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BANK SIZE, REPUTATION, AND DEBT RENEGOTIATION

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ABSTRACT

This paper examines the effect that the coexistence of small and large banks, with different interests in the international market, has on the debt renegotiation process. Making use of a reputational model, we argue that the presence of small banks implies that debtor countries have a harder time obtaining new money than what they would have absent the small banks.

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1. Introduction

The failure of several LDC's to meet the original payment schedule on their loans from foreign banks ushered in the "debt crisis" at the beginning of the 1980's. Since then various theories have been proposed to explain the causes of this crisis. These theories have stressed alternatively the macroeconomic shocks faced by LDC's (as a consequence of a US economic policy after the second oil shock that resulted in high real interest rates, a world wide recession, and unfavorable terms of trade), the failure of LDC governments to adjust to the new economic environment, and the existence of market imperfections (resulting, for example, from collective action problem within syndicates and the threat of default).[1]

The problems and the factors that influence the renegotiation process, however, have received far less theoretical attention. A few exceptions are Sachs (1983), Krugman (1985), and Bulow and Rogoff (1986).

Sachs shows that if banks possess an increasing marginal cost of loans and if each bank negotiates separately with the debtor country, default is a possible competitive equilibrium when the country faces a

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[1] See Kahler (1986) for a review of these theories.

temporary liquidity crisis although the country is not insolvent. This occurs because it may not be in the interest of any individual bank to extend a further loan to the debtor to allow it to avoid default if the bank expects all other banks to stop lending. If all banks have the same expectation, the result is self-confirming.

Krugman shows that collusive action on the part of creditors can, by allowing banks to offer lower interest rates and large enough new loans, avert the debt crisis that may arise if creditors acted competitively. He points out the free-rider problem that may exist, however, if creditors aren't perfectly collusive.

Bulow and Rogoff use Rubinstein's (1982) bargaining model to examine how a debtor country and a bank may bargain over repayment of a loan. The perfect equilibrium is characterized by both parties achieving an agreement instantaneously and, if the solution lies in the "bargaining region," the relative shares of each party are in inverse proportion to their respective rate of impatience in reaching a settlement.

None of the above analyses, however, have examined the effect that reputational considerations may have on negotiations. These are an extremely important element in reality, as can be seen by the fact that favorable terms obtained by one country are almost always referred to in subsequent negotiations by other countries.[2]

Rescheduling is an extremely complicated process involving hundreds of banks and loans of various maturities and terms. In a

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[2] For example, the terms obtained by Mexico in 1986 were thought to be concessionary and were demanded in subsequent negotiations by Brazil and Argentina.

typical scenario, a troubled debtor approaches a major creditor and asks for changes in its repayment schedule. This bank then consults with other important creditors and a creditor committee is set up. The syndication and collective bargaining technique employed by banks enable them to respond to many of the adverse selection, moral hazard, and endogenous default problems endemic to international lending. The sharing of information lowers its cost and allows for greater monitoring of borrowers. Moreover, the cost of default to borrowers is increa ed since collective sanctions are now feasible.[3]

There does not exist any simple harmony of interest among creditors, however. They are a heterogeneous group characterized by different degrees of exposure to the various countries, by different economic ties to each borrower, and by different roles played within the field of international banking. This paper seeks to examine how existing asymmetries among creditors influence the negotiation process between creditors and debtors. An obvious differentiation among banks is by size: there is a small group of very large international banks such as Citibank, Chase, Lloyds, etc. and then a much larger group of small banks. Renegotiation is essentially carried out by this group of larger banks. It is they who sit on the creditor committee, engage in data collection, come up with how much "new money" must be included in the rescheduling package, and reach an agreement with the debtor country. It is then up to the smaller banks to ratify the agreement.

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[3] Equilibria such as the one derived by Sachs are ruled out since the syndicate will not adopt solutions that are collectively irrational.

Although the small banks have not had too much problem in accepting the new terms proposed by the large banks on outstanding loans, they have been much more unhappy about providing the new loans required as part of the rescheduling package. US regulations require that loans on which interest payments have not been made to be downgraded after ninety days. Therefore US banks have an additional incentive to keep interest payments current and hence to engage in "involuntary loans" in order to enable the debtor country to do so. To ensure that on bank's involuntary loans are not used to pay off the interest on another bank's loan, participation in involuntary loans takes a pro rata form, i.e. each bank participates in all new loans in proportion to its existing exposure.

Not all banks are equally sanguine, however, about extending new loans. The larger banks have a much greater stake in the renegotiation process than do the smaller ones. Not only are they the largest creditors, but also their exposure relative to capital is much higher.[4] Moreover, as emphasized by Lipson (1986), large banks perceive themselves as having permanent interests in the stable operation of international capital markets. They have long-standing ties both to other major institutional players and to many of the debtor countries. Their relationship often extends to state agencies, local firms, and to the domestic banking system of the debtor country. To the extent that there is a long run benefit from maintaining these relationships and a greater vulnerability to any writedown in the

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[4] For example, in 1985 the nine major US banks' exposure to problem debtors in Latin America was 148.6% of capital as compared to 36.9% of all other banks (excluding the top fifteen banks). Source: Federal Reserve.

value of outstanding loans, a large bank will be more willing to participate in involuntary loans than a small bank with less exposure and with no such ties to the international community or to a sovereign debtor.

The greater reluctance of smaller banks to participate in involuntary loans often implies that the larger banks must resort to pressuring the latter in order to ensure participation. An attempt by a small bank to hold out can be met by the threat of blacklisting from future international lending and, more importantly, by a threat to their domestic operations since large banks provide important services to small banks in the domestic market. As a last resort, as recounted by Kraft (1984) in the Mexican case, the Federal Reserve or the Treasury may also bring pressure to bear.

This paper seeks to examine how differences among banks' interests influences rescheduling. We attempt to show that the presence of small banks and the existence of uncertainty on the part of the country as to how much pressure a big bank may be able to exert over a small one results in harsher terms for the debtor. The presence of asymmetric information gives rise to a reputation effect and to a dynamic game in which partial defaults may occur.

2. The Model

Reflecting the reality of the negotiation process, negotiations are thought of as occurring between big banks and the debtor country over the terms of repayment of all loans, and between big and small banks as to the degree of participation of small banks in new involuntary loans. The large banks are assumed to act collusively. The small banks, however, are perfect competitors; they take the terms of agreement reached by the large banks and the country as given and, since small banks are not legally required to participate in involuntary lending, simply decide whether they wish to participate or not. It is assumed that participation takes a pro rata form. Non-participation implies, however, that the small banks may then incur the costs that can be imposed on them by the large banks. These costs can result from being blacklisted from future international lending and, more importantly, from domestic loan participation and from the use of banking services provided by the big banks. Big banks are assumed to incur zero transaction costs in applying pressure to small banks.

The country is engaged in paying interest on its debt over N periods. In each period rL of the debt payment is renegotiated. The country attempts to obtain new loans in order to finance this repayment. These can be conceived of as being new long-term loans which will then be refinanced in the future (with a low probability of repayment), or alternatively as a partial writedown of the debt. The country can also choose to partially default, however, by refusing to repay that portion of the debt that has come up for repayment. The costs incurred in doing so, $D>0$, reflect the costs of being restricted to barter trade and from any form of international lending during that period.

The payoffs to banks and country in any one period is as follows:

$$\pi_c = \begin{cases} -rL + \hat{L} & \text{if agreement} \\ -D & \text{if no agreement} \end{cases}$$

$$\pi_b = \begin{cases} rL_b - \hat{L}_b & \text{if agreement} \\ 0 & \text{if no agreement} \end{cases} \qquad (1)$$

$$\pi_s = \begin{cases} rL_s - \hat{L}_s & \text{if participates} \\ rL_s - \delta & \text{if does not participate} \\ 0 & \text{if no agreement} \end{cases}$$

where δ is the cost to small banks imposed by the large banks, $L=L_b+L_s$, $\hat{L}=\hat{L}_b+\hat{L}_s$, $\hat{}$ denotes involuntary loans/writedowns, and subscripts b and s signify big and small banks respectively. It is assumed for notational simplicity that there is only one large and one small bank.

It may be very difficult, however, for a country to know how much pressure big banks can apply on small banks. It is sensible to assume, therefore, that the country is uncertain about the maximum amount of pressure that the large bank can exert. For simplicity we assume that the maximum cost that big banks can inflict on small banks, $\hat{\delta}$, may be either high or low, i.e. $\hat{\delta}\epsilon\{\delta_H,\delta_L\}$, $\delta_H>\delta_L$.

It is well known that the equilibria of a strategic non-cooperative game played between two agents is very sensitive to the institutional framework in which the game is embedded. Furthermore, the analysis required is quite complex. As a result, there have been few explicitly strategic analyses of the debt crisis (two exceptions are Bulow and Rogoff, and Fernandez and Rosenthal (1988)). In this paper we do not undertake to solve the bargaining problem between the large bank and the country in each stage of the game. Instead, we assume that the solution to this bargaining problem is given by the Nash bargaining solution. While this is an ad hoc assumption (with the unappealing property that it imposes a cooperative solution), we argue that the particular solution concept adopted is not essential for our results; what matters is the ranking of the payoffs in a way that will be made explicit further on in the paper. This allows us to treat our problem as a finitely repeated game with asymmetric information.

Any solution to the bargaining problem between debtor and creditor naturally depends on the true value of $\hat{\delta}$, δ^*, and on the country's belief as to the value of δ^*. We assume that the country and the bank can give instructions to their respective negotiating teams to negotiate as if δ^* were either δ_H or δ_L, regardless of the true value of $\hat{\delta}$, and that if both negotiating teams agree on the value of δ^*, the bargaining outcome reached is given by the Nash bargaining solution.

The game played between the big bank and the country is of the following form. In each period the country first declares whether it wishes to take a "tough" stance, that is it declares that it will negotiate as if $\hat{\delta}=\delta_H$, or a "conciliatory" stance, that is it declares that it will negotiate as if $\hat{\delta}=\delta_L$ (the reasoning behind this terminology will become evident below). The big bank is then also given the same choice of negotiation strategies with the reverse terminology associated with the respective negotiating positions, i.e. the claim $\hat{\delta}=\delta_H$ is conciliatory whereas the claim $\hat{\delta}=\delta_L$ is tough.

If both the big bank and the country play tough (i.e. the bank declares $\hat{\delta}=\delta_L$ and the country $\hat{\delta}=\delta_H$) no agreement is reached and a default is declared for that period. The country suffers a default penalty (which is assumed to be greater than the total amount of money owed by the country in that period, i.e. D>rL). If both parties agree to negotiates as if $\hat{\delta}=\delta_L$ (i.e. the country adopts a conciliatory position) then the payoffs are C and W respectively for the country and big bank. If both players agree to negotiate as if $\hat{\delta}=\delta_H$, the country receives T and the big bank receives Z_L or Z_H depending on δ^*, the true value of the maximum amount of pressure that the big bank can apply on the small bank. If the big bank can only apply a maximum of $\hat{\delta}=\delta_L$ then, although it negotiated as if $\hat{\delta}=\delta_H$, if $\hat{L}$ is large enough the big bank will be forced to make part of the loans which if $\delta^*=\delta_H$ the small bank would make. It is assumed that the big bank respects the pro rata rule and does not attempt to extract a greater proportion of loans from the small bank than that which is stipulated by this requirement. That is, the maximum amount that the big bank can extract from the small bank is $\min(\delta^*, \alpha L_S)$ where α is the percentage of the big bank's original loan that the big bank pays as an involuntary loan. The complete set of one-period payoffs is presented in the game tree in Figure 1.

By assumption, the values of C, T, and Z_H are given by the solution to the Nash bargaining problem in (2). That is, $\hat{L}$ is chosen to solve

$$\text{Max } [\pi_c(\hat{L}) + D][\pi_b(\hat{L})] \tag{2}$$

The small bank's contribution to $\hat{L}$ depends on the magnitude of $\hat{L}_s$ relative to $\hat{\delta}$. Note that $\hat{L}$ can be written as

$$\hat{L} = \begin{cases} \alpha(L_b + L_s) & \alpha \leq \hat{\delta}/L_s \\ \hat{\delta} + \alpha L_b & \alpha > \hat{\delta}/L_s \end{cases} \tag{3}$$

according to whether or not the large bank has needed to apply the maximum amount of pressure that it states it can.[5] Hence the maximization problem may be divided into two parts depending on whether the α that maximizes (2) is greater or smaller than $\hat{\delta}/L_s$.

For $\alpha \leq \hat{\delta}/L_s$ (2) can be written as

$$\underset{\alpha}{\text{Max}} \; [-rL + \alpha(L_b + L_s) + D][rL_b - \alpha L_b] \tag{4}$$

The first order condition yields

$$\alpha = [(2rL - D)L_b - \lambda]/2LL_b \tag{5}$$

$$\lambda \geq 0, \quad \hat{\delta}/L_s - \alpha \geq 0, \quad \lambda(\hat{\delta}/L_s - \alpha) = 0$$

where λ is the Lagrange multiplier associated with the constraint. Note that if $2rL<D$, α is negative. This solution to (2) implies that the country pays more than what it owes in order to avoid default. We rule this out by imposing an additional constraint on (2): $\hat{L} \geq 0$. For $\alpha \geq \hat{\delta}/L_s$ (2) can be written as

$$\underset{\alpha}{\text{Max}} \; [-rL + \alpha L_b + \hat{\delta} + D][rL_b - \alpha L_b] \tag{6}$$

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[5] This formulation assumes that when the small bank drops out of making further loans, it still contributes $\hat{\delta}$ since that is the maximum that the big bank can extract.

The first order condition yields

$$\alpha = (L_b[r(L_b + L) - (\hat{\delta} + D)] + \lambda)/2(L_b)^2 \qquad (7)$$

$$\lambda \geq 0, \quad \alpha - \hat{\delta}/L_s \geq 0, \quad \lambda(\hat{\delta}/L_s - \alpha) = 0$$

Whether the solution is given by (5) or (7) depends on the parameters of the model. We can distinguish among five cases:

Case 1: The Nash solution is the constrained solution for both $\hat{\delta}=\delta_L$ and $\hat{\delta}=\delta_H$.

$\hat{\delta}=\delta_L$: $\alpha=\delta_L/L_s$ $\quad \pi_b=[r-(\delta_L/L_s)]L_b$ $\quad \pi_c=[(\delta_L/L_s)-r]L$

$\hat{\delta}=\delta_H$: $\alpha=\delta_H/L_s$ $\quad \pi_b=[r-(\delta_H/L_s)]L_b$ $\quad \pi_c=[(\delta_H/L_s)-r]L$

Case 2: The Nash solution is the constrained solution for $\hat{\delta}=\delta_L$ and an interior solution with $\alpha<\delta_H/L_s$ for $\hat{\delta}=\delta_H$.

$\hat{\delta}=\delta_L$: $\alpha=\delta_L/L_s$ $\quad \pi_b=[r-(\delta_L/L_s)]L_b$ $\quad \pi_c=[(\delta_L/L_s)-r]L$

$\hat{\delta}=\delta_H$: α is given by (5) with $\lambda=0$ $\quad \pi_b= (r-\alpha)L_b$ $\quad \pi_c=(\alpha-r)L$

Case 3: The Nash solution is characterized by $\alpha>\delta_L/L_s$ for $\hat{\delta}=\delta_L$ and $\alpha<\delta_H/L_s$ for $\hat{\delta}=\delta_H$. Note that in this case the big bank's payoff under $\hat{\delta}=\delta_L$ may be larger or smaller than with $\hat{\delta}=\delta_H$ whereas the country's payoff is necessarily smaller.

Case 4: The Nash solution for $\hat{\delta}=\delta_L$ is $\alpha>\delta_L/L_s$ and for $\hat{\delta}=\delta_H$ is $\alpha>\delta_H/L_s$. Here both the big bank and the country's payoffs are greater if $\hat{\delta}=\delta_H$ (this can be seen graphically by noting that the slope of the level sets of $(\pi_c + D)(\pi_b)$ depend only on the ratio of π_c+D to π_b).

Case 5: The Nash solution for $\hat{\delta}=\delta_L$ is $\alpha<\delta_L/L_S$. Here the payoffs are the same for both values of $\hat{\delta}$.

Figure 2 gives a graphical representation of the Nash solution for case 2. Note that in all cases the country's payoff is larger if $\hat{\delta}=\delta_H$.

In order for a reputational effect to come into play, two conditions must be met: 1) $W>Z_H$ and 2) $Z_L<0$. The first condition specifies that the big bank's payoff should be larger when both bank and country agree to negotiate as if $\delta^*=\delta_L$ (i.e. the country adopts a conciliatory position) than if both parties agree to negotiate as if $\delta^*=\delta_H$ (i.e. the country adopts a tough position and the big bank is conciliatory). That is, the big bank's payoff should be greater if it can "convince" the country that it is not able to extract a large new loan (or forgiveness) from the small bank than if the country believes that it lies within the big bank's power to apply a large amount of pressure on the small bank. This condition is always met in cases 1 and 2 above and may be met in case 3. In case 4, π_b when $\hat{\delta}=\delta_H$ is greater than π_b when $\hat{\delta}=\delta_L$, whereas in case 5 the payoffs are equal regardless of the value of $\hat{\delta}$. We shall restrict our attention to those cases for which the first condition is satisfied. The second condition stipulates that when the big bank negotiates as though $\hat{\delta}=\delta_H$, if in reality $\delta^*=\delta_L$ the big bank's payoff should be lower than the cost of no agreement. For the second condition to be met the difference $\delta_H-\delta_L$ must be "large". We shall assume this to be the case.

In a static and complete information version of this game, the subgame-perfect Nash equilibrium would be (δ_L, δ_L) if $\delta^* = \delta_L$ and (δ_H, δ_H) if $\delta^* = \delta_H$, where the first term in the parenthesis refers to the negotiation stance taken by the country and the second to that taken by the bank. The reason for this is that when $\delta^* = \delta_L$ and the latter is common knowledge, the big bank cannot credibly threaten to play tough since, if called upon to do so, it would be made worse off than by acquiescing and being conciliatory. Subgame perfection rules out equilibria based on incredible threats. The fact that this game is played over N periods (in each period rL of the debt is negotiated) and that the country does not know δ^* implies that there may be an incentive for the bank to take a tough position, i.e. to play as if $\hat{\delta} = \delta_L$ even if $\hat{\delta} = \delta_H$, in the hope of convincing the country that it has little bargaining power over the small bank. As has been shown by Kreps and Wilson (1982b), for a large enough N the reputational effect comes into play.

The general structure of the game is as follows. There are N periods in which the game shown in Figure 1 is played.[6] Time is indexed backwards so that first stage N is played, then N-1, ..., then 1. The possible payoffs of the big bank depend on δ^*, whereas those of the country are independent of δ^*. The bank knows the true value of $\hat{\delta}$. The country, on the other hand, starts out with an initial belief as to the probability that $\delta^* = \delta_L$.

As in Kreps and Wilson, we look for a sequential equilibrium. This has the following properties:[7] a) Every extensive game has at

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[6] Another interpretation of the game is that in each period a different country's debt comes up for renegotiation (with N countries in total) with the same big bank.

[7] See Kreps and Wilson (1982a) for a fuller discussion of sequential equilibria.

least one sequential equilibrium. b) If a set of beliefs and strategies for the players constitutes a sequential equilibrium, then the set of strategies constitutes a subgame-perfect Nash equilibrium.

Three conditions must be fulfilled for a sequential equilibrium: 1) Each player called upon to make a move has a probability estimate of what previously occurred. 2) The estimate satisfies Bayes' rule, whenever the later applies. 3) At every node, including nodes off the equilibrium path, the players follow optimal strategies given their probability assessment of that node and contingent on the prior history of moves.

The game begins with p_N, the initial probability assigned by the country to the possibility that $\delta^*=\delta_L$, exogenously specified. A sequential equilibrium to the game is given below. It is described by a function p_n, a strategy for the country, and a strategy for the big bank. We shall then proceed to show that these constitute a sequential equilibrium.

<u>The country's probability assessment, p_n</u>:

a). If the country adopts a conciliatory position in stage n+1, then $p_n=p_{n+1}$.

b). If both the country and the bank play tough in stage n+1, then $p_n=\max(b^n,p_{n+1})$, where $b=(T-C)/(T+D)$.

c). If the country plays tough in stage n+1 and either the bank adopts a conciliatory position or $p_{n+1}=0$, then $p_n=0$.

This describes how p_n is computed at every node of the game.

Strategies:

The country: At each stage n, the country compares p_n, the probability that the country assigns to the event $\delta^*=\delta_L$, with b^n. If $p_n>b^n$, the country is conciliatory. If $p_n=b^n$, the country is conciliatory with probability σ, where $\sigma=Z_H/(W-Z_H)$. If $p_n<b^n$, the country is tough.

The big bank: If it has little power over the small bank ($\delta^*=\delta_L$), it always takes a tough position. If it has a lot of power over the small bank ($\delta^*=\delta_H$), then: If the players are in the last stage of negotiation, that is, if n=1, the bank is conciliatory. If n>1 and $p_n\geq b^{n-1}$, the bank plays tough. If n>1 and $p_n<b^{n-1}$, the bank randomizes and takes a tough position with probability X_n, where $X_n=[p_n(1-b^{n-1})]/[(1-p_n)b^{n-1}]$.

The beliefs and strategies described above constitute a sequential equilibrium. This can be demonstrated by showing that the beliefs of the country are consistent with the strategy of the bank (in the sense that Bayes' rule holds wherever it applies) and that, given one agent's strategy, the other agent is following a payoff maximizing strategy.

The consistency of beliefs can be verified by noting that when the country is conciliatory no information is gained, so $p_{n-1}=p_n$. If $p_n\geq b^{n-1}$, the big bank is tough with probability one. If $p_n=0$, the bank (with $\delta^*=\delta_H$) is conciliatory. Hence, as long as the big bank follows its strategy, by Bayes' rule $p_{n-1}=p_n$ in both cases. If $p_n\epsilon(0,\ b^{n-1})$, the bank is tough with probability X_n. The big bank takes a conciliatory stance only if $\delta^*=\delta_H$. Hence, if the bank is ever conciliatory, $p_{n-1}=0$. Lastly, if in period n the bank took a tough position then Bayes' rule requires:

$$p_{n-1} = \Pr(\hat{\delta}=\delta_L|\delta_L)\Pr(\delta_L)/[\Pr(\hat{\delta}=\delta_L|\delta_L)\Pr(\delta_L)+\Pr(\hat{\delta}=\delta_L|\delta_H)\Pr(\delta_H)] =$$

$$p_n/[p_n+X_n(1-p_n)] = b^{n-1} \qquad (8)$$

where Pr(**|*) is the probability that the bank took position ** given that reality is * and where Pr(*) is the country's prior assessment of the probability that the big bank's power over the small bank is *. This confirms that beliefs and strategies are Bayesian consistent.

Bayes' rule does not apply for two different scenarios:

(i). $p_n \geq b^{n-1}$ and the bank adopts a conciliatory stance, and

(ii). $p_n=0$ and the bank adopts a tough position. In both cases we set $p_{n-1}=0$. That is, it is assumed that any conciliatory behavior on the part of the bank demonstrates, once and for all, that the true value of $\hat{\delta}$ is δ_H. While in Kreps and Wilson (1982b) this assignment of beliefs off the equilibrium path is somewhat arbitrary, in the context of our problem if we assume, very plausibly, that the involuntary loans made by the big bank and the small bank can be observed separately by the country, then conciliatory behavior on the part of the big bank does indeed reveal δ^*.

X_n is derived by calculating a probability of the bank with $\delta^*=\delta_H$ taking a tough position in period n such that the country is indifferent between playing tough and being conciliatory in that period. Hence X_n solves

$$C=(1-p_n)[X_n(-D)+(1-X_n)T] + p_n(-D) \qquad (9)$$

Note that (9) takes into account the country's assessment of the possibility that $\hat{\delta}$ truly equals δ_L. By Bayes' rule, however, X_n depends on p_{n-1}. Iteration on (9) generates the following system of equations:

$$\begin{aligned} C&=(1-p_{n-1})[X_{n-1}(-D)+(1-X_{n-1})T] + p_{n-1}(-D) \\ &\vdots \qquad\qquad\qquad\qquad\qquad\qquad\qquad (10) \\ C&=(1-p_1)[X_1(-D)+(1-X_1)T] + p_1(-D) \end{aligned}$$

Note that X_1 is necessarily equal to zero, since in the last round there no longer exist any dynamic considerations (i.e. there is no reputation to be gained by being tough) and the payoff for being tough if $\delta^*=\delta_H$ is smaller than the payoff for being conciliatory. Hence, the bank (with $\delta^*=\delta_H$) is always conciliatory. Solving (10) and using Bayes' rule to express X_n as a function of p_n and p_{n-1} yields, for $p_n \epsilon (0,b^{n-1})$:

$$p_{n-1}= b^{n-1}$$

and (11)

$$X_n = p_n(1-b^{n-1})/b^{n-1}(1-p_n)$$

The first line of (11) gives the country's probability estimate in period n-1 of the bank's true value of $\hat{\delta}$ equalling δ_L given that in period n both the bank and the country were tough. Note that if $p_n=0$, then $X_n=0$, and if $p_n=b^{n-1}$, then $X_n=1$.

The country's mixed strategy, used whenever $p_n = b^n$, is derived by calculating the probability, σ_n, of the country being conciliatory in stage n such that the bank (with $\delta^* = \delta_H$) is indifferent between being tough and conciliatory. In the last stage of the game the big bank's payoff is

$$\pi_b = \begin{cases} Z_H & \text{if } p_1 < b \\ \sigma_1 W + (1-\sigma_1) Z_H & \text{if } p_1 = b \end{cases} \qquad (12)$$

In the second to last stage, the big bank's payoff for the remaining stages is, if $p_2 < b^2$:

$$\pi_b(\hat{\delta}=\delta_H) = 2Z_H \qquad (13)$$
$$\pi_b(\hat{\delta}=\delta_L) = 0 + \pi(p_1 = b)$$

$\pi_b(\hat{\delta}=\delta_i)$ is the expected payoff of the big bank (with $\delta^* = \delta_H$) over the remaining stages of the game given that it adopts the strategy of negotiating as if $\hat{\delta}=\delta_i$ i=H,L in the first period in which the country is tough. $\pi(p_n = b^n)$ is the expected payoff for the n remaining stages given $p_n = b^n$.

Setting the two payoffs from the pure strategies in (13) equal, we find

$$\sigma_1 = Z_H/(W - Z_H) \qquad (14)$$

If $p_2 = b^2$, the pure strategy payoffs are:

$$\pi_b(\hat{\delta}=\delta_H) = \sigma_2[W + Z_H] + (1-\sigma_2)2Z_H \qquad (15)$$
$$\pi_b(\hat{\delta}=\delta_L) = \sigma_2[W + Z_H] + (1-\sigma_2)[0 + \pi(p_1 = b)]$$

In the third to last stage of the game, if $p_3 < b^3$

$$\pi_b(\hat{\delta}=\delta_H) = 3Z_H \qquad (16)$$
$$\pi_b(\hat{\delta}=\delta_L) = 0 + \pi(p_2 = b^2)$$

Setting the two payoffs in (16) equal, using (15), yields:

$$\sigma_2 = Z_H/(W-Z_H) \qquad (17)$$

By induction, the general form of the payoff for the remaining n stages of the game is

$$\pi_b(\hat{\delta}=\delta_L) = 0 + \pi(p_{n-1}=b^{n-1}) = \pi_b(\hat{\delta}=\delta^H) = nZ_H \qquad (18)$$

if $p_n<b^n$, and

$$\pi_b(\hat{\delta}=\delta_L) = \sigma_n[W + \pi(p_{n-1}<b^{n-1})] + (1-\sigma_n)[0 + \pi(p_{n-1}=b^{n-1})] =$$

$$\pi_b(\hat{\delta}=\delta_H) = \sigma_n[W + (n-1)Z_H] + (1-\sigma_n)nZ_H = (n+1)Z_H \qquad (19)$$

if $p_n=b^n$, and[8]

$$\sigma_1 = \sigma_2 = \ldots \sigma_n = \sigma = Z_H/(W-Z_H) \qquad (20)$$

We can now verify that the players' strategies are optimal. It is easy to show that if the country's estimate V (where $V=p_n+(1-p_n)X_n$ $=p_n/b^{n-1}$) of the probability that the big bank will be tough is less than b, then the country's expected payoff in that period is strictly greater if the country adopts a tough position rather than a conciliatory one. If $p_n \geq b^{n-1}$, the bank is tough with probability one. Hence it is optimal for the country to be conciliatory since the country does not gain information by being tough and would also suffer a loss in expected payoff for that period. If $b^n<p_n<b^{n-1}$, the bank is conciliatory with a positive probability but with a probability less than 1-b. Hence, once again it does not pay for the country to play tough.

We must also show, however, that the country cannot gain a long-run benefit by being tough when $b^n<p_n<b^{n-1}$. That is, we must show that there is no long-run informational gain for the country by being tough in this case.

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8 Note, however, that if $p_N=b^n$ for some $n \leq N$, any randomization is valid for that stage.

$$\pi_{c,n-1}(\delta=\hat{\delta}_H)=[p_n+(1-p_n)X_n]\{[b^{n-1}+(1-b^{n-1})X_{n-1}](-D) + (1-b^{n-1})(1-X_{n-1})T\} + [(1-p_n)(1-X_n)]T$$

$$=(p_n/b^{n-1})[b(-D)+(1-b)T]+[1-(p_n/b^{n-1})]T \tag{21}$$

$$= T - (D+T)(p_n/b^{n-2})$$

is the expected payoff from being tough in turn n-1 given that the country was tough in period n. The expected payoff from being tough in turn n-1 given that the country was conciliatory in period n is

$$\pi_{c,n-1}(\delta=\hat{\delta}_L)=[p_{n-1}+(1-p_{n-1})X_n](-D)+[(1-p_{n-1})(1-X_{n-1})]T \tag{22}$$

$$= T - (D+T)(p_n/b^{n-2})$$

verifying that the expected payoff in turn n-1 is invariant to the position taken by the country in period n. (Note that in both cases the expected payoff from being conciliatory in period n-1 is C.) This, combined with the fact that the country suffers a loss in its expected payoff in period n if it is tough that period, implies that the country is following an optimal strategy by being conciliatory when $b^n<p_n<b^{n-1}$.

If $p_n=b^n$, the big bank is conciliatory with probability 1-b, so the country is indifferent and randomizes. An analysis similar to that conducted above confirms that there is no long-run benefit to be gained by the country from being tough with probability one.

The above analysis can also be extended to show that the expected payoff in any period n-m, m<n, is also invariant to the negotiating position chosen in period n. This follows from the fact that the expected payoff in stage n-1 is independent of p_{n-1}. Hence there is no dynamic advantage to be gained by altering the strategy. This verifies the optimality of the country's strategy.

The optimality of the big bank's strategy if $\delta^*=\delta_L$ is easily shown. If in any period the big bank is ever conciliatory, this results in more future tough positions taken by the country than does being tough. Since in the short run fighting is better for the bank and in the long run fewer defaults are better, always fighting is the optimal strategy for the big bank.

The expected payoffs to the big bank with $\delta^*=\delta_H$ from following its strategy from stage n to 1 is given by the following function of p_n.

$$\pi_b=nZ_H \qquad \text{if } p_n<b^n$$
$$\pi_b=(n+1)Z_H \qquad \text{if } p_n=b^n \tag{23}$$
$$\pi_b=[n-k(p_n)+1]W + (k(p_n)-1)Z_H \qquad \text{if } b^n<p_n<b^{k(pn)-1}$$
$$\pi_b=[n-k(p_n)+1]W + k(p_n)Z_H \qquad \text{if } b^n<p_n=b^{k(pn)-1}$$

where $k(p)=\inf(n:b^n<p_n)$ for $p_n>0$ and π_b is understood to be calculated for the entire n periods of the game.

The first two payoffs are obtained from equations (19) and (20). The third is found by noting that as long as $b^n<p_n$ the country is conciliatory and the big bank receives W in each of those periods. The last period in which this occurs is $n=k(p_n)$. Hence the bank receives W for $N-k(p_n)+1$ periods. If in stage $k(p_n)-1$ we have $p_n<b^{k(pn)-1}$, then in each period thereafter, $k(p_n)-1$ to 1, the bank receives an expected payoff of Z_H. The last equation is the same as the third except that in period $k(p_n)-1$ $p_n=b^{K(pn)-1}$ instead of the prior inequality. Therefore the bank receives an expected payoff of $2Z_H$ instead of Z_H in that period.

Suppose that the country is tough in stage n. By being conciliatory, the bank receives Z_H in that period and in every period thereafter. By being tough, the bank receives zero in that period and future expected payoffs of $(n-1)Z_H$ if $p_n=0$, nZ_H if $0<p_n\leq b^{n-1}$, and more than nZ_H if $p_n>b^{n-1}$. Thus, the big bank (with $\delta^*=\delta_H$) is optimizing by following the strategy described.

3. Implications

Our model allows us to make a number of predictions about the negotiation process. Most significantly, negotiations will not be smooth and agreements will not be reached instantaneously; there will be extended periods during which negotiations regularly break down. This result is independent of the true value of the big bank's power over the small bank. If the bank has $\delta^*=\delta_H$, then during the period in which the big bank defends its reputation, that is from the first period in which $p_N\leq b^n$ until the period in which the bank first adopts a conciliatory stance, a default will occur at least every other period. This is clearly seen from the country's strategy set and its probability estimating function. Whenever the bank adopts a tough position, this causes the country's reassessment of the probability that $\delta^*=\delta_L$ to be such that in the next period the country randomizes. If the result of this randomization is conciliatory behavior on the part of the country, in the following period the country is tough with probability one. If instead the randomization had resulted in the country being tough then, if the bank were also tough, randomization would again occur next period. On the other hand, if the bank has $\delta^*=\delta_L$ it never adopts a conciliatory position. Hence default occurs at least every other period commencing with the first period in which

$p_N \leq b^n$.

The introduction of a reputational effect into the negotiation process leaves the big bank which has a great deal of power over the small bank ($\delta^* = \delta_H$) at least as well off as absent this effect. If $p_N < b^N$, the big bank is just as well off in terms of its expected payoff as without the reputation effect since the complete certainty equilibrium has $\pi_b = Z_H$. If $p_N \geq b^N$, the bank's payoff is greater with the reputational effect. This follows from (23) where the payoffs given by the last three equations are all greater than NZ_H (since $W > Z_H$). Thus the big bank's expected payoff is unambiguously larger with the reputational effect. The small bank's payoffs move in tandem with the big bank's. Therefore, the same conditions for the implications of the reputational effect apply to it. If the big bank has little power over the small bank (i.e. $\delta^* = \delta_L$), the big bank is made worse off by the introduction of asymmetric information since for each period in which a default occurs it loses W.

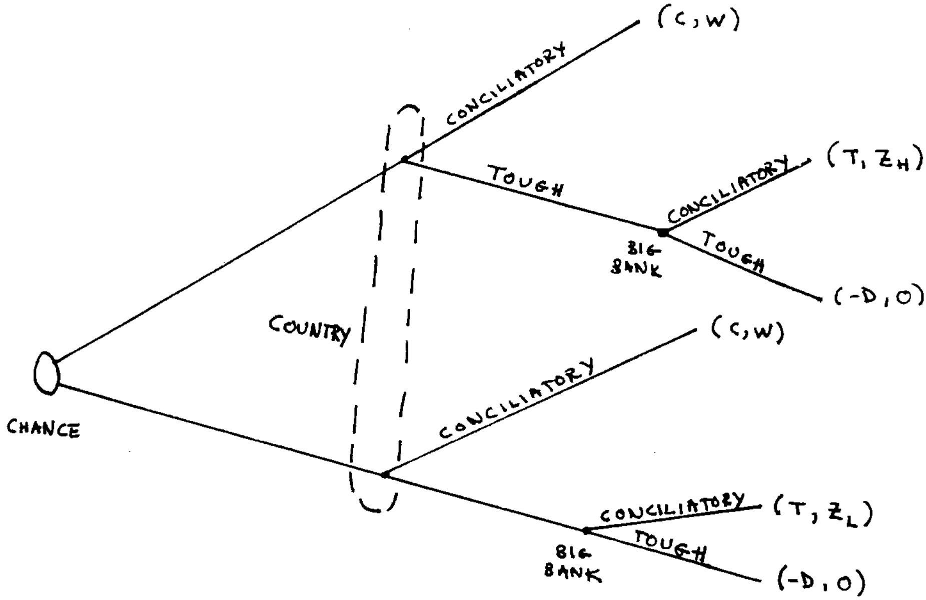
The country is clearly worse off as a consequence of the reputational effect. If default never occurs, the game is a zero-sum game; with default it is a negative-sum game. We have already established that given $\delta^* = \delta_H$ the big bank is never worse off as a consequence of the introduction of a reputational effect. Moreover, the expected number of periods in which default occurs is greater than zero (unless initial beliefs are such that the country never challenges the bank). Hence the country's expected payoff is necessarily less than in the non-reputation game. If $\delta^* = \delta_L$, the big bank never is conciliatory. Thus, the country is worse off since each period in which it challenges the big bank, default occurs, occasioning a loss of C+D.

The existence of small banks is detrimental for the country. If there were no small banks involved in the negotiation process i.e., if all banks, big and small, were to act collusively as a single big bank, the country's payoff in a single period would be greater than or equal to its payoff given the existence of small banks. The new solution would be given by $\alpha' = (2rL-D)/2L)$. Consequently, the total amount of involuntary loans/forgiveness would be greater and the country's payoff correspondingly larger. The big bank, however, would not necessarily be worse off since the small bank's participation would now be pro rata.

4. Conclusion

The experience of the last few years has demonstrated that debt rescheduling negotiations between debtor nations and their creditors are far from smooth. Despite the cost to both parties, the flow of new loans and interest payments have been regularly disrupted. The reluctance of the small regional banks to agree to rescheduling terms and the concern of the large international banks of the effect that the terms of negotiation may have on future negotiations with same or with other countries has been an important source of the problem.

This paper highlights the role played by the presence of small banks and asymmetric information in contributing to the existence of a reputational effect and hence permitting rocky negotiations. The principle implication of our analysis is that the country is always made worse off as a consequence of the reputational effect. It also provides a possible explanation for the recent introduction of exit bonds by Argentina. These long-term, lower interest bonds, targeted at the regional banks, would allow the purchaser to be exempt from participation in further rescheduling and lending. The bonds themselves would not be rescheduled, nor would they be included in the base that determines the obligation to provide new money. As shown by our analysis, the elimination of the reputational effect that this would allow makes the country better off. Also, provided that these bonds are not themselves evaluated by the small banks as being too risky, they would also make the small banks better off.



(C, W)
CONCILIATORY
TOUGH
(T, Z_H)
CONCILIATORY
TOUGH
BIG BANK
(-D, 0)
COUNTRY
(C, W)
CONCILIATORY
CHANCE
CONCILIATORY
(T, Z_L)
TOUGH
BIG BANK
(-D, 0)

FIGURE 1

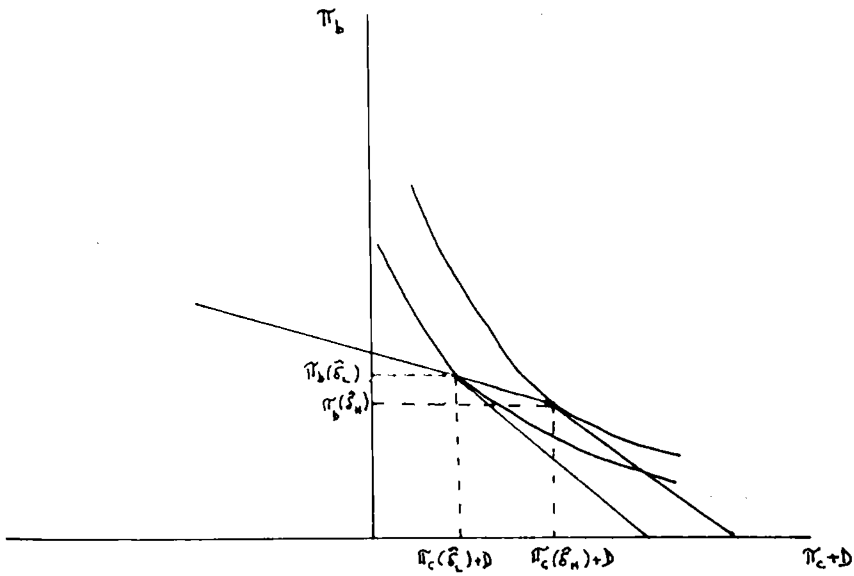

π_b
$\pi_b(\hat{\delta}_L)$
$\pi_b(\hat{\delta}_H)$
$\pi_c(\hat{\delta}_L)+D$
$\pi_c(\hat{\delta}_H)+D$
π_c+D

FIGURE 2

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