**Asymmetric Information, Loan Contract and Financial Policy in an Economy of Crony Capitalism**

Been-Lon Chen
Institute of Economics
Academia Sinica

Yeong-Yuh Chiang
Department of Money and Banking
National Chengchi University

Ping Wang
Department of Economics
Vanderbilt Universities

This Version: August 1999

ABSTRACT

This paper develops a competitive equilibrium model to examine the macroeconomic and financial consequences of crony capitalism and to evaluate the effectiveness of financial policies. With asymmetric information about borrowing firms' types, an incentive-compatible loan contract features a club fee and a credit documentation cost. In the presence of crony capitalism, the collusion between banks and firms is captured by a high club fee together with a low credit documentation cost. We prove the existence and uniqueness of an equilibrium with both types of borrowing firms actively participating. The two financial policy instruments considered are: a pecuniary punishment policy that penalizes banks with excessive loans to less productive firms and a reserve requirement policy that serves to limit excessive funds supply to be channeled through the banking industry. We find that the presence of crony capitalism leads to more severe misallocation of loans to less productive firms and that from both welfare and production considerations, the pecuniary punishment policy is generally more effective in correcting the misallocation problem resulting from crony capitalism.

Keywords: Crony Capitalism, Incentive-Compatible Loan Contract, Punishment and Reserve Policy.

JEL Classification:

Acknowledgment: We have benefitted from Henry Wan for valuable comments and suggestions. This research was initiated while the third author was a visiting research fellow at the Institute of Economics, Academia Sinica, which offered financial support to facilitate this international collaboration. Needless to say, the usual disclaimer applies.

Address for Correspondence: Ping Wang, Department of Economics, Vanderbilt University, Nashville, TN 37235, Tel: 615-322-2388, Fax: 615-343-8495, E-mail: ping.wang@vanderbilt.edu.

## I. Introduction

Recent financial crises in Asia have created a big wave of research. Many wonder why those rapidly growing economies have a fragile financial sector. While the existing explanation has focused on illiquidity and speculative attack, it is also believed that crony capitalism may be, at least partially, responsible for such a major financial downturn.[1] However, little has been done to develop a formal model to elaborate theoretically the macroeconomic and financial consequences of crony capitalism. This paper provides the first attempt at such an endeavor, through which we can also evaluate the effectiveness of financial policies.

Conventional models of financial intermediation emphasize its active roles of liquidity management and risk pooling (see, respectively, Diamond and Dybvig 1983 and Townsend 1978, among many others). In this paper, we construct a framework that is in particular suitable for the considerations of crony capitalism. We introduce a loan contract that features a club fee and a credit documentation cost. In the presence of crony capitalism, the collusion between banks and borrowing firms is captured by a high club fee together with a low credit documentation cost. We then consider two financial policy instruments of great relevance: a pecuniary punishment policy that penalizes banks with excessive loans to less productive firms and a reserve requirement policy that serves to limit excessive funds supply to be channeled through the banking industry.[2]

More specifically, we allow for asymmetric information where lenders cannot observe the productivity of the borrowers (high- and low-return types). In the presence of the adverse-selection problem, it is conventional to use differential loan rates to derive optimal credit-constrained loan contracts.[3]

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[1] For the Asian financial crisis literature, see Sachs (1997), Chang and Velasco (1998) and Krugman (1998), to name but a few. For a brief discussion concerning the role of crony capitalism, the reader is referred to Roubini (1998).

[2] Pecuniary punishment policy may include fine and other types of penalty such as discriminating discount window operation, limitation on branching and deposit/loan regulations.

[3] For example, see Stiglitz and Weiss (1981), Azariadis and Smith (1993) and Bencivenga and Smith (1993).

We instead consider club fees and credit document requirements as the mechanism for banks to assure borrower's incentive compatibility. While consumers behave passively by depositing their income to banks, firms of various types seek to obtain bank loans to undertake their productive projects (with no moral hazard problem ex post). Competitive banks decide the loan contract with specified club fee schedules and credit document requirements and the allocation of loans to borrowing firms, to achieve profit maximization subject to incentive compatibility and individual rationality (active market participation) constraints. Moreover, the zero profit condition determines the deposit interest rate. Under proper conditions, the resultant banking optimization is associated with a nontrivial amount of funds allocated to the low-return types, thus leading to production inefficiency. The possibility of this inefficiency justifies the role of an active central bank, which can adopt the pecuniary punishment and/or reserve requirement policy so as to attain the highest social welfare.

The main findings of the paper are as follows. First, under proper conditions, there exists a unique equilibrium with both types of borrowing firms actively participating and with an incentive-compatible loan contract that specifies the unit club fee for the high type at the upper bound and the credit document requirement for the low type at zero. Second, the presence of crony capitalism leads to more severe misallocation of loans to less productive firms. Third, an increase in unit punishment or a tightened reserve requirement encourages the allocation of loan slots to high type firms together with a tougher requirement of credit documentation and a reduced club fee for the low type. Fourth, based on social welfare maximization, the pecuniary punishment policy is always adopted regardless of the underlying primitives, whereas the reserve requirement policy is adopted only when consumer's reservation value is sufficiently high and the ratio of aggregate deposits to the size of each loan is small. Finally, while a higher pecuniary punishment or required reserve ratio raises total output by correcting the misallocation problem, the latter also creates an adverse effect on total output by reducing total loan supply. Thus, from both welfare and production criteria, the pecuniary punishment policy is in general a more effective instrument correcting the misallocation problem resulting from crony capitalism.

## II. The Basic Environment

There are four theaters of economic activities: consumers, firms, banks and a central bank. Both consumers and banks are homogeneous and have a unit mass, whereas firms are heterogeneous, consisting of high- and low- return types of mass $N_H$ and $N_L$, respectively, with $N_H + N_L = N > 0$. Each consumer deposits his wealth (exogenously given) in a bank and receives in return a deposit interest. Each firm of either type borrows externally from a bank to finance a productive project. In transforming from deposits into loans, each bank sets up an incentive compatible contract, subject to market competition and regulations imposed by central bank. There are two types of central bank regulations, in forms of a uniform reserve requirement (on all banks) and a pecuniary punishments on those banks which allocate "too much" funds to lower-return type borrowers.

Next we describe the time sequence of economic activities in this environment. First, the benevolent central bank determines optimal policy reaction functions to maximize social welfare. Then, given the central bank's policy rule, each bank sets the deposit rate and the loan contract. Facing the bank's loan contracts, a firm decides whether or not to borrow to undertake a productive project. Once production is undertaken, the outcome is observed and the repayment of loans is made. Free entry of banks drives their profits to zero, while the distribution of deposit interests is made to consumers to maintain their active participation.

Notice that the only decision facing consumers and firms is whether or not to participate actively (to deposit and to borrow/produce, respectively). As a consequence, the focus of the model is on the profit maximization of banks and the social welfare maximization of the central bank. A central feature of the model is to account for the economics of cronism: all firms which intend to borrow from a bank must join as a "member" by paying a club fee determined by the underlying loan contract. In many developing countries (???), there exist various types of traditional financial organizations, including Farmers Credit Association, Fishermen Credit Association and Credit Coorporative Association. In any of these "banks," membership is required prior to obtaining a loan and the membership (or club) fee is determined in accordance to the size of loans and market competition.[4] The presence of these cronism-type banks is widely believed an important factor driving bank insolvency and financial crisis.

Let $D$ denote the total amount of deposits and $x$ denote the (exogenous) size of loan. Given the required reserve ratio  , the total available funds for loan is (1-  )$D$. Let $M$ denote the total available "slots" for loans. Further denote $M_H$ as the actual slots to the high type (type-H) and $M_L$ as the actual slots to the low type (type-L), so $M = M_H + M_L$. We focus on the interesting case where $N_H < M < N$; that is, there are enough slots for all of type-H firms to get a loan but not every firm can get a loan even by joining as a member. While the former provides an incentive for banks to have excessive lending, the latter induces type-L firms to have an incentive to misrepresent the type-H. Knowing that banks may provide loans to type-L firms, the central bank can impose a pecuniary punishment when banks allocate loans to type-L borrowers exceeding the first-best level. For simplicity, we assume such a fine is at a constant rate   per unit of loans and thus the total amount of fine is:

$$\Phi = \phi \max\{[(M-M_H)-(M-N_H)],0\}x = \phi \max\{(N_H-M_H),0\}x. \qquad \textbf{(1)}$$

The consumer behavior is trivial. Let $R_D$ denote the deposit rate of interest and $\underline{R}$ be the lower bound (reservation value). Active consumer participation therefore requires $R_D \geq \underline{R}$.

Denote $C_i$ ($i = H$ and $L$) as the unit club fee. Upon paying a club fee of $C_i x$, each firm of type $i$ can enter the credit pool waiting for the loan approval. Let $Q_i$ measure type-i firm's credit document requirements and   be the unit cost of credit document preparation. Upon an approval of the loan, a firm of type $i$ undertakes production receiving net return (net of the amount of loan) per unit of loan of $H$ and $L$, respectively. Thus, a type-i firm's net profit is:

[4] To some degree, the Rotating Saving and Credit Association may also be regarded as a financial club.

$$\pi_i = (\lambda_i i - C_i - \alpha Q_i)x. \tag{2}$$

where $\;_H = M_H / N_H$ and $\;_L = (M\text{-}M_H)/N_L$ denote, respectively, the fraction of type-i firms obtaining bank loans. Denote the upper bound of the club fee as $U$ such that $U \geq C_i x$ for $i = H$ and $L$. This restriction implies:

$$C_i \leq \bar{C} \equiv \frac{U}{x} \tag{3}$$

Notice that the only decision to be made by firms is whether or not to take an action - borrowing and producing. In order for a firm to actively participate in the credit market, it is required that $\;_i \geq 0$. An increased degree of crony capitalism can be regarded as a reduction in the unit cost of credit documentation (i.e., a smaller ), as in such an economy credit documentation prepared for a colluded bank is likely superficial. Moreover, while the club fee for type-H firms may just be standard payments for financial loans, that for type-L firms can be treated as a bribe since it serves as a price mechanism for the type-L to obtain a loan slot from a colluded bank.

Denote $v$ as bank's unit (variable) operation cost, $F$ as the fixed cost, and as the unit cost of credit search facing each bank. This credit search cost, $Q_i$, may be regarded as the state verification cost considered in previous studies, although we allow $Q_i$ to be endogenously determined as part of the loan contract. Thus, a bank's profit can be specified as the total revenue from club fees net of the total costs of operation, credit search, deposit interests and fine (by the central bank):[5]

$$\Pi = [C_H M_H + C_L (M\text{-}M_H)]x - v[M_H + M_L]x - F - \Phi - R_D D - \beta(M_H Q_H + M_L Q_L)x$$

[5] For simplicity, we assume that upon paying the club fee, loans are interest free. This can be easily generalized to allow for positive loan interests with the loan rates exogenously given. In this case, both firm's and bank's profit are, respectively, subtracted by and added with a constant (loan interest payment and revenue, respectively). The analysis and results remain qualitatively unchanged.

Utilizing (1), bank's profit can be rewritten as:

$$\Pi = [C_H M_H + C_L(M - M_H)]x - M_H(v + \beta Q_H)x - (M - M_H)(v + \beta Q_L)x - F - R_D D - \phi \max\{N_H - M_H, 0\}x. \tag{4}$$

By free entry of banks, = 0 in equilibrium and all banks have zero retained earnings. Thus, the economy-wide balance sheet identity implies:

$$(1 - \gamma)D = Mx \tag{5}$$

Finally, to examine the optimal financial policy of the benevolent central bank, we propose a simple social welfare measure by adding up the total benefits and subtracting the total costs of all economic agents: $\Omega = [\sum_i M_i i - vM - (\beta + \alpha)\sum_i Q_i M_i]x - F.$ That is, the social benefit is the aggregate returns from the productive projects, whereas the social costs include fixed and variable operation costs as well as credit document preparation and search costs. Using the identity $M = M_H + M_L$, we can rewrite the above social welfare function as:

$$\Omega = M_H[(H - L) - (\alpha + \beta)(Q_H - Q_L)]x + (1 - \gamma)D[L - (\alpha + \beta)Q_L - v] - F \tag{6}$$

## III. Optimization and Incentive-Compatible Contract

Under our setting, consumers and firms are passive players - they are only involved in market participation without any other optimization decision. Since firms are heterogeneous and their types are unobservable to banks, banks must set up loan contracts to induce truth-telling by firms. Specifically, banks will choose differential unit club fee schedules ($C_H$ and $C_L$), credit documentation requirements ($Q_H$ and $Q_L$) and the fraction of slots to be allocated to type-H firms ($M_H$) subject to firm's incentive compatibility and market participation (or individual rationality) constraints. Moreover, the deposit rate of interest that achieves bank's zero profit condition must satisfy consumer's market participation constraints. Once loan and deposit contracts are designed for a given set of policy parameters { , }, we apply the backward solving method to have the central bank choosing the two financial policy instruments to maximize social welfare, subject to bank's optimizing behavior.

Thus the bank's optimization problem can be written as:

$$\underset{\{C_H, C_L, Q_H, Q_L, M_H\}}{Max} \quad \Pi = [(C_H - C_L) + \phi - \beta(Q_H - Q_L)]M_H x + (C_L - v - \beta Q_L)(1-\gamma)D - \phi N_H x - F - R_D D$$

subject to

$$(IC_H) \qquad \lambda_H H - C_H - \alpha Q_H \geq \lambda_L H - C_L - \alpha Q_L \tag{7}$$

$$(IC_L) \qquad \lambda_L L - C_L - \alpha Q_L \geq \lambda_H L - C_H - \alpha Q_H \tag{8}$$

$$(IR_H) \qquad \lambda_H H - C_H - \alpha Q_H \geq 0 \tag{9}$$

$$(IR_L) \qquad \lambda_L L - C_L - \alpha Q_L \geq 0 \tag{10}$$

and $0 \leq C_i \leq \bar{C}$, $Q_i \geq 0$ and $0 < M_H < M$ for i = H, L, in which each individual bank takes the aggregate fractions, $_H$ and $_L$, as given.

Let $\mu_1$, $\mu_2$, $\mu_3$, and $\mu_4$ be Lagrangian multipliers for equations (7)-(10), respectively, and $\mathcal{L}$ be the Lagrangian function. Straightforward application of the Kuhn-Tucker theorem yields the necessary conditions for the solution of $\{C_H, C_L, Q_H, Q_L, M_H\}$:

$$\frac{\partial \mathcal{L}}{\partial C_H} = [M_H x - \mu_1 + \mu_2 - \mu_3] \begin{cases} > 0 & for\ C_H = \bar{C} \\ = 0 & for\ 0 < C_H < \bar{C} \\ < 0 & for\ C_H = 0 \end{cases} \tag{11}$$

$$\frac{\partial\mathcal{L}}{\partial C_L} = (M - M_H)x + \mu_1 - \mu_2 - \mu_4 \quad \begin{cases} >0 & for\ C_L = \bar{C} \\ =0 & for\ 0 < C_L < \bar{C} \\ <0 & for\ C_L = 0 \end{cases} \tag{12}$$

$$\frac{\partial\mathcal{L}}{\partial Q_H} = -M_H\beta\, x - \alpha\,(\mu_1 - \mu_2 + \mu_3) \leq 0 \quad (=0\ for\ Q_H > 0) \tag{13}$$

$$\frac{\partial\mathcal{L}}{\partial Q_L} = -(M - M_H)\,\beta\, x + \alpha\,(\mu_1 - \mu_2 - \mu_4) \leq 0 \quad (=0\ for\ Q_L > 0) \tag{14}$$

$$\frac{\partial\mathcal{L}}{\partial M_H} = \frac{\partial\Pi}{\partial M_H} = [(C_H - C_L) - \beta\,(Q_H - Q_L)]x + \phi x = 0 \tag{15}$$

That is, we only focus on the nondegenerate solution where the solution of $M_H$ is interior. Yet, we allow the incentive compatible loan contracts to be set with either the club fees or the credit document requirements at the corner.

First, we examine the individual rationality conditions, $IR_H$ and $IR_L$, to conclude:

**Lemma 1.** *$IR_H$ never binds, whereas $IR_L$ always binds.*

Proof: Suppose $IR_H$ binds. Then the LHS of (7) is zero, implying the RHS of (7) is smaller than or equal to zero. Since $L < H$, the LHS of (8) is negative which evidently violates (10). The second part is shown by the following arguments. To increase their profits, banks always have incentive to increase the club fees. Given that (9) is not binding, they can adjust $C_H$ and $C_L$ up such that $IR_L$ binds and (7) and (8) still hold.||

We now investigate whether the incentive compatibility conditions, $IC_H$ and $IC_L$, are binding. There are four possible cases to be considered:

Case I. Neither $IC_H$ nor $IC_L$ binds

Case II. $IC_H$ does not bind whereas $IC_L$ binds

Case III. $IC_H$ binds, whereas $IC_L$ does not bind.

Case IV. Both $IC_H$ and $IC_L$ bind.

We first rule out Case IV.

**Lemma 2.** *If* $_L \mho _H$, *then it is impossible to have both* $IC_H$ *and* $IC_L$ *bind.*

Proof: Suppose not. Then both (7) and (8) hold with equality. The RHS of (7) subtracting the LHS of (8) equals $_L(H\text{-}L)$, whereas the LHS of (7) subtracting the RHS of (8) equals $_H(H\text{-}L)$. The equalities of (7) and (8) therefore imply $_L(H\text{-}L) = {}_H(H\text{-}L)$, which leads to $_L = {}_H$ given H > L. This contradicts to the presumption that $_L \mho _H$.||

The following discussion characterizes the properties of the loan contract for each case. Notice that the bank's profit is increasing in $C_H$ and $C_L$, and decreasing in $Q_H$ and $Q_L$. From Lemma 2, we can focus our analysis on Cases I-III. We show in Lemma 3 below that the fraction of the provision of loans to the type-H is always higher than that to the type-L firms.

**Lemma 3.** $_H$ *is always strictly greater than* $_L$.

Proof: From Lemma 2, either (7) or (8) is not binding. Thus, the LHS of (7) subtracting the RHS of (8), which equals $_H(H\text{-}L)$, must be strictly greater than the RHS of (7) subtracting the LHS of (8), which equals $_L(H\text{-}L)$. This implies $_H > {}_L$.||

There are therefore three remaining cases to be examined. In these cases, we can show,

**Lemma 4.** $C_H$ *is set at its upper bound, whereas* $Q_L$ *is always zero.*

Proof: In these cases, it is impossible to have both $IC_H$ and $IC_L$ bind, and moreover, $IR_H$ does not bind. Thus, it is feasible to raise $C_H$ without violating *IC* or *IR*, implying $C_H = \bar{C}$. By the same argument, we can lower $Q_L$ till $Q_L = 0$ without violating *IC* or *IR*. These imply $C_H = \bar{C}$ and $Q_L = 0$. ||

Lemma 1 and 4 implies that (10) holds with equality, so

$$C_L = \lambda_L(M_H)L. \tag{16}$$

We next proceed to rule out Cases I and III.

**Lemma 5.** $IC_L$ *always binds*.

Proof: Suppose that neither $IC_H$ nor $IC_L$ is binding. Since $Q_H$ is non-negative and $\mu_1 = \mu_2 = \mu_3 = 0$ in this case, (13) reduces to $\partial\mathcal{L}/\partial Q_H = -M_H \beta x < 0$, implying that $Q_H = 0$. From this solution and Lemma 4, (15) can be rewritten as $C_H - C_L = \bar{C} - C_L = -\phi$. The last inequality implies $C_L > \bar{C}$, leading to a contradiction.||

Combining lemma 1 and 5, it must be the case that $IC_H$ is not binding and $IC_L$ is binding. While the result that $IC_H$ is not binding rules out Case III, the result that $IC_L$ is binding rules out Case I. From these arguments, we can now restrict our attention to Case II in which $IC_H$ is not binding whereas $IC_L$ is binding. In this case, (8) and (10) hold with equality while lead

$$Q_H - Q_L = \frac{1}{\alpha}\left[(\lambda_H - \lambda_L)L - (\bar{C} - C_L)\right] \tag{17}$$

Thus, the differential in credit document requirements (between type-H and type-L firms) is positively related to the relative advantage of type-H in slot allocations but negatively related to the club fee difference. Combining (15)-(17), we obtain

$$(1 + \frac{\beta}{\alpha})\bar{C} - (\frac{\beta}{\alpha}\lambda_H + \lambda_L)L + \phi = 0 \tag{18}$$

where the LHS is the net marginal benefit of $M_H$. By the second-order condition, it is obvious that the net marginal benefit must be decreasing in $M_H$, which is guaranteed by the following condition:

**Condition N:** $\beta N_L > \alpha N_H$ .

Given that    >    , Condition N is met if the number of type-L firms is sufficiently large relative to type-H firms.

Recall that $\lambda_H = \frac{M_H}{N_H}$ and $\lambda_L = \frac{M - M_H}{N_L}$. Substituting these expressions and (5) into (18) yields the solution for the endogenous allocation of loan slot to type-H firms:

$$M_H = \frac{(1+\frac{\beta}{\alpha})\bar{C}+\phi-(1-\gamma)\frac{D}{x}\frac{L}{N_L}}{(\frac{\beta}{\alpha}\frac{1}{N_H}-\frac{1}{N_L})L} \qquad \textbf{(19)}$$

Manipulation of (16) into (19) gives the solution of the unit club fee for type-L claimers:

$$C_L = \frac{(1-\gamma)\frac{D}{x}\frac{\beta}{\alpha}\frac{L}{N_H}-(1+\frac{\beta}{\alpha})\bar{C}-\phi}{(\frac{\beta}{\alpha}\frac{1}{N_H}-\frac{1}{N_L})N_L} \qquad \textbf{(20)}$$

Utilizing Lemma 5 ($C_H = \bar{C}$, $Q_L = 0$), (16), (17) and (19), we get the credit document requirement for type-H claimers:

$$Q_H = \frac{1}{\alpha}\left[\frac{(1+\frac{N_H}{N_L})\bar{C}+\phi-(1-\gamma)\frac{D}{x}\frac{L}{N_L}}{(\frac{\beta}{\alpha}\frac{1}{N_H}-\frac{1}{N_L})N_H}\right] \qquad \textbf{(21)}$$

Consider,

**Condition C:** $(1-\gamma)\frac{D}{x}\frac{\beta}{\alpha}\frac{L}{N_H} > (1+\frac{\beta}{\alpha})\bar{C}+\phi$.

**Condition Q:** $(1+\frac{N_H}{N_L})\bar{C}+\phi > (1-\gamma)\frac{D}{x}\frac{L}{N_L}$.

While Condition C ensures $C_L > 0$, Condition Q guarantees $Q_H > 0$. Under Condition N, the LHS of Condition

C is greater than the RHS of Condition Q, whereas the RHS of Condition C is greater than the LHS of Condition Q. To have both conditions satisfied, we thus need the difference between the LHS of Condition C and the RHS of Condition Q to be sufficiently large, which can be met if $N_L \gg L \gg N_H$.

In equilibrium, both incentive compatibility constraints are met and thus no misrepresentation is observed. We can summarize the above arguments and Lemmas 1-6 in,

**Theorem 1.** *Under Conditions N, C and Q, there exists a unique incentive compatible loan contract* $\{C_H, C_L, Q_H, Q_L\}$ *satisfying the following properties:*

*(i)* $IC_H$ *and* $IR_H$ *do not bind whereas* $IC_L$ *and* $IR_L$ *both bind;*

*(ii) the loan slot allocation is favorable toward the high type (* $_H > _L$ *) with the fraction to type-H claimer specified as in (19);*

*(iii) the unit club fee for the type-H is fixed at the upper bound* ($\bar{C}$) *whereas that for the type-L satisfies (20);*

*(iv) the credit document requirement for the type-H solves (21) whereas that for the type-L is set at zero.*

## IV. Equilibrium and Comparative Statics

By competition, bank's profits must be driven down to zero in equilibrium. This enables us to solve the deposit rate $R_D$ by substituting (19)-(21) into (4) and utilizing Lemma 5:

$$R_D = (1-\gamma)\left\{\left(\frac{(1-\gamma)\frac{D}{x}\frac{\beta}{\alpha}\frac{L}{N_H}-(1+\frac{\beta}{\alpha})\bar{C}-\phi}{(\frac{\beta}{\alpha}\frac{1}{N_H}-\frac{1}{N_L})N_L}\right)-v\right\}-\left(\phi N_H+\frac{F}{x}\right)\frac{x}{D} \tag{22}$$

In order for consumers to actively participate in the loanable funds market, it is required that $R_D \geq \underline{R}$, or,

**Condition D:** $$(1\text{-}\gamma)\left\{\left(\frac{(1\text{-}\gamma)\frac{D}{x}\frac{\beta}{\alpha}\frac{L}{N_H}-(1+\frac{\beta}{\alpha})\bar{C}-\phi}{(\frac{\beta}{\alpha}\frac{1}{N_H}-\frac{1}{N_L})N_L}\right)-v\right\} \geq \underline{R}+\left(\phi N_H+\frac{F}{x}\right)\frac{x}{D}.$$

From (20), we can see that Condition D also implies $C_L > v > 0$ and thus Condition C.

We are now prepared to define the equilibrium.

**Definition.** An equilibrium is a list specifying a loan contract $\{C_H , C_L , Q_H , Q_L \}$, total loan slots $M$, a loan allocation mechanism $M_H$ and a deposit rate $R_D$ such that:

(i) the loan contract is incentive compatible, (7) and (8), and individually rational, (9) and (10), with $\lambda_H = \frac{M_H}{N_H}$ and $\lambda_L = \frac{M - M_H}{N_L}$ ;

(ii) the loan allocation is profit maximizing, i.e., the first-order condition, (15), and the second-order condition are satisfied;

(iii) the total loan slots satisfies bank's balance sheet, (5);

(iv) the deposit rate satisfies bank's zero profit condition, (22), and consumer's individual rationality constraint, $R_D \geq \underline{R}$.

Given a pair of policy tools of the central bank: the required reserve ratio ( ) and the unit punishment ( ), the equilibrium is associated with an incentive compatible contract characterized by Case II. From the above analysis, (19) gives the fraction of loan slots allocated to the type-H, $M_H$. The club fee for type-H firms is $C_H = \bar{C}$ and the club fee for type-L firms, $C_L$, is given by (20). There is no credit document requirement for the type-L ($Q_L = 0$) and that the type-H, $Q_H$, is given by (21). While the total number of loan slots, $M$, solves (5), the deposit rate is obtained from (22). Under Conditions N and D, the second-order condition for loan slot allocation and the individual rationality constraint for consumers are met. Moreover, Conditions N and Q together imply $M_H > 0$. Since Condition D is sufficient to ensure $C_L > 0$, from (10) and Lemma 1 we thus have $_L > 0$ which guarantees $M_H < 1$. Therefore, we can conclude:

**Theorem 2.** *Under Conditions N, Q and D, there exists a unique equilibrium in which both type-H and type-L firms are active (i.e., $0 < M_H < 1$).*

Using equations (19), (20), (21) and (22), we can perform comparative-static analysis to characterize how changes in the central bank's policy and parameters affect fund allocations, unit club fees and deposit rates and credit document requirements. The results are summarized in Table 1.

Higher unit punishment indicates that it is more costly to misallocate loans to type-L firms. Thus the bank has more incentive to allocate funds to firms of type-H (i.e., $M_H$ increases). As a consequence, the fraction of loan slots allocated to type-L firms ( $_L$) is lower. In order for the type-L to actively participate in the loanable funds market, banks must then set a lower unit club fee for them (i.e., $C_L$ decreases). Moreover, accompanied by an increase in $M_H$, the credit document requirement for type-H claimers ($Q_H$) must be higher to satisfy incentive compatibility constraints such that the type-L would not misrepresent. Since both higher punishment and lower club fees for the type-L reduce bank's profit margin, the deposit rate ($R_D$) must be lower in order to maintain the zero profit condition for the competitive banking industry.

When the central bank increases the required reserve ratio ( ), each bank has less funds available for loans, which can be regarded as an increase in the effective cost of banking. In response, each bank increases the loan slots to the high types to assure its profitability. The subsequent changes in the unit club fee for the type-L, the credit document requirement for the type-H and the deposit rate follow the same arguments as in the case of higher punishment.

The bank operation cost ($v$) is universal to different types of loans (type-H and type-L). It therefore leaves the loan slot allocation unaffected. As a result, neither the unit club fee schedule nor the credit document requirement change in response to a rise in the bank operation costs. However, such a shift reduces the profit margin of banks and, by the zero profit condition, the deposit rate decreases accordingly.

Since the unit club fee for type-H claimers is set at the upper bound ($\bar{C}$) in equilibrium, an increase in this upper bound raises the profitability from lending to the type-H, thus inducing more loan slots to type-H firms. This is accompanied by a lower unit club fee for type-L firms and a higher credit document requirement for type-H claimers, in order to satisfy type-L's individual rationality and incentive compatibility constraints. Yet, in contrast to the financial policy changes illustrated above, this effect is to increase the profit margin and hence raise the deposit rate in equilibrium.

When state verification becomes more difficult, the ratio of credit search to the credit document preparation cost increases (i.e., a higher / ). Under Condition Q, this shift discourages the allocation of loan slots to type-H claimers.[6] Since the individual rationality constraint for type-L firms is binding, banks can charge them a higher unit club fee while maintaining their market participation. Recalling that the incentive compatibility constraint for type-L is binding, the credit document requirement for type-H claimers must be lower in response to a lower fraction of loan slots allocated to the type-H. Since an increase in unit club fees widens bank's profit margin, the deposit rate is higher to achieve zero profit.

It is interesting to examine the consequences of crony capitalism based on results in the previous paragraph. Recall that an increased degree of crony capitalism can be regarded as a reduction in the unit cost of credit documentation (i.e., a smaller ), while the club fee can be reinterpreted as bribes. Thus the above analysis suggests that the more severe the crony capitalism is, the larger the fraction of misallocated loan slots and the higher the amount of bribes will be.

In summary, we have

**Proposition 1:** *Under Conditions N, Q and D, an equilibrium satisfies the following properties:*

*(i)* *an increase in unit punishment or a tightened reserve requirement encourages the allocation of loan slots to type-H firms together with a tougher requirement of credit documentation, and reduces the unit club fee for the type-L and the deposit rate;*

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[6] Differentiation of (19) with respect to / yields an expression negatively proportional to the numerator of $Q_H$ in (21), which is less than zero under Condition Q.

*(ii)* *increased severity of crony capitalism or difficulty in state verification generates exactly opposite results to a tight financial policy;*

*(iii)* *while changes in the bank operation cost have no effect on loan slot allocation, the effect of a higher upper bound of the unit club fee is to increase the allocation to type-H firms.*

## V. Optimal Financial Policy

In the previous section, we solve for the equilibrium outcome for a given pair of financial policy instruments ( , ). In this section, we turn to examining optimal financial policy in the sense of social welfare maximization. Substituting (17) and (19) into (6) gives:

$$\Omega=\left\{(H\text{-}L)\text{-}(1+\frac{\beta}{\alpha})\left(\frac{(1+\frac{N_H}{N_L})\bar{C}+\phi-\frac{L}{N_L}(1\text{-}\gamma)\frac{D}{x}}{(\frac{\beta}{\alpha}\frac{1}{N_L}-\frac{1}{N_L})N_H}\right)\right\}\left(\frac{(1+\frac{\beta}{\alpha})\bar{C}+\phi-\frac{L}{N_L}(1\text{-}\gamma)\frac{D}{x}}{\left(\frac{\beta}{\alpha}\frac{1}{N_H}-\frac{1}{N_L}\right)L}\right)x+(1\text{-}\gamma)D(L\text{-}v)\text{-}F$$

By differentiating $\Omega$ in the above expression with respect to $\phi$ (given $\gamma$ ) and to $\gamma$ (given $\phi$ ), we get, respectively, the following two Kuhn-Tucker conditions:

$$M_H \geq \frac{(H\text{-}L)+(1+\frac{\beta}{\alpha})\bar{C}}{2(1+\frac{\beta}{\alpha})\frac{L}{N_H}} \equiv A_1, \quad \textit{with equality for } \phi > 0 \tag{23}$$

$$M_H \geq A_1 - \frac{(L\text{-}v)\left(\frac{\beta}{\alpha}\frac{1}{N_H}-\frac{1}{N_L}\right)N_L}{2(1+\frac{\beta}{\alpha})\frac{L}{N_H}} \equiv A_1\text{-}A_2, \quad \textit{with equality for } \gamma > 0 \tag{24}$$

Substituting (19) into (23) and (24), one can obtains two lines in ( , )-space, denoted by the PP (pecuniary punishment) locus and the RR (reserve requirement) locus as shown in the Figure 1. Since and affect the locus only through $M_H$ , by examining (19) the two loci must be linear and parallel. Under Condition N, $A_2 > 0$ and hence the vertical intercept of the PP locus ( $_P$) is strictly greater than that of the RR locus ( $_R$). In the area above the PP locus, $\frac{\partial \Omega}{\partial \phi}$**<0** and below that $\frac{\partial \Omega}{\partial \phi}$**>0**. Similarly, above the RR locus $\frac{\partial \Omega}{\partial \gamma}$**<0** and below that $\frac{\partial \Omega}{\partial \gamma}$**>0.** To characterize the contour of social welfare (or welfare indifference maps, denoted WW), we derive its slope as:

$$\frac{d\phi}{d\gamma}\Big|_{\Omega=constant} = -\frac{\partial\Omega/\partial\gamma}{\partial\Omega/\partial\phi} = -\frac{D}{x}\frac{A_1-A_2-M_H}{A_1-M_H}$$

It is clear that the contour is downward sloping when $M_H > A_1$ or $M_H < A_1 - A_2$ (i.e., either below the RR or above the PP locus). The contour is vertical when $M_H = A_1$ (i.e., on PP) and horizontal when $M_H = A_1 - A_2$ (i.e., on RR). The contour is upward sloping for $A_1 - A_2 < M_H < A_1$ (i.e., between the PP and RR loci). The contour of      is shown in Figure 1.

The solution for the cental bank optimization problem must satisfy the individual rationality constraint facing consumers. Denote such a constraint with equality as the iso-consumer rationality (CC) locus (i.e., $R_D = \underline{\boldsymbol{R}}$). The CC locus has a negative slope of,

$$\frac{d\phi}{d\gamma}\Big|_{R_D\ constant} = -\frac{D}{x}\frac{1}{1+(\frac{\beta}{\alpha}\frac{1}{N_H}-\frac{1}{N_L})\frac{N_H N_L L}{1-\gamma}\frac{x}{D}} < 0.$$

which is flatter if $D/x$ is smaller. We note that the CC locus is indeed convex in    but for illustrative purpose, we draw a linear CC locus in Figures 2-4, as its convexity property is inessential to our analysis except that it guarantees the uniqueness of the social optimum. All points below the CC locus satisfy consumer's individual rationality condition. From (22), it is easily seen that the vertical intercept of CC ( $_C$) is decreasing in $\underline{\boldsymbol{R}}$.

Depending on the relative position of the CC locus to the PP and RR loci, there are three possible cases to discuss for determining the optimal financial policy. In Case 1, consumer's individual rationality constraint does not bind and ${}_{C} > {}_{P}$ (see Figure 2). The optimal punishment is therefore pinned down by $= {}_{P}$ and the optimal required reserve ratio is zero. In Case 2, consumer's individual rationality constraint binds and ${}_{C} < {}_{P}$ with a relatively steep CC locus (see Figure 3). We obtain a socially optimal punishment at $= {}_{C}$ and required reserve ratio still at zero. Thus, in either case, the punishment policy strictly dominates the reserve requirement policy in achieving social optimum.

For Case 3, consumer's individual rationality constraint binds and ${}_{C} < {}_{P}$ with a relatively flat CC locus (see Figure 4). In this case, the socially optimal solutions of both financial policies are interior and the punishment policy is no longer a dominant instrument. This interior solution is likely to occur if consumer's reservation value is sufficiently high and the ratio of aggregate deposits to the size of each loan is small. Intuitively, when consumer's reservation value is sufficiently high, the direct negative effect of the required reserve ratio on social welfare is relatively unimportant compared to the adverse effect via loan slot allocation. If we further assume that $D/x$ is small, then the damage of the reserve requirement policy is less significant relative to the punishment policy. As a consequence, the punishment policy is no longer dominant in social welfare considerations.

To the end, we can reexamine the financial policy based on a production criterion. Note that the aggregate output can be expressed as: $M_H H + M_L L = M_H(\ ,\ )(H-L) + (1-\ )(D/x)L$. It is obvious that either a greater pecuniary punishment or a higher required reserve ratio raises aggregate output by correcting the misallocation problem (i.e., increasing $M_H$). However, a higher required reserve ratio also creates an adverse effect on aggregate output by reducing total loan supply (as can be seen from the second term of the LHS of the expression). Thus, from the production criterion, the pecuniary punishment policy seems also more effective in correcting the misallocation problem resulting from crony capitalism.

The above discussion leads to,

**Theorem 3.** *Under Conditions N, Q and D, there exists a unique socially optimal financial policy* combination {   *,    *}.

**Proposition 2.** *Under Conditions N, Q and D, the socially optimal financial policy satisfies the following properties:*

(i) *the punishment policy is always adopted regardless of the underlying parameters;*

(ii) *the reserve requirement policy is adopted when consumer's reservation value is sufficiently high and the ratio of aggregate deposits to the size of each loan is small.*

It may be worth noting that the limited role of reserve requirement is due partly to the absence of the illiquidity problem in the setup of the bank behavior. Under this framework, the punishment policy is in general a more effective instrument correcting the misallocation problem resulting from crony capitalism (i.e., a small number of loan slots allocated to the high type firms accompanied by a large unit club fee for the low type firms).

## VI. Conclusions

In this paper, we construct a competitive equilibrium model enabling us to understand the macroeconomic and financial consequences of crony capitalism and to evaluate the effectiveness of financial policies. Due to asymmetric information about borrowing firms' types, an incentive-compatible loan contract is derived featuring a club fee and a credit documentation cost. In the presence of crony capitalism, the collusion between banks and firms is captured by a high club fee together with a low credit documentation cost. Under proper conditions, we show the existence and uniqueness of an equilibrium with both types of borrowing firms actively participating. We find that the presence of crony capitalism leads to more severe misallocation of loans to less productive firms. Based on welfare and production criteria, the pecuniary punishment policy is in general a more effective instrument for correcting the misallocation problem resulting from crony capitalism.

For future research along these lines, one may consider explicitly the illiquidity problem by allowing the possibility that low-type firms may not be able to pay back the loan under limited liability. In this case, consumers may withdraw their deposits and bank runs may occur. Should one consider this possibility, there may be another active role for the reserve requirement policy to play. Moreover, there may be a more direct link between the severity of crony capitalism and the likelihood of bank runs.

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**Table 1: Comparative Statics**

| | Loan Slots Allocated to Type-H<br><br>$M_H$ | Unit Club Fee for Type-L<br><br>$C_L$ | Credit Document for Type-H<br><br>$Q_H$ | Deposit Interest Rate<br><br>$R_D$ |
|---|---|---|---|---|
| 1. Financial Policy Changes | | | | |
| | + | - | + | - |
| | + | - | + | - |
| 2. Economic Parameter Changes | | | | |
| $v$ | 0 | 0 | 0 | - |
| $\bar{C}$ | + | - | + | + |
| / | - | + | - | + |

**Notation List**

$H$ high return per dollar

$L$ low return per dollar

$N_H$ cardinality of high-return type

$N_L$ cardinality of low-return type, $(N = N_H + N_L)$

$D$ total deposit

$x$ size of each loan (exogenous)

$F$ the fixed cost of bank

$M$ total available slots for loans, $Mx = (1- \ )D$, where is required reserve ratio

$M_H$ actual slots to type $H$, $M_H \leq N_H$

$M_L$ actual slots to type $H$, $M_L \leq N_L$, $(M = M_H + M_L)$

$R_H$ loan rate to type $H$

$R_L$ loan rate to type $L$

$R_D$ deposit rate

$Q_H$ type $H$'s credit document requirements

$Q_L$ type $L$'s credit document requirements

$_i$ fraction of type i obtaining loan, $_i = M_i/N_i$, $i = H$ and $L$

unit fine per dollar imposed by the central bank ( = total fine)

v unit operation cost

unit cost of credit documentation

unit cost of credit search facing each firm

required reserve ratio

***R*** the depositor's reservation rate for making deposits