Hitotsubashi Journal of Commerce and Management 37 (2002), pp.25-38. © Hitotsubashi University

INTERTEMPORAL RENT-SEEKING IN THE BANKING INDUSTRY AND UNDERWRITING BY COMMERCIAL BANKS

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Abstract

This paper develops an information-based banking model where the duration of lending relationships is determined endogenously. In the model, banks may use their informational advantage to extract intertemporal monopoly rents from the borrowers, which deteriorates the allocation of funds. The duration of lending relationship is affected by competition in an underwriting business and the extent of information disclosure about borrowers' quality. The paper shows that competitive pressure by the entry of banks to the underwriting business may deteriorate the allocation of funds, and that the firewall that limits informational interlinks between lending and underwriting is not necessarily welfare improving.

I. *Introduction*

The purpose of this paper is to analyze an environment with asymmetrically informed borrowers and lenders where long-term lending relationships between a bank and borrowers arise endogenously and reduce economic welfare. In the model, due to an adverse selection problem, the borrowers without any previous financial transaction must raise funds from the bank, which, in turn, exerts monitoring efforts in order to alleviate the information problem. In the course of repeated transactions with the bank, the borrowers acquire credibility, and, eventually, they get access to securities markets, where they issue bonds to obtain cheaper credit. In order to prevent their client firms going public, the banks may select imperfect rather than perfect monitoring to reduce the public exposure of information about its clients; i.e. the banks may sacrifice the current revenue for possible increases in future revenues. Due to the intertemporal rent-seeking activities by the banks, the lending relationships are likely to last for longer periods, which results in an inefficient allocation of funds, and reduces social welfare.

The duration of lending relationships as well as allocation of funds are affected by various factors. First, this paper examines effects of public exposure of information about a borrower's credibility on a lending relationship. The level of public exposure of information depends on things such as an extent of accounting information revealed to the public, information generated by credit rating agencies, etc. It is shown that greater exposure of information is not necessarily welfare improving. In fact, it is shown that with some parameter restrictions, greater exposure of information deteriorates allocation of funds, and, hence, reduces social

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welfare.

Second, effects of competition in a bond market on a lending relationship is studied. It is often argued that fund raising opportunity from a public market is likely to increase the magnitude of competition in a loan market, which, in turn, improves an allocation of funds in the loan market. Contrary to the conventional view, the current analysis shows that there exists a parameter space where competitive pressure induced by the potential fund raising opportunity from the bond market increases the duration of lending relationship and deteriorates an allocation of funds.

This paper is related to literature on costs of lending relationships. Sharpe (1990) develops a model which shows that a lending relationship arises between a bank and borrowers since the bank which made loans to a certain customer in the past knows more about the customer than other banks. He shows that banks are likely to set a lending rate lower than a competitive rate to obtain the informational advantage against other banks, and to collect monopoly rents in the future, which, in turn, allocates capitals to low quality borrowers. Rajan (1992) examines an environment where a bank has bargaining power over its client due to the information acquired in the course of lending. He shows that the firm's incentive to exert efforts for a greater return may be reduced when the bank has monopoly power over firm's profits. This paper is similar to Sharpe (1990) and Rajan (1992) in that the source of the cost of lending relationship is a bank's monopoly power over its customer firms which arises from its informational advantage over other potential financiers. However, the current analysis differs from theirs in that the level of the informational advantage is determined endogenously by banks' choice of certification standards, which, in turn, determines rents acquired by the banks and the duration of lending relationships endogenously.

This paper also relates to Diamond (1991) who examines the choice between direct borrowing and indirect borrowing through a bank that monitors borrowers' choice of projects to alleviate an information problem. In both Diamond (1991) and this paper, the shift from indirect borrowing to direct borrowing arises due to evolution of reputation acquired by the borrowers through repeated financial transactions with the bank. However, the current analysis is distinguished from Diamond's in that he highlights moral hazard by the borrowers whereas I focus on a strategic choice of certification standards by banks, which, in effect, determines the duration of lending relationships.

The current analysis also provides the implications of repealing the law separating banking and securities businesses, as regulated by the Glass-Steagall provisions of the U.S. The provisions were relaxed in 1987, and, currently, some commercial banks are permitted by the Federal Reserve to establish section 20 subsidiaries which can underwrite public securities. The model predicts that a break-down of the product-line barriers may enhance monitoring efforts exerted by banks, which results in a more efficient allocation of funds, and improves social welfare. Further, it is shown that when banks are allowed to operate both banking and securities businesses, competitive pressure induced by the entry of banks to the underwriting business does not necessarily reduce the extent of intertemporal rent-seeking activities by the banks. The result is contrary to the conventional argument that supports the break-down of the product-line barriers on the grounds that competitive pressure by new entrants would compete away excess profits obtained by securities firms.

This paper also studies welfare consequences of a firewall that limits informational links between lending and underwriting operations. Currently, section 20 subsidiaries are permitted

to underwrite public securities, yet they are subject to a strict set of firewalls that limit information, personnel, and resource interlinks between lending and underwriting operations. Though the firewalls are intended to mitigate conflicts of interest that may arise when banks are allowed to underwrite securities for firms, welfare consequences of the regulation is uncertain. The current analysis finds conditions where the firewall *is* and *is not* welfare improving. It is shown that the firewall improves social welfare when the underwriting business is either moderately competitive or moderately uncompetitive. Further, this paper shows that the firewall adversely affects the allocation of funds when the underwriting business is either very competitive or very uncompetitive.

The rest of the paper is organized as follows. Section 2 presents the model and shows that the intertemporal rent-seeking activities exerted by banks may make lending relationships last longer and reduce economic welfare. Effects of competition in an underwriting business and public exposure of information on a lending relationship are also explored. Section 3 extends the intertemporal rent-seeking model developed in Section 2 and studies the welfare implications of separating banking and securities operations. Welfare consequences of a firewall that limits informational interlinks between lending and underwriting operations are also examined. Section 4 discusses tentative extensions of the current analysis and concludes the paper.

II. *The Model*

1. The Environment

The following analysis builds upon the model developed by Diamond (1991). The model has two dates ($t=1, 2$). There are four risk neutral agents; lenders, borrowers, banks and securities firms. Each lender receives one unit of non-consumable input as an endowment at the beginning of each period. A lender can invest his endowment either by lending to a borrower or by storing it himself. The lender has access to a constant returns to scale technology for storing the endowment within a period, converting it to a perishable consumption good at the end of the period. The storage technology returns Q units of consumption good for a unit of input.

The borrowers receive no endowment. However, there are two kinds of projects available to the borrowers. The borrowers must raise funds from the lenders in order to operate their projects. Every project requires one unit of input. Let N_t be population of the potential borrowers in period t. For simplicity, it is assumed that $N_1=1$.

There are two types of borrowers: S-type and R-type. The proportion of S-type (R-type, respectively) in period t is given by $\pi_t \in [0, 1]$ ($1-\pi_t$, respectively). Every borrower has access to a constant returns to scale technology whose kind is associated with her type. An S-type has access to a safe project which returns H units of consumption good for a unit of input, while an R-type has access to a risky project which returns L units of consumption good with probability λ and returns zero with probability $1-\lambda$ for a unit of input. In other words, R-type borrowers fail to repay their debt obligations and go bankrupt with probability $1-\lambda$. The rate of returns, H and L, and the default rate, λ, are public information. The exact type of borrower, on the other hand, is private information. Each borrower knows her type, but the lenders cannot identify the borrower's type. Banks are able to detect the type of borrower if

they exert monitoring efforts. Monitoring by the banks is described in detail later.

To introduce an adverse selection problem into the current analysis, the following assumption is essential:

Assumption 1 $\lambda L < Q < H < L$

Two implications follow Assumption 1. First, $H < L$ states that R-types have an incentive to imitate S-types' action since S-types have a lower reservation value than R-types; namely, S-types cannot contract upon a lending rate above H, while R-types can contract upon a lending rate above H as long as the rate is lower or equal to L. Second, $\lambda L < Q < H$ states that the lenders may have an incentive to detect R-types because the rate of return of S-types' project is higher than that of storage technology and the rate of return of storage technology is higher than that of R-types' project in expected terms.

It is assumed that the borrowers own no capital and that they need to raise funds either by borrowing from banks or by issuing corporate bonds in a public market. When borrowers raise funds by borrowing from banks, the banks undertake monitoring efforts to ascertain the borrower's type. It is assumed that the monitoring effort is costless for simplicity's sake. The monitoring effort in period t is denoted by $\phi_t \in [0, 1]$. If ϕ_t is chosen by a bank, it detects a fraction ϕ_t of potential R-type borrowers in period t. Hence, ϕ_t can be interpreted as bank's certification standards. Further, when borrowers raise funds by borrowing from a bank, terms of loan contracts are determined by bilateral negotiation between the bank and borrowers. I consider a polar situation where banks have all the bargaining power against the borrowers and extract all the surplus from the borrowers. This is a simplifying assumption which enables us to study an interesting situation where firms with a high credit rating obtain cheeper credits by issuing bonds. The following results should not be changed in any substantive way even if the bargaining position were set differently.

In the following analysis, default history and the initial proportion of S-types, π_1, are public information, while credit history is not. In particular, lenders can identify only a fraction $\theta \in [0, 1]$ of R-types who could not raise funds from banks in the past. The assumption is intended to capture the fact that banks send imperfect signal about borrowers' quality to investors as suggested by empirical works by James (1987) and Lummer and McCommell (1989). The level of θ depends on the extent of public exposure of accounting information about the borrowers, information production abilities of credit rating agencies, etc.

Assumption 2 $\pi_1 < \{(1+\gamma)Q - \lambda H\}/\{(1-\lambda)H\} \equiv \bar{\pi}$

The assumption states that the proportion of S-types in period 1, π_1, is so small that the return from investing in the storage technology, Q, exceeds the return from investing to borrowers via a public market, $\pi_1 H + (1-\pi_1)\lambda H - \gamma Q$. In other words, the borrowers' credit ratings are very low so that they cannot issue bonds in period 1; i.e. they must borrow from banks to raise funds in period 1. The RHS of the inequality in Assumption 2 is defined as $\bar{\pi}$.

For simplicity, assume that the population of lenders is greater than that of borrowers. Recall that every lender is endowed with one unit of input and every borrower needs one unit of input to undertake her investment project. Hence, there is excess supply of funds in the loan market, and the banks can raise funds from the lenders at a cost of Q for each unit of input, i.e. the reservation value of the lenders. The securities companies are also able to sell bonds to

the lenders with a gross rate of return equal to Q.

When the borrowers issue corporate bonds, securities companies underwrite the bonds, and they charge γQ, where $\gamma \in [0, \gamma^{max}]$, for a unit of the fund as an underwriting fee. (γQ is used as an underwriting fee instead of a single variable for computational simplicity.) $\gamma^{max}Q$ is the maximum underwriting fee that securities firms can charge to the borrowers. Since the S-types are willing to pay up to $H-Q$ to the securities firms, $\gamma^{max}Q=H-Q$. The underwriting fee is paid to the securities companies from the security proceeds raised in the market. A borrower's cost of raising a unit of fund from the bond market is $(1+\gamma)Q$ when a borrower is an S-type and the type is known perfectly to an underwriter. When the underwriter cannot tell the exact type of the borrower, the cost is $(1+\gamma)Q$ plus a risk premium. The risk premium is assumed to be determined in the way the rate of return to the lenders is Q in expected terms. (Note that the underwriting fee is paid to the securities companies up front the securities proceeds. Therefore, the securities companies obtain γQ with certainty.) The level of γ depends on the level of competition in the bond underwriting business; i.e. a smaller γ (a greater γ, respectively) is associated with greater competition (less competition) in the bond underwriting business.

2. Equilibrium: Intertemporal Rent-Seeking by Banks

The rest of this paper examines decision problems of a representative bank. In the environment described above, if lending relationships last for one period only (i.e. only in period 1), the bank's payoff, $U_1(\phi_1)$, is given by

$$U_1(\phi_1)=\{\pi_1+(1-\pi_1)(1-\phi_1)\lambda\}H-\{\pi_1+(1-\pi_1)(1-\phi_1)\}Q \tag{1}$$

The expression in the first bracket represents the population of the borrowers who repay their debt obligations. Note that the bank offers H to the borrowers. Therefore, the first term of the RHS of (1) is the total revenue to the bank. The expression in the second bracket represents the population of borrowers who obtained funds from the bank. Hence, the second expression of the RHS of (1) is the total cost to the bank.

If the lending relationships last for two periods (i.e. period 1 and period 2), the bank's payoff, $U_2(\phi_1, \phi_2)$, is given by

$$\begin{aligned} U_2(\phi_1, \phi_2)=&\{\pi_1+(1-\pi_1)(1-\phi_1)\lambda\}H-\{\pi_1+(1-\pi_1)(1-\phi_1)\}Q \\ &+\beta N_2[\{\pi_2+(1-\pi_2)(1-\phi_2)\lambda\}H \\ &-\{\pi_2+(1-\pi_2)(1-\phi_2)\}Q] \end{aligned} \tag{2}$$

where $\beta \in (0, 1)$ is the bank's discount factor and N_2 is the population of potential borrowers in period 2 (i.e. those who obtained funds and did not default in period 1) which is given by:

$$N_2=1-(1-\pi_1)\{\phi_1+(1-\phi_1)(1-\lambda)\}$$

π_2 in (2) is the proportion of S-type borrowers in period 2, which is given by:

$$\pi_2(\phi_1)=\frac{\pi_1}{N_2}$$
$$=\frac{\pi_1}{1-(1-\pi_1)\{\phi_1+(1-\phi_1)(1-\lambda)\}}$$
$$=\frac{\pi_1}{1-(1-\pi_1)(1-\lambda+\lambda\phi_1)}$$

The first two terms in (2) are the revenue and the cost to the bank in period 1. The last term multiplied by β is the present value of the net revenue to the bank in period 2. π_2 is a decreasing function of ϕ_1, and, hence, it is expressed as $\pi_2(\phi_1)$.

Since there is no point in choosing $\phi_t<1$ in the last period of lending relationships, the bank chooses $\phi_1=1$ for $U_1(\phi_1)$ and $\phi_2=1$ for $U_2(\phi_1, \phi_2)$. Hence, the expressions of the bank's payoff are reduced to the following:

$$U_1=\pi_1(H-Q)$$
$$U_2(\phi_1)=\{\pi_1+(1-\pi_1)(1-\phi_1)\lambda\}H$$
$$-\{\pi_1+(1-\pi_1)(1-\phi_1)\}Q+\beta\pi_1(H-Q)$$

$U_1(\phi_1)$ ($U_2(\phi_1, \phi_2)$, respectively) is expressed as $U_1(U_2(\phi_1)$, respectively) since $U_1(\phi_1)$ ($U_2(\phi_1, \phi_2)$, respectively) is no longer a function of $\phi_1(\phi_2$, respectively).

The following proposition is now ready to be shown:

Proposition 1 *The banks may reduce the level of monitoring efforts (regardless of the fact that it is costless) in order to collect intertemporal monopoly rents by making the lending relationships last for more than one period.*

To verify the proposition, it is sufficient to show that there exists $\phi_1\in[0, 1)$ such that $U_2(\phi_1)>U_1$ and $\pi_2(\theta\phi_1)<\bar{\pi}$ where $\pi_2(\theta\phi_1)$ is the lenders' prior probability that a borrower is an S-type. $U_2(\phi_1)>U_1$ states that the bank prefers to keep the lending relationship with the firm for two periods, while $\pi_2(\theta\phi_1)<\bar{\pi}$ says that the firm cannot raise funds from the public market in period 2 when the bank chooses ϕ_1 as the monitoring level in period 1. Subtracting U_1 from $U_2(\phi_1)$ yields:

$$U_2(\phi_1)-U_1=(1-\phi_1)(1-\pi_1)(\lambda H-Q)+\beta\pi_1(H-Q) \tag{3}$$

where the first term of the RHS of (3) is the cost of extending the lending relationships, and the second term is the benefit from extending the lending relationships. Hence, it is necessary for ϕ_1 to satisfy the following:

$$\phi_1>1-\frac{\beta\pi_1(H-Q)}{(Q-\lambda H)(1-\pi_1)} \tag{4}$$

ϕ_1 also needs to satisfy

$$\pi_2(\theta\phi_1)<\bar{\pi}=\frac{(1+\gamma)Q-\lambda H}{(1-\lambda)H} \tag{5}$$

Solving (5) for ϕ_1, we obtain

$$\phi_1 < \frac{1}{\lambda}\left(\frac{\bar{\pi}-\pi_1}{\bar{\pi}(1-\pi_1)}+\lambda-1\right)\cdot\frac{1}{\theta} \tag{6}$$

It is straightforward to show that there exists $\phi_1 \in [0, 1)$ satisfying both (4) and (6) for a sufficiently large β.[1]

The result obtained in Proposition 1 is different from the existing literature in that previous works explore benefits of bank financing whereas this paper studies a cost of bank financing.[2]

Note that the optimal level of monitoring effort, ϕ_1^*, maximizes $U_2(\phi_1)-U_1$. By Assumption 1, (3) indicates that $U_2(\phi_1)-U_1$ is decreasing in ϕ_1. Hence, by (6), the optimal level of monitoring effort is given by

$$\phi_1^* = \frac{1}{\lambda}\left(\frac{\bar{\pi}-\pi_1}{\bar{\pi}(1-\pi_1)}+\lambda-1\right)\frac{1}{\theta}-\epsilon \tag{7}$$

where ϵ is a infinitesimally small value. The following propositions are in order.

Proposition 2 *There exists γ^* such that ϕ_1^* is increasing in γ for $\gamma \in [\gamma^*, \gamma^{max}]$, and $\phi_1^*=1$ for $\gamma \in [0, \gamma^*)$.*

In the rest of this paper, it is assumed that the bank chooses perfect monitoring when perfect monitoring and imperfect monitoring are indifferent to the bank. An alternative assumption should not change the following results. Substituting (5) into (7), it is easy to see $\partial\phi_1^*/\partial\gamma > 0$. The intuition is as follows. A greater γ makes it more costly for the borrowers to issue bonds, and, hence, the borrowers are more likely to rely on bank loans as the source of financing. In this situation, it becomes less costly for the bank to have a long-term lending relationship; i.e. the bank can choose greater monitoring efforts in period 1 and still capture its client in period 2. When γ is sufficiently small, however, ϕ_1^* becomes very small and it breaks the inequality in (4). Namely, as γ gets smaller, it becomes easier for borrowers to issue bonds and raise funds from a public market, and it becomes more costly for the bank to maintain a long-term lending relationship. Therefore, for a sufficiently small γ, the bank is likely to choose a short-term lending relationship and, hence, perfect monitoring. The proposition implies that (i) if an underwriting business is very competitive(i.e. $\gamma \in [\gamma^*, \gamma^{max}]$), banks choose perfect monitoring and, hence, funds are allocated efficiently, and (ii) if the underwriting business is not very competitive (i.e. $\gamma \in [0, \gamma^*)$), a greater competition in the underwriting business induces the bank to choose a lower intensity of monitoring activities, or, alternatively, a lower certification standard.

Proposition 3 *There exists θ^* such that ϕ_1^* is decreasing in $\theta \in (0, \theta^*)$, and $\phi_1^*=1$ for $\theta^* \in [\theta^*, 1]$ and $\theta=0$.*

It is immediate from (7) that ϕ_1^* is decreasing in θ. The intuition behind the proposition is as follows. When more precise information about borrowers' credibility is exposed to lenders, it becomes easier for borrowers to raise funds in a public market. Hence, if public exposure of

[1] For example, $\beta=0.9$, $\gamma=0.2$, $\theta=1$, $\lambda=0.7$, $Q=4$, $H=5$, $L=5.5$, and $\pi_1=0.2$ satisfy Assumption 1 and 2, and these parameter values are sufficient for the existence of π_1 satisfying (4) and (6).

[2] Sharpe (1990) and Rajan (1992) are exceptions as explained in the introduction.

information is high (i.e. $\theta^* \in [\theta^*, 1]$), banks must reduce the level of monitoring efforts in order to extend the duration of lending relationships and collect rents for longer periods. When θ is very low (i.e. $\theta=0$), however, the inequality in (4) does not hold any longer, and, hence, the banks choose perfect monitoring. It is because when a level of information disclosure is sufficiently high, the cost of reducing the monitoring efforts (i.e. the loss of current revenues due to imperfect monitoring) outweighs the benefit (i.e. the gain from extending the duration of lending relationships). When $\theta=0$, no information about borrowers is exposed to the public. In this case, the banks choose perfect monitoring, lending relationships last for two periods, and funds are allocated efficiently.

III. *Welfare Implications of Separating Banking and Securities Business Operations*

1. An Economy with a Firewall

The United States and Japan have been one of the few industrial countries where banking and securities businesses were legally separated. The Glass-Steagall provisions of the Banking Act of 1933 in U.S. and Article 65 of the Securities and Exchange Law of Japan (enacted in 1948) prohibited commercial banks from underwriting corporate securities concerning that combining lending and underwriting operations would result in potential conflicts of interest. However, the Glass-Steagall provisions were relaxed in 1987, and, currently, some banks are permitted by the Federal Reserve to establish section 20 subsidiaries which can underwrite public securities. In Japan, the Financial System Reform Law enacted in 1993 currently allows commercial banks to operate securities businesses through bank-owned subsidiaries.

Though the regulatory changes may have substantial effects on social welfare, few theoretical analysis have been provided.[3] This section analyzes impacts of deregulating the legal separation of banking and securities operations on lending relationships and an allocation of funds by two steps; first, I explore an environment where commercial banks are subject to a firewall, and, second, an environment where they are free from the firewall.

For now, assume that there exists a firewall which limits the informational interlinks between lending and underwriting operations; namely, information produced in the course of lending operations is not reusable when a bank underwrites corporate bonds.

When a bank can operate both banking and securities business, its payoff is given by

$$\overline{U}_1 \equiv \pi_1(H-Q)+\beta\delta\gamma Q\pi_1 \tag{8}$$

if the lending relationships last for one period, where $\delta \in [0, 1]$ is a bank's share in a bond underwriting business. The first term of the RHS of (8) is the return from lending in period 1, while the second term is the return from underwriting operation in period 2. The level of δ depends on how close a relationship between the bank and its customer; i.e. a tighter

[3] Puri (1996) and Kanatas and Qi (1998) are exceptions. Puri (1996) studies effects of combining lending and underwriting operations on the pricing of underwritten securities. Kanatas and Qi (1998) examines an environment where commercial banks face the conflict of interests when they are allowed to underwrite public securities. The cost that stems from the conflict of interests is weighed against the benefit from scope economies in combined lending and underwriting, and they find conditions under which regulatory separation of lending and underwriting is optimal.

relationship is associated with higher δ. δ also depends on the difference between distributional abilities of banks and those of securities firms. For example, right after the granting of debt underwriting powers, banks may not have good distributional channels to underwrite new issues. In such a case, δ should be small.

If lending relationships last for two periods, the bank's payoff is given by

$$\begin{aligned}\overline{U}_2(\phi_1) \equiv & \{\pi_1+(1-\pi_1)(1-\phi_1)\lambda\}H \\ & -\{\pi_1+(1-\pi_1)(1-\phi_1)\}Q+\beta\pi_1(H-Q)\end{aligned} \tag{9}$$

The first term minus the second term of the RHS of (9) represents the net revenue from lending in period 1, and the third term is the net revenue from lending in period 2.

The following propositions are ready to be verified:

Proposition 4 *There exists* $\underline{\gamma}^{**}>\gamma^*$ *such that* $\phi_1^*=1$ *for* $\gamma\in[0, \underline{\gamma}^{**}]$.

For a lending relationship to last for two periods, it is necessary that the following condition holds:

$$\overline{U}_2(\phi_1)-\overline{U}_1>0 \tag{10}$$

(10) says that the payoff to a universal bank is greater when a lending relationship lasts for two periods than when it lasts for one period only. Substituting (8) and (9) into (10), and rearranging it yields

$$(1-\phi_1)(1-\pi_1)(\lambda H-Q)+\beta\pi_1(H-Q)-\beta\delta\gamma Q\pi_1>0 \tag{11}$$

Solving (11) for ϕ_1 yields

$$\phi_1>1-\frac{\beta\pi_1(H-Q)}{(Q-\lambda H)(1-\pi_1)}+\frac{\beta\delta\gamma Q\pi_1}{(Q-\lambda H)(1-\pi_1)} \tag{12}$$

The lending relationship lasts for two periods if there exists ϕ_1^* (the optimal level of monitoring activities given by (7)) that satisfies both (6) and (12). Recall that (4) and (6) need to be satisfied for a lending relationship to last for two periods when banks are not allowed to underwrite bonds. Since the RHS of (12) is greater than the RHS of (4), and ϕ_1^* is increasing in γ, the inequality in (12) is less likely to be satisfied than the inequality in (4) for sufficiently large γ, which, in turn, implies that $\underline{\gamma}^{**}$ defined in Proposition 4 is greater than γ^* defined in Proposition 2. Hence, the proposition is verified.

The proposition indicates that if an underwriting business is relatively competitive (i.e. for $\gamma\in[0, \underline{\gamma}^{**}]$), the lending relationship is more likely to last for a long-term when banks are prohibited to underwrite bonds than when they are not. The rationale for Proposition 4 is as follows. When banks cannot underwrite bonds, they must reduce the level of monitoring activities and give up a fraction of revenues from lending in period 1 in order to have long-term lending relationships with borrowers. When banks are allowed to underwrite bonds, however, they must give up not only a fraction of current revenues from lending operations but also potential future revenues from underwriting operations. Hence, it is more costly for universal banks to have long-term lending relationships than it is for banks that are not permitted to underwrite bonds. Therefore, when banks are allowed to underwrite bonds, lending relationships are more likely to last for longer duration, and funds are allocated more efficiently for

$\gamma \in [0, \underline{\gamma}^{**}]$.

Note that the third term of the RHS of (12) is increasing in δ; i.e. the inequality in (12) is more restrictive for greater γ. This implies that if a bank is allowed to underwrite bonds, the lending relationship is more likely to last for a short term and social welfare is more likely to be improved when the bank has closer ties with its client firms. The result is rather surprising since close ties between a bank and its client is often associated with a long-term lending relationship.

Proposition 5 *There exists* $\overline{\gamma}^{**}$ $(>\underline{\gamma}^{**})$ *such that* $\phi_1^*=1$ *for* $\gamma \in [\overline{\gamma}^{**}, \gamma^{max}]$, *and* $\phi_1^*=1$ *is increasing in* γ *for* $\gamma \in [\underline{\gamma}^{**}, \overline{\gamma}^{**}]$.

Recall that $\gamma^{max} \cdot Q = H - Q$. Since the first term of the LHS in (11) is negative by Assumption 1, and γQ can be as great as $H-Q$, the inequality in (11) does not hold for sufficiently large γ and δ, implying that the universal bank chooses $\phi_1^*=1$ for sufficiently large γ. $\phi_1^*=1$ is increasing in γ for $\gamma \in [\underline{\gamma}^{**}, \overline{\gamma}^{**}]$ since $\partial \phi_1^* / \partial \gamma > 0$ holds for $\phi_1^* < 1$. (See equation (7).) Hence, the proposition is verified.[4]

Proposition 5 indicates that when banks are allowed to underwrite bonds and an underwriting business is not competitive, the banks select perfect monitoring, lending relationships last for one period only, and funds are allocated efficiently. The intuition is simple. If the revenue from underwriting is substantial, it is costly for a universal bank to give up the revenue and extend the duration of lending relationship. Therefore, the universal bank chooses $\phi_1^*=1$ for sufficiently large γ.

It was shown in the last section (see Proposition 2) that when banks are not allowed to underwrite bonds and an underwriting business is not competitive, they do not select perfect monitoring, lending relationships last for two periods, and funds are not efficiently allocated. Hence, the current analysis predicts that allowing banks to operate underwriting businesses improves social welfare when the underwriting market is not competitive (i.e. for $\gamma \in [\overline{\gamma}^{**}, \gamma^{max}]$).

The current result also gives an insight into the issue of the financial system design of developing countries and transitional economies such as China and former Communist countries.[5] Presumably, securities markets in less developed countries and transitional economies may be less competitive than those in developed countries. The result in this section suggests that the societal welfare of nascent economies may be improved by the entry of banks to securities businesses all the more because the securities markets are not competitive in those economies.

So far, it has been implicit that the entry of commercial banks does not increase competition in the underwriting business. An interest question would be: Does the competitive pressure induced by the entry of commercial banks improve social welfare? To answer the question, let γ_1 be the level of competition in an underwriting business prior to the entry of commercial banks, γ_2 be the level of competition after the entry of commercial banks, and ϕ_1^* and ϕ_2^* be the optimal level of monitoring efforts associated with γ_1 and γ_2 *when banks are allowed to underwrite corporate bonds*. It is assumed that $\gamma_1 > \gamma_2$ holds due to the competitive

[4] Technically, universal banks select $\phi_1^*=1$ for γ in two separate intervals since $\partial \phi_1^* / \partial \gamma > 0$, $\partial^2 \phi_1^* / \partial \gamma^2 < 0$, and the RHS of (12) is linear and increasing in γ. Therefore, parameter values being properly chosen, (7) intersects with (12) twice for $\gamma \in [0, \gamma^{max}]$.

[5] See Aoki (1994) for the issue of financial system design of transitional economies.

pressure induced by the entry of commercial banks to the underwriting business. γ_1 can also be interpreted as the level of competition after the entry of commercial banks when the competitive pressure by the new entrants is negligible.

Now, the following definition is made:

Definition 1 *Competitive pressure induced by the entry of commercial banks to the underwriting business is welfare improving if* $\phi_1^* < \phi_2^*$ *holds.*

Given Definition 1, the following proposition is immediate from Proposition 4 and Proposition 5.

Proposition 6 *Competitive pressure induced by the entry of commercial banks is welfare improving for* $\{(\gamma_1, \gamma_2) : \gamma_1 \in [\underline{\gamma}^{**}, \overline{\gamma}^{**}], \gamma_2 \in [0, \underline{\gamma}^{**})\}$, *while it reduces social welfare for* $\{(\gamma_1, \gamma_2) : \gamma_1 \in [\underline{\gamma}^{**}, \overline{\gamma}^{**}], \gamma_2 \in [\underline{\gamma}^{**}, \overline{\gamma}^{**}]\}$ *and* $\{(\gamma_1, \gamma_2) : \gamma_1 \in [\overline{\gamma}^{**}, \gamma^{max}], \gamma_2 \in [\underline{\gamma}^{**}, \overline{\gamma}^{**}]\}$.

Note that the break-down of product-line barriers is often supported on the grounds that competitive pressure by new entrants (i.e. commercial banks) would compete away excess profits obtained by securities firms.[6] Contrary to the conventional view, the current result argues that competitive pressure induced by the entry of commercial banks may reduce the level of monitoring efforts exerted by the banks, and, hence, deteriorates the allocation of funds.[7]

2. An Economy without a Firewall

Next, suppose that a firewall that limits the informational interlinks between lending and underwriting is not binding; i.e. a securities division/affiliate of a bank can take advantage of the information produced by the bank in the course of lending operations. This subsection explores conditions under which the firewall *is* and *is not* welfare improving.

Theorem 1 *Suppose that a lending relationship lasts for one period only. Then, given* $0 < \delta < 1$ *and* $\gamma > 0$, *the universal bank chooses* $\phi_1^* = 1$ *when the firewall is binding, while it chooses* $\phi_1^* < 1$ *when the firewall is not binding.*

The theorem says that if the firewall is not binding, some R-type borrowers obtain loans from the universal bank in period 1, and some R-types raise funds by issuing bonds in period 2, while if the firewall is binding, no R-type borrower can raise funds both in period 1 and period 2, and, hence, the economy achieves the first best allocation of funds.

The theorem holds for the following reason. If universal banks are subject to the firewall, they choose the highest level of monitoring efforts (i.e. $\phi_1^* = 1$) since their choice when they operate lending activities in period 1 does not affect their revenues from underwriting operations in period 2. If the universal banks are not subject to the firewall, all the information obtained by the universal banks through lending operations can be reusable when they underwrite bonds, whereas only a fraction of the information is exposed to securities firms that already exist in the underwriting business. In such an environment, the universal banks have

[6] See Benston (1990), Litan (1987) and Rajan (1996) for example.

[7] If $[\underline{\gamma}^{**}, \overline{\gamma}^{**}]$ is a null set, the universal bank always chooses perfect monitoring. However, the current result does not support the conventional view since in such case, the universal bank selects perfect monitoring even without an increase in the level of competition in the underwriting business.

an incentive to reduce the level of monitoring activities in period 1 (i.e. $\phi_1<1$ should be chosen) so that they obtain informational advantage over securities firms, which, in turn, enables the universal banks to informationally capture their client firms when they issue bonds. In particular, the universal banks reduce the level of monitoring efforts by very small amount, say ϵ. Then, the securities firms must charge a greater risk premium than the universal banks do, which induces borrowers to choose the universal banks as an underwriter. (Recall that the risk premium is determined in a way the rate of return to lenders is set at the rate of return from investing in the storage technology in expected terms.) Note that we can always find a small ϵ with which the net revenue of reducing the level of monitoring activities for the universal bank is positive provided that the share of a universal bank in an underwriting market, δ, and the rate of underwriting fee, γ, satisfy $0<\delta<1$ and $\gamma>0$.[8] Hence, the theorem is verified.

Proposition 7 *Given* $0<\delta<1$, *there exist* $\underline{\gamma}^{***}>\underline{\gamma}^{**}$ *and* $\overline{\gamma}^{***}<\overline{\gamma}^{**}$ *such that* $\phi_1^*=1-\epsilon$ *for* $\gamma\in(0, \underline{\gamma}^{***}]\cup[\overline{\gamma}^{***}, \gamma^{max}]$ *and* ϕ_1^* *is increasing in* γ *for* $\gamma\in(\underline{\gamma}^{***}, \overline{\gamma}^{***})$.

The proof of Proposition 7 follows exactly the proofs of Proposition 4 and Proposition 5, except $\underline{\gamma}^{***}>\underline{\gamma}^{**}$ and $\overline{\gamma}^{***}<\overline{\gamma}^{**}$ need to be shown. To verify the proposition, let $\overline{\overline{U}}_1$ be the payoff to the representative universal bank if lending relationships last for one period, and $\overline{\overline{U}}_2$ be the payoff to the representative universal bank if lending relationships last for two periods. Then, $\overline{\overline{U}}_1$ and $\overline{\overline{U}}_2$ are given by the following expressions:

$$\overline{\overline{U}}_1(\phi_1)=\{\pi_1+(1-\pi_1)(1-\phi_1)\lambda\}H -\{\pi_1+(1-\pi_1)(1-\phi_1)\}Q+\beta\delta(\phi_1)\gamma Q\pi_1 \tag{13}$$

$$\overline{\overline{U}}_2(\phi_1)=\{\pi_1+(1-\pi_1)(1-\phi_1)\lambda\}H -\{\pi_1+(1-\pi_1)(1-\phi_1)\}Q+\beta\pi_1(H-Q) \tag{14}$$

The first two terms in (13) and (14) represent net revenues from lending operations in period 1, while the third term in (13) is the revenue from underwriting operations in period 2, and the third term in (14) is the net revenue from lending operations in period 2. Note that δ in (13) is now a function of ϕ_1, and, hence, $\overline{\overline{U}}_1$ is a function of ϕ_1. In particular, $\delta(\phi_1)=1$ for $\phi_1<1$ since the universal bank informationally captures its clients that issue bonds when $\phi_1<1$ is chosen, and $\delta(\phi_1)=\delta$ for $\phi_1=1$. By Theorem 1, however, the universal bank chooses $\phi_1<1$ when lending relationships last for one period only. In particular, the universal bank chooses $\phi_1=1-\epsilon$ where ϵ is a infinitesimally small value. Hence, $\overline{\overline{U}}_1(\phi_1)$ in (13) is approximated by

$$\overline{\overline{U}}_1(\phi_1)=\pi_1(H-Q)+\beta\gamma Q\pi_1 \tag{15}$$

Subtracting (15) from (14) yields

$$\overline{\overline{U}}_2(\phi_1)-\overline{\overline{U}}_1(\phi_1)=U_2(\phi_1)-U_1-\beta\gamma Q\pi_1 \tag{16}$$

where $U_2(\phi_1)-U_1$ is given by (3). It is immediate from (11) and (16) that $\overline{\overline{U}}_2(\phi_1)-\overline{\overline{U}}_1(\phi_1)>\overline{U}_2(\phi_1)-\overline{U}_1$, implying that lending relationships are more likely to last for a long term when the firewall is binding than when it is binding. (ϕ_1's in $\overline{\overline{U}}_2(\phi_1)$, $\overline{\overline{U}}_1(\phi_1)$ and $\overline{U}_2(\phi_1)$ are not necessarily the same value since they are chosen in order to maximize the bank's revenue in

[8] If δ and/or γ is zero, the universal bank's revenue from underwriting operations is zero for any level of monitoring efforts. Therefore, the universal bank chooses perfect monitoring if δ and/or γ is zero.

each case.) Therefore, $\overline{\gamma}^{***} < \overline{\gamma}^{**}$ and $\underline{\gamma}^{***} > \underline{\gamma}^{**}$ hold.

Proposition 7 indicates that welfare consequences of the firewall that limits informational interlinks between lending and underwriting operations depend on the level of competition in an underwriting business. In particular, the proposition predicts that (i) societal welfare is improved by an enforcement of the firewall for $\gamma \in (\underline{\gamma}^{**}, \underline{\gamma}^{***}] \cup [\overline{\gamma}^{***}, \overline{\gamma}^{**})$, and (ii) societal welfare is deteriorated by the enforcement of the firewall for $\gamma \in [0, \underline{\gamma}^{**}] \cup [\overline{\gamma}^{***}, \gamma^{max}]$. In words, societal welfare is improved when the underwriting business is either moderately competitive or moderately uncompetitive, whereas societal welfare is deteriorated when the underwriting business is either very competitive or very uncompetitive.

The intuition behind the proposition is as follows. Due to an economy of scope that arises from reusability of information between lending and underwriting operations, the universal bank earns greater revenues from underwriting operations when the firewall is not binding than when it is binding. Therefore, it is more costly for the universal bank to have a long-term lending relationship with its customer firm when the firewall is not binding than when it is. Hence, when the universal bank is subject to the firewall, it is more likely to choose a short-term lending relationship (in particular, for $\gamma \in (\underline{\gamma}^{**}, \underline{\gamma}^{***}] \cup [\overline{\gamma}^{***}, \overline{\gamma}^{**})$), and funds are allocated more efficiently. The economy of scope, however, does not provide the universal bank with an informational advantage over other underwriters if it selects perfect monitoring in period 1 since all the information produced by the universal bank in the course of lending operations is exposed to the public. Hence, as explained earlier following Theorem 1, the universal bank always chooses imperfect monitoring in period 1 in order to obtain the informational advantage over other intermediaries. Therefore, even if the universal bank choose short-term lending relationships, a fraction of risky borrowers obtain loans when the firewall is not binding, while no risky borrowers obtain loans when the firewall is binding.

IV. *Concluding Remarks*

A model has been established to explain the welfare implications of intertemporal rent-seeking activities by banks. The main point of the current analysis has been that banks may strategically use their informational advantage over investors and other financial intermediaries in order to extract intertemporal monopoly rents from borrowers. The main results obtained in the current analysis are as follows:

(1) Due to the intertemporal rent-seeking activities by banks, lending relationships between banks and borrowers may last longer, which results in an inefficient allocation of funds, and reduces social welfare.

(2) Competition in an underwriting business deteriorates allocation of funds and reduces social welfare when the underwriting business is relatively uncompetitive.

(3) Disclosure of information about borrowers' quality may deteriorate allocation of funds.

(4) An economy is more likely to achieve the first best allocation of funds when banks are allowed to underwrite corporate bonds than when they are prohibited to do so. In particular, if the underwriting business is not competitive, funds are allocated efficiently when banks are allowed to underwrite bonds, while the allocation is not efficient when they cannot underwrite bonds.

(5) If banks are allowed to underwrite bonds, the allocation of funds is more likely to be deteriorated when the banks have closer ties with their client firms.

(6) The enforcement of a firewall that limits informational interlinks between lending and underwriting operations improves social welfare when the underwriting business is either moderately competitive or moderately uncompetitive. The firewall deteriorates the allocation of funds when the underwriting business is either very competitive or very uncompetitive.

There are a few ways to extend the current analysis. First, the current analysis could be extended to permit firms to borrow from banks and issue bonds simultaneously. It would enable us to study effects of allowing banks to underwrite securities on firms' choice of a debt structure.

Second, this paper presents decision problems of a representative bank, and abstracts from heterogeneity of banks in various aspects. An interesting question would be: Why are some banks willing to underwrite public securities while others are not? A possible extension of the current model could be to introduce more than one types of commercial banks (that are different in sizes of loans, for example), which might give rise to incentives of banks to underwrite public securities and a different set of conditions for an efficient allocation of funds. A more fully specified model needs to be developed to discuss these issues.

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