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Study on the Collusive Corruption in Supervision of Bank Credit

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Abstract

Commercial banks are typical hierarchical organizations, in which the multiple-principal-agent problem exists and induces serious internal collusive corruption. This article analyzes the collusive corruption between credit supervisors and credit managers in bank credit activities, through three possible situations of supervision. The results indicate that internal supervision is necessary even though supervisors and managers could collude. Meanwhile, it is inefficient for banking only depending on the costly external supervisor. Finally, the implications of findings are discussed.

JEL classification numbers: D73, D82, G2

Keywords: bank credit, collusive corruption, supervision, principal-agent

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1 Introduction

Banking can be viewed as a nexus of principal-agent relationships and the principal-agent problem can occur at any hierarchy. A number of cases of internal fraud and collusive corruption are emerged associated with the enormous gains from fraud and the lack of prudential regulations to prevent from illegal activities. Numerous evidences show that collusion of multi-agent contracting in banking is a particularly serious problem. It exists widespread that the unauthorized delegation is abused through executing private contracts and financial collusive corruption to maximize the sum of illegal payoffs.

Baliga and Sjostrom [1] proposed that collusion can occur when supervisors and agents cooperate with each other to manipulate the information to the principal and the side contract exists between them. Tirole [6] stated that the principal would hire supervisors with superior information to monitor agents not to shirk. However, it is possible that supervisors do not provide the verifiable reports of agents. When supervisors can be bribed by inefficient agents, a coalition between supervisors and agents would hurt the interests of the principal. Subsequent studies employ game theory and incomplete contracting theory to consider the collusion in the organization and propose an analytical framework of collusive behavior to develop the research paradigm of collusion.

Laffont and Martimort [5] employed three-layer hierarchies with the principal, supervisor and agent (P-S-A) to develop a benchmark model without collusion and then collusion is imposed under asymmetry information. Two types of coalitions are considered. First, a coalition among high efficient and inefficient agents could occur to achieve the pooling equilibrium when the principal consider the trade-off between efficiency and information rents. Second, there is a coalition between supervisors and agents. The supervisors with superior information including internal supervisors and external auditors may collude with the agents in the absence of incentives. Finally, the collusion-proof mechanism is described.

Kofman and Lawarre′e [4] extended the three-layer hierarchies with P-S-A model including collusion to explore auditing problems. The control mechanism is to monitor not only the managers but also the auditors in the firms. Some studies (Holmstrom and Molgmm [3] and Varian [7]) suggested that actual and potential coalitions between supervisors and agents existed in the way of hidden information exposure that would damage the benefits of the final principal including depositors and small investors. In the other words, the principal cannot constrain behaviors of the agents. A huge number of corruption cases occur in banking industry. The contribution of this study is to analyze the collusive corruption between credit supervisors and credit managers in bank credit activities and describe the optimal collusion-proof mechanism.

2 Analysis benchmark

Consider three parties in the game. The stockholder of banking can be viewed as the principal (*P*). The agents include the credit manager (*A*) and the credit supervisor (*S*), respectively. The profits created by the risk-neutral credit manager depend on the function, $q = e + \theta$, where $\theta \in \{\theta_1, \theta_2\}$ is the type of the credit manager representing the manager's profitability or production level. For simplicity, assume $\theta_1 < \theta_2$ and $Pr(\theta_1) = 1/2$. The effort of the credit manager follows the function, $g(e)=e^2/2$, where g(e) is strictly convex and the standardized reservation utility is assumed zero. Both of the principal and the agent are assumed risk-neutral. The principal designs the main contract and offers to the agent who could choice whether receive or not.

When the bank can observe θ and e, the first best problem is to choose the type of the agent subject to the transfer payoff (T_i) and the agent's effort (e_i) to maximize the bank's expected profit.

$$\max_{e_i,T_i} \frac{1}{2}(\theta_1 + e_1 - T_1) + \frac{1}{2}(\theta_2 + e_2 - T_2) \quad (1)$$

$$s.t.\ T_i \geq \frac{e_i^2}{2}, i = 1,2 \quad (2)$$

Equation (2) represents the individual rationality constraint of credit manager's type, indexed by *i*. By utilizing the Lagrange function, the first best solution can be obtained, e_i=1and T_i=1/2. The result implies that the marginal cost of the credit manager's effort is equal to the marginal profit of productivity, indicating e_1=e_2=1. Meanwhile the principal gives the level of transfer payoff that the agent is willing to accept the contract and the payoff is uncorrelated with the agent's effort, indicating T_1= T_2=1/2.

Under asymmetric information, supervision does not exist and θ is private information. The second best problem is also to maximize the expected profit. According to the revelation principle, there is additional incentive constraint as following.

$$T_2 - \frac{e_2^2}{2} \geq T_1 - \frac{(\max\{0, e_1 - \Delta\theta\})^2}{2} \quad (3)$$

The constraint represents that the high efficient credit manager would not pretend to the low efficient manager. For simplicity, we assume $\Delta\theta = \theta_2 - \theta_1 = 1$. The assumption indicates that θ_2 credit manager can obtain profit (q_1) without any effort because of e_1 <1. The constraint can be replaced in the simple form.

$$T_2 - \frac{e_2^2}{2} \geq T_1 \quad (4)$$

Replace T_i in the objective function by the equation (2) and equation (4) and maximize the Lagrange function with respect to the variable, e_i. The second best solution can be obtained, e_1=1/2 and e_2=1. The result indicates that the high efficient credit manager would exert the optimal level of effort and obtain information rents whereas the low efficient manager would exert lower than the optimal level of effort and receive only the reservation income.

3 Collusive corruption in the bank credit supervision

3.1 The honest and costly supervisor alone

Assumptions are given as follows. First, the credit manager can identify his type (θ_i). Second, the bank sign contracts with the credit manager and the supervisor respectively. Third, the credit manager chooses a contract to obtain the maximized profit. Fourth, the bank signs a contract with the supervisor to regulate the probability of supervision depending on the productivity. When the actual productivity (q_i) is observed, the supervision of the credit manager can be done randomly.

According to the framework of Tirole [6], the objective of the bank is to reduce the information rents of the efficient credit manager as possible. It can be achieved by imposing punishment when the credit manager with low effort is observed. When the actual productivity is lower, the credit manager will be punished in the first best contract, whereas the supervisor's signal is positive related with the efficiency type.

Assume that the probability of the supervision is γ subject to the lower productivity. The cost of the supervisor is z. When the supervisor observes the low productive signal y_1, the credit manager would be imposed the punishment K and the maximum punishment is K^*. The contract problem of the bank can be presented as follows.

$$\max_{e_i,T_i,\gamma,K} \frac{1}{2}\{\theta_1 + e_1 - T_1 + \gamma[(1-\xi)K - z]\} + \frac{1}{2}(\theta_2 + e_2 - T_2) \tag{5}$$

$$s.t.\ T_i - \gamma(1-\xi)K \geq \frac{e_1^2}{2} \tag{6}$$

$$T_2 \geq \frac{e_2^2}{2} \tag{7}$$

$$T_2 - \frac{e_2^2}{2} \geq T_1 - \gamma\xi K \tag{8}$$

Comparing with the second best contract without supervision, three implications could be obtained. First, the bank has the new supervisory costs. The ex-ante probability to hire the supervisor is 1/2 and the cost is $\gamma z/2$. Next, when the supervisor does not transmit the correct information, the probability of a mistake to punish the inefficient credit manager is 1-ξ. When the credit manager is risk-neutral, the effect does not exist because of the incentive mechanism that increasing the transfer payoff T_1 is used to compensate the bank. Third, the supervision would reduce information rents of the efficient credit manager. If his productivity is low, he would be punished more strictly than the inefficient manager. To obtain the result, the constraints of equation (6) and equation (8) can be combined.

$$T_2 - \frac{e_2^2}{2} \geq \frac{e_1^2}{2} - \gamma(2\xi - 1)K \tag{9}$$

When the punishment K is increased, the second rationality constraint, equation (7) could be also tight. The information rents would not exist. Profit of supervision would be enhanced as K is increasing. Thus, the maximum deterrence is the best (Becker 1968). It is optimal when $K= K^*$, and meanwhile the accuracy of the supervisory signal ξ is improved.

The bank needs to make a trade-off between the benefits from the efficient credit manager and the cost of supervision. Given the cost z, the properties of the first best contract are as follows. The supervision does not exist and e_1=1/2, when the supervisor does not report the signal honestly and the maximum punishment for the credit managers is minimal. However, the supervision would be quite worthwhile when the accuracy of supervisory signal is relative high and the punishment for the credit manager is enlarged relatively. Given the linear format of the contract, the probability of supervision should be one when the supervisor observes the low productivity. The information rents of efficient credit manager are decreased but still positive. The effort of inefficient credit manager still remains at 1/2. Next, the information rents would not exist when the supervisor

report honestly and punishment for the credit manager is severe. Meanwhile, the inefficient credit manager would increase his effort e_1 at the optimal level. The level of effort would be distorted downward because the information rents of the efficient credit manager are decreased. Finally, when the effort of the inefficient credit manager is at the optimal level, the probability of supervision γ could be reduced no matter to improve the accuracy of the signal or to enlarge the size of punishment.

3.2 The corrupt and costless supervisor alone

Collusion between the supervisor and the credit manager would occur when low productivity can be pretended to high productive signal y_2. Banking would provide rewards w to avoid collusion when the supervisor observes y_2 and transmits honestly. The rewards must satisfy the collusion-proof constraint or coalition incentive compatibility between the supervisor and the credit manager.

$$w \geq K \tag{10}$$

Differing from the above, the supervisory cost is minima assumed to be zero and thus the bank does not pay the cost z. Assume that the supervisor's wealth constraint exists and meanwhile the supervisor would be punished when he fails to reveal the signal y_2. The expected supervisory cost of the bank is $\gamma w(1-\xi)/2$. The probability of the supervision is γ when the productivity q_1 is observed. The probability of the supervisor receiving the signal y_2 is $1-\xi$.

The bank's contract problem is similar with the above whereas the differences consist of these ways that z in the objective function should be replaced with $w(1-\xi)$ and there is an additional constraint in equation (10). The optimal contract with collusion is the third best. The bank's supervisory costs increase when the punishment K for the credit manager is enlarged. The bank needs to make a trade-off between the cost of supervision and information rents.

The expected profit of the supervisor is $\gamma(1-\xi)K/2$. The information rents of the credit manager would be reduced. According to equation (7), the expected rent is $\gamma(2\xi-1)K/2$. Thus, the bank would supervise the lending when and only when $\xi \geq 2/3$.

The supervision would exist when the signal is so accurate that the above constraints are satisfied. When the productivity q_1 can be observed, the optimal outcome depends on the maximum punishment K^* imposed on the credit manager. If K^* is less, both types of credit managers would exert the same level of effort without the supervision whereas the information rents of the credit manager would be decreased. For the higher K^*, the information rents would not exist and therefore the low productive credit manager would gradually enhance his effort to achieve the optimal level.

There are no any additional benefits to enhance the punishment further when the efficient credit manager cannot receive the information rents and meanwhile he exerts effort to the optimal level. Because the increased punishment K would be fully offset by the rewards w paid to the supervisor indicating that the maximum deterrence proposed by Becker [2] is not strictly optimal and becomes invalid when the supervisor and the credit manager collude.

3.3 The Coexistence of both supervisors

The corrupt and costless supervisor provides internal supervision whereas the honest and costly one offers external supervision. Similar with the previous analysis, the probability of internal supervision is γ and K_i represents the punishment of the credit manager when the internal supervisor reveals the signal y_1. The probability of external supervision is ψ and K_e represents the punishment of the credit manager when the external supervisor reveals the signal y_2. When the report of internal supervision is y_2, v represents the probability of the existence of

external supervision. When the internal supervisor and the credit manager do collude, the internal supervisor reports the signal y_2. The collusion would be found certainly by the external supervisor, and the punishments (K_{ie}, S_i) are imposed to the credit manager and the internal supervisor, respectively. The contract problem can be represented as follows.

$$\max_{e_i,T_i,\gamma,\psi,v,w,K_j} \frac{1}{2}\{\theta_1 + e_1 - T_1 + \gamma[(1-\xi)(K_i - w) - \xi vz] + (1-\gamma)\psi[(1-\xi)K_e - z]\} + \frac{1}{2}(\theta_2 + e_2 - T_2) \quad (11)$$

$$s.t.\ T_1 - (1-\xi)[\psi(1-\gamma)K_e + \gamma K_i] \geq \frac{e_1^2}{2} \quad (12)$$

$$T_2 \geq \frac{e_2^2}{2} \quad (13)$$

$$T_2 - \frac{e_2^2}{2} \geq T_1 - \xi[\psi(1-\gamma)K_e + \gamma K_i] \quad (14)$$

$$w \geq K_i - v(K_{ie} + S_i) \quad (15)$$

The external supervision could reduce information rents of the credit manager and collusion between the internal supervisor and the credit manager. The internal supervision cannot dominate resources initially and the collusion-proof constraint can be rewritten as follows.

$$w = \max\{0, K_i - v(K^* + S_i^*)\} \quad (16)$$

Given that the bank depends on the internal supervisor to monitor the credit activities, the net profit from the external supervision v is as follows.

$$\begin{aligned}(1-\xi)(K_i - w) - \xi vz &= (1-\xi)\min\{K_i, v(K^* + S_i^*)\} - \xi vz \\ &= \min\{(1-\xi)K_i - \xi vz, v[(1-\xi)(K^* + S_i^*) - \xi z]\}\end{aligned} \quad (17)$$

It implies that the choice of v does not affect the individual rationality and incentive constraints imposed to the credit manager. When $(1-\xi)(K^* - S_i^*) - \xi z < 0$, v=0 is the optimal. Meanwhile, the best v is $v = \frac{K_i}{K^* + S_i^*}$ after considering $(1-\xi)(K^* - S_i^*) - \xi z \geq 0$.

When the probability of external supervision is positive, the cost of internal supervision would reduce to zero. The probability of external supervision is not one when q_i is observed and the internal supervision is performed, indicating that the total costs of the supervision decrease. Furthermore, ψ=0 is the best, showing that it is inefficient when the bank only depends on the high cost external supervision consistent with the results of Kofman and Lawarr´ee [4].

4 Conclusion

This study utilizes the P-S-A framework with hard-information constraint to explore the collusion between credit supervisors and credit managers. Results are presented as following. First, expected maximum deterrence is suboptimal in the presence of collusion. Increasing the credit manager's punishment raises his effort but also makes the collusion more attractive. The credit manager has motivation to offer more bribes to the supervisor and thus collusion deterrence becomes more costly. Second, the monitor of supervisor is useful for banking even though the supervisor and the credit manager could collude. Although the external supervision is effective, only depending on the costly external supervision is inappropriate. Banking would deter collusion only when the detriment is larger than the benefits. Finally, the lack of incentive compatible for supervisors would lead to lower supervisory effort and thus credit managers exert less productive effort.

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