions in Chapter 11, Journal of Law and Economics 36, 633653.

Berger, A. and G. Udell, 1992, Some Evidence on the Empirical Significance of Credit Rationing, Journal of Political Economy 100, 1047-1077.

Berkovitch, E., R. Israel, and J. Zender, 1993, The Design of Bankruptcy Law: A Case for Management Bias in Bankruptcy Reorganizations, Working Paper (University of Michigan).

Bernanke, B. and M. Gertler, 1987, Banking in General Equilibrium, in New Approaches to Monetary Economics (ed. William Barnett and Kenneth Singleton), Cambridge: Cambridge University Press.

Besanko, D. and A. Thakor, 1987a, Collateral and Rationing; Sorting Equilibria in Monopolistic and Competitive Credit Markets, International Economic Review 28, 671-689.

Border, K. and J. Sobel, 1987, A Theory of Auditing and Plunder, Review of Economic Studies, 525-540.

Boyd, J. H. and Bruce D. Smith, 1994, How Good Are Standard Debt Contracts? Stochastic versus Nonstochastic Monitoring in a Costly State Verification Environment, Journal of Business, Vol. 67, 539-561

Brown, D., 1989, Claimholder Incentive Conflicts in Reorganization: The Role of Bankruptcy Law, The Review of Financial Studies 2, 109-123.

Brown, D., C. James and R. Mooradian, 1993a, The Information Content of Distressed Restructuring Involving Public and Private Debt Claims, Journal of Financial Economics 33, 93-118.

Buck, A. J. , J. Friedman, and W. C. Dunkelberg, 1991, Risk and Return in Small Business Lending: The Case of Commercial Banks, Advances in Small Business Finance, edited by R. Yazdipour, Kluwer Academic Publishers, 121-137.

Chan, Y., and G. Kanatas, 1985, Asymmetric Valuation and the Role of Collateral in Loan Agreements, Journal of Money, Credit and Banking 17, 84-95.

Chatterjee, S., U. Dhillon and G. Ramirez, 1994, Resolution of Financial Distress, Debt Restructuring via Chapter 11 Reorganizations, Prepackaged Bankruptcies, and Public Workouts, Working Paper (Fordham University).

Diamond, D., 1984, Financial Intermediation and Delegated Monitoring, Review of Economic Studies 51, 393-414.

Diamond, D., 1993, Seniority and the Maturity of Debt Contracts, Journal of Financial Economics 33, 341-368.

Dye, R., 1986, Optimal Monitoring Policies in Agencies, Rand Journal of Economics 17, 339-350.

Farmer, R., 1984, A New Theory of Aggregate Supply, American Economic Review 74, 920-930.

Franks, J., and W. Torous, 1989, An Empirical Investigation of U.S. Firms in Chapter 11 Reorganization, Journal of Finance 44, 747-767.

Franks, J., and W. Torous, 1993, A Comparison of Financial Recontracting in Distressed Exchanges and Chapter 11 Reorganizations, Working Paper (London Business School).

Gale, D. and M. Hellwig, 1985, Incentive-Compatible Debt Contracts: The One-Period Problem, Review of Economic Studies, LII, 647-64.

Gertner, R. and D. Scharfstein, 1991, A Theory of Workouts and the Effects of Reorganization Law, Journal of Finance 46, 1189-1222.

Giammarino, R., 1989, The Resolution of Financial Distress, Review of Financial Studies 2, 25-47.

Giammarino, R. and E. Nosal, 1994, The Efficiency of Judicial Discretion in Bankruptcy Law, Working Paper (University of British Columbia).

Gilson, S., K. John and L. Lang, 1990, Trouble Debt Restructuring: An Empirical Study of Private Reorganization of Firms in Default, Journal of Financial Economics 27, 315-353.

Haugen, R. and L. Senbet, 1988, Bankruptcy and Agency Costs: Their Significance to the Theory of Optimal Capital Structure, Journal of Financial and Quantitative Analysis 23, 27-38.

Hillier, B., and M. Ibrahimo, 1993, Asymmetric Information and Models of Credit Rationing, Bulletin of Economic Research 45, 271-304.

Holly, S., 1994, Small Businesses Rate High With Credit Scorecards, Bank Systems and Technology 31, 28-30.

Jaffee, D., and T. Russell, 1976, Imperfect Information, Uncertainty, and Credit Rationing, Quarterly Journal of Economics 90, 651-666.

James, C., 1994, When Do Banks Take Equity ? An Analysis of Bank Loan Restructuring and the Role of Public Debt, Working Paper (University of Florida).

Jensen, M., 1989, Active Investors, LBOs, and the Privatization of Bankruptcy, Journal of Applied Corporate Finance 2, 35-44.

Kreps, D., and R. Wilson, 1982, Sequential Equilibria, Econometrics 50, 863-894.

Marshall, J., 1992, Lenders Take Aim at Bankruptcy Code, United States Bankers, January, 16-19.

Melumad, N., and D. Mookherjee, 1989, Delegation As Commitment: The case of Income Tax Audits, Rand Journal of Economics.

Mookherjee, D. and I. Png, 1989, Optimal Auditing, Insurance, and Redistribution, Quarterly Journal of Economics 104, 399-415.

Pettit, R. and J. McConnell, 1991, The Impact of Usury Laws on the Effectiveness and Efficiency of the Operation of Small Business, Small Business Finance, edited by P. Horvitz and R. Pettit. JAI Press Inc.

Reinganum, J. and L. Wilde, 1986, Settlement, Litigation, and Allocation of Litigation Costs, Rand Journal of Economics 17, 557-566.

Riley, J., 1987, Credit Rationing, A Further Remark, American Economic Review 77, 224-227.

Stiglitz, J. and A. Weiss, 1981, Credit Rationing in Markets with Imperfect Information, American Economic Review 71, 393-410.

Stiglitz, J. and A. Weiss, 1987b, Credit Rationing with Many Borrowers, American Economic Review 77, 228-231.

Townsend, R., 1979, Optimal Contracts and Competitive Markets with Costly State Verification, Journal of Economic Theory 21, 1-29.

Townsend, R., 1988, Information Constrained Insurance: The Revelation Principle Extended, Journal of Monetary Economics 21, 411-450.

Venkataraman, S., 1994, Financial Distress and the Role of Capital Contributions by the Owner Manager, Working Paper (University of Florida)

Warner, J., 1977, Bankruptcy Costs: Some New Evidence, Journal of Finance 32, 239-276.

Webb, D., 1987, The Importance of Incomplete Information in Explaining the Existence of Costly Bankruptcy, Economica 54, 279-288.

Williamson, S., 1986, Costly Monitoring, Financial Intermediation, and Equilibrium Credit Rationing, Journal of Monetary Economics 18, 159-179.

Williamson, S., 1987, Costly Monitoring, Loan Contracts, and Equilibrium Credit Rationing, Quarterly Journal of Economics 102, 135-145.