Relationship banking, deposit insurance and bank portfolio choice

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1 Introduction

The purpose of this paper is to examine the consequences of interbank competition and bank–capital market competition on the portfolio choices of banks and the welfare of borrowers in a regulatory environment of (*de facto*) complete deposit insurance. Our focus is on an industry characterized by 'relationship banking', i.e. a setting involving repeated, bilateral credit transactions between banks and borrowers. A key feature of relationship banking is the intertemporal accumulation of proprietary borrower-specific information in the hands of the bank, and the consequent creation of informational rents (see Sharpe, 1990). To the extent that these rents are shared by the bank and the borrower, *both* parties see a value in continuing their relationship. The desire to protect such relationships affects the bank's asset portfolio choice.

A second factor that affects the bank's asset portfolio choice is deposit insurance. As is well known, risk-insensitive deposit insurance pricing induces socially wasteful risk taking by banks (see Merton, 1977).[1] Partially mitigating this fondness for risk is the threat of bank charter termination by the insurer, but this threat is effective only if bank charters are sufficiently valuable (see Chan, Greenbaum and Thakor, 1992).[2] We show that relationship banking provides one source of value for the bank charter.[3] Relationship banking diminishes in value, however, as the banking industry becomes more competitive, so that increased interbank competition accentuates the attractiveness of risk pursuit initially engendered by deposit insurance. The same holds true for increased competition from the capital market.

This framework provides a useful cognitive link between bank market structure, the capital market, relationship banking, deposit insurance and bank portfolio choice. It thus allows us to explore simultaneously a rich set of issues related to the consequences of relaxing barriers to entry into banking and improving borrowers' access to the capital market. We are particularly interested in the manner in which deregulated entry into banking impinges on *borrower* welfare.

The question of optimal market structure in banking has dominated regulatory thinking (especially in the US) for decades. Prior to 1980, the focus in the US was on safety and thus bank charters were issued rather selectively. As a result, despite the presence of numerous banks owing to interstate and intrastate branching restrictions, the banking industry in the US was an oligopoly like its counterparts in Canada, Japan, the UK, etc. Since then, however, the focus has shifted to the virtues of competition, and entry restrictions have been relaxed. The putative rationale for this regulatory shift is that borrowers and savers are made better off by increased interbank competition.

This assertion was formally verified by us using a spatial model of oligopolistic banking (see Besanko and Thakor, forthcoming). We showed that increased competition would make depositors and borrowers better off and banks' shareholders worse off. However, that model did not analyse potentially interesting interactions between the bank's portfolio choice and the market structure of the banking industry. Moreover, the static nature of the model precluded consideration of relationship banking issues.

In this paper we show that this conventional wisdom is not quite correct when the impact of market structure on banks' portfolio choices is accounted for. It may *not* be a good thing for some borrowers if banks compete more fiercely for their business. This seemingly counter-intuitive result is based on two conflicting effects that increased interbank competition has on borrowers' welfare. The direct effect is that their borrowing cost is lowered in the current period as well as in future periods, which is good for them. But this increase in the borrowers' surplus causes a concomitant reduction in the value of the bank–customer relationship to the bank. This weakens the pivotal countervailing force to the bank's desire to maximize the value of the deposit insurance put option in the *current* period by appropriately increasing risk. The resulting reduction in the bank's survival probability jeopardizes the bank–customer relationship and creates an indirect effect of increased interbank competition, which is not good for borrowers.

Similar reasoning applies to improved capital market access. Although a given borrower is unambiguously better off owing to greater access to the capital market, this creates a negative externality for *other* borrowers who have poorer access. For such borrowers, relationship banking is valuable, but there is an asymmetry in the way they assess relationship banking and the way the bank assesses it. Each of these borrowers is concerned solely with the value of that borrower's *bilateral* relationship with the bank, whereas the bank takes a *multilateral* portfolio approach and considers the cumulative value of all its relationships. A lowering of the value of this 'relationship portfolio' due to improved capital market access for a *subset* of its borrower pool distorts the bank's asset portfolio choice in the direction of greater risk. This hurts the borrowers whose capital market access has not improved.

Our work is related to three distinct strands of the contemporary financial intermediation literature. One strand is related to exploring the efficiency connotations of market structure in banking. Apart from our earlier work (Besanko and Thakor, forthcoming), Wong (1991), Winton (1991) and Matutes and Vives (1991) have recently taken up different aspects of this issue. Wong (1991) argues that a less competitive banking system may be less harmful than pro-competition advocates suggest, if borrowers possess sufficiently strong bargaining power in dealing with banks. Winton (1991) suggests that deposit insurance leads to banking industry fragmentation – smaller and more numerous banks – and thus strengthens regulatory incentives to limit charters and permit collusion. Matutes and Vives (1990) focus on banking instability arising from the multiplicity of equilibria attributable to the usual coordination problem between depositors. They find that competition per se is not responsible for banking instability, even though it is 'socially excessive'. They also make a case for deposit insurance and deposit interest rate regulation. Our intended contribution on this score is the finding that regulating entry to create an imperfectly competitive banking industry is not only good for stability but *may also make borrowers better off.*

A second strand of the literature is concerned with relationship banking. Sharpe (1990), von Thadden (1990) and Rajan (1991) have all examined the implications of bank–customer relationships in informationally constrained settings. Sharpe (1990) focuses on subgame perfect Nash equilibria in which the incumbent bank is tempted opportunistically to raise its loan interest rate to successful borrowers about whom it knows more than competing banks. *Ex ante* interbank competition results in banks bidding away these anticipated *ex post* expected profits by sufficiently lowering the initial loan interest rate. With a downward-sloping demand schedule for loans, this results in new borrowers being allocated *too much* credit and older borrowers being allocated too little credit relative to the first best. A different sort of second-best inefficiency arises in von Thadden (1990). In that model, a privately informed borrower can choose between a short-term project that reveals its 'type' to all early, and a socially preferred long-term project that resolves the informational asymmetry later. The incumbent bank is assumed to be able to learn the borrower's type early at a cost. The subgame perfect strategy for the incumbent bank is then to exploit its informational advantage in pricing its second-period loan. Anticipation of this future surplus extraction may induce the borrower to prefer the short-term project that would deny the incumbent bank any future informational monopoly. Rajan (1991) shows that borrowers may sometimes prefer 'arm's-length' borrowing (capital market access) to bank borrowing because the latter involves an extraction of borrower surplus that can be avoided with the former. While it is true that the incumbent bank's informational advantage can create distortions, our focus in this paper is on its *beneficial* effects. In this regard, our paper can be distinguished from the earlier research on the basis of its focus on the effect of relationship banking on the bank's portfolio choice rather than on the borrower's investment decisions.

A third strand of the literature to which our work is connected is that on deposit insurance. This literature is too voluminous to cite exhaustively, but in most models that rationalize governmental deposit insurance the role of deposit insurance is to enhance banking stability and improve the liquidity of depositors' claims.[4] Moreover, borrowers also benefit because deposit insurance eliminates banking panics that could disrupt borrowers' projects. We abstract from the coordination failures that cause panics in these models. Given this abstraction, the only beneficial role of deposit insurance is to provide depositors a riskless claim. But deposit insurance has the disadvantage of inducing excessive risk taking by banks, a disadvantage that is magnified with increased interbank competition for borrowers. We assume that regulators expeditiously close banks that fail, so that an increase in bank portfolio risk jeopardizes relationship banking even with governmental deposit insurance. Hence, deposit insurance creates costs even for borrowers.

The rest of the paper is organized as follows. In section 2 we develop a model of dynamic asset portfolio choice for a bank operating over two time periods spanning three points in time. We examine the dependence of the bank's portfolio choice on its anticipated future informational advantage as well as credit market structure. Section 3 contains the analysis. Section 4 discusses the policy implications of the analysis. Section 5 concludes with a summary of the main results.

2 The model

2.1 Preferences, endowments and time horizon

We consider an environment with universal risk neutrality. There are three points in time, $t = 0$, 1 and 2, and two time periods, the first beginning at $t = 0$ and ending at $t = 1$, and the second beginning at $t = 1$ and ending at $t = 2$. There are five types of players: banks, borrowers, depositors, the deposit insurer and the capital market. At the start of each period, each borrower is endowed with a project requiring a \$1 investment, but does not have the necessary investment funds. Each borrower can either approach a bank for a loan or access the capital market directly for funds. Borrowers have no terminal wealth so, if a borrower's project produces insufficient cash flow to repay the lender, the borrower defaults and surrenders the cash flow to the lender. Realized cash flows are costlessly observable to all.[5] In the first period, the bank raises $\$D$ of deposits. Deposit insurance is complete, so that depositors must be repaid $\$Dr_f$ at $t = 1$, where r_f is one plus the riskless interest rate. If the bank can fully repay depositors on its own at $t = 1$, it stays in business for a second period and raises $\$D$ in new deposits. If not, the deposit insurer pays off the depositors and closes the bank.[6] Also, for simplicity, we assume that the bank has no equity capital, so that D is the total amount available for lending in each period. As an alternative to lending, any bank can invest in a marketable security which yields $\$R$ with probability $\delta \in (0, 1)$ and zero with probability $1 - \delta$ for every dollar invested. This marketable security is priced to preclude arbitrage (i.e. $\delta R = 1$ and the net present value from purchasing this security is zero). The availability of this investment opportunity implies that, despite deposit insurance, the bank will not price its loan to earn a net expected return less than that available on the marketable security.

In what follows, we will assume that each borrower has an effort choice in the second period (but not in the first period, because first-period effort choice has no bearing on the analysis), with negative utility for effort.

2.2 *Borrowers' investment opportunities*

At $t = 0$, each borrower can invest \$1 in a project that will pay off at $t = 1$. The payoff will be either $R_1 > r_f$, or zero. In the first period, there are two observationally distinct risk classes of borrowers, A and B. These two classes are distinguished by success probability, with $\delta_A \in (0, 1)$ denoting the success probability of class A borrowers, and $\delta_B \in (0, 1)$ the success probability of class B borrowers. The higher-quality (lower-risk) borrowers are in class A, so $\delta_A > \delta_B$. Borrower types are common knowledge at $t = 0$.

The evolution of a borrower's investment opportunities and risk class is depicted in Figure 10.1. If a borrower's first-period project succeeds, then the borrower's second-period project (which also requires a \$1 investment) is riskless and yields S at $t = 2$. If the borrower's first-period project

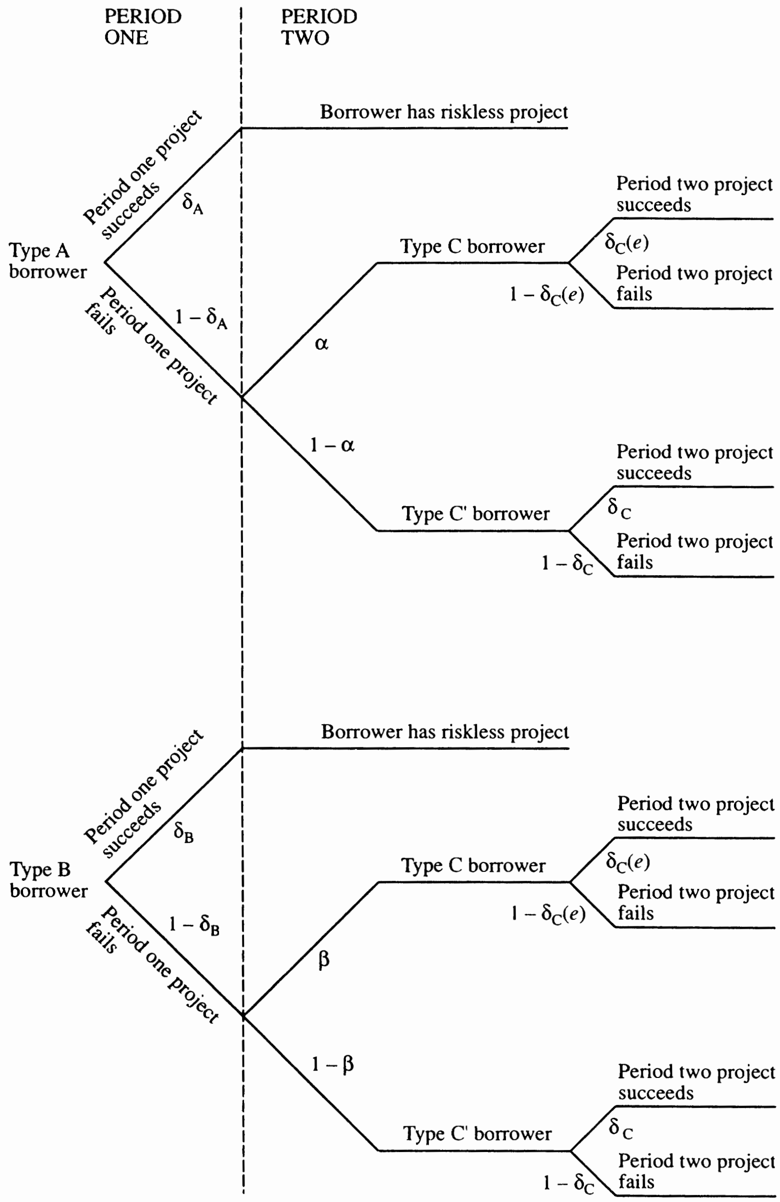


Figure 10.1 Evolution of borrower types

fails, then their second-period project is less lucrative and more risky than the first-period project. This project has a return $R_2 \in (r_f, R_1)$ in the successful state and zero in the unsuccessful state, with success probability $\delta_i(e)$, $i \in \{C, C'\}$, $e \in \{0, 1\}$, where e is the borrower's choice of effort, which only the borrower observes. That is, conditional on first-period failure, the borrower can fall into one of two second-period risk classes, designated by C and C′. We assume that $\delta_C(1) > \delta_C(0) \equiv \delta_C = \delta_{C'}(0) = \delta_{C'}(1)$. Since the success probabilities for type C′ do not depend on e, we will write $\delta_{C'} \equiv \delta_{C'}(e)$. The borrower's effort disutility for choosing effort e is with We, $W > 0$. In this first period, a borrower does not know what class they will be in should their project fail, although transition probabilities are common knowledge. Given that a borrower is in risk class A in period one, the probability that they are in risk class C should they fail in period one is $\alpha \in (0, 1)$, and the probability that they are in risk class C′ is $1 - \alpha$. If they are in risk class B in period one, the corresponding probabilities are $\beta \in (0, 1)$, and $1 - \beta$, respectively. We assume that $\beta < \alpha$. Thus, there is imperfect intertemporal correlation of risk classes for risky projects.

2.3 *Information structure and market structure*

At $t = 0$, a borrower's 'type' (their risk class) is common knowledge, as are all the exogenous parameter values. We assume that, at this stage, the borrower is already with an existing bank (the incumbent bank) and that the banking industry is imperfectly competitive. Let M_{1l} represent the 'mark-up' over the incumbent bank's breakeven interest factor (one plus the loan interest rate) that is charged to a borrower of risk class l on their first-period loan from the incumbent bank. We will argue shortly that the incumbent bank stands to earn a positive expected profit on its second-period loan to the borrower in some states and a zero expected profit in all other states. *Ex ante* (date 0) competition will then affect the pricing of the first-period loan, in anticipation of these second-period rents for the incumbent bank. If there was perfect competition at the outset, M_{1l} would be negative (see Sharpe, 1990, for a verification). With imperfect competition, M_{1l} could be positive, zero or negative. The point is that the incumbent bank will set M_{1l} such that the borrower is indifferent between staying with that bank and switching to a competitor, but M_{1l} will not dissipate all of the incumbent bank's expected future rents.

Now, if a borrower fails in period one, the incumbent bank learns the borrower's period-two risk class perfectly. Outside banks know that the borrower has failed *and* also receive an additional imperfect signal about the borrower's period-two risk class. The commercial paper market knows only that the borrower failed in the first period. For borrowers who succeeded in period one, all parties know that such borrowers have access to a riskless project. We assume that, at the start of the second period, the borrower simultaneously solicits bids from all credit sources and selects the cheapest source. An outside bank's screening technology can be described as follows. A bank observes a signal σ about a borrower's type, where $\sigma \in \{C, C'\}$, i.e. the signal tells the bank either that the borrower is of risk class C or that they are of risk class C′. Assume $\Pr(\sigma = C \mid \text{true type is } C') = \Pr(\sigma = C' \mid \text{true type is } C) = \phi \in (0, 0.5)$. Thus, ϕ is the probability of an erroneous identification by a competing bank. The incumbent bank's second-period interest factor will depend on two considerations: the magnitude of the error in screening by a competing bank and credit market structure. As $\phi \to 0$, the competing bank's information set converges with that of the incumbent bank. If, in addition, the credit market is also perfectly competitive, then incumbent banks cannot earn any second-period profits.

3 The analysis

3.1 The second-period problem

3.1.1 Interest factors charged by competing banks

To ensure subgame perfection, we adopt the usual dynamic programming approach and start with the second period. By Bayes rule, the posterior probabilities, as assessed by a competing bank, are:

Pr (true type is C$|\sigma = $ C, failure in first period, true type was A in period one) =

$$a' = a[1 - \phi][a(1 - \phi) + [1 - a]\phi]^{-1} \in (a, 1)$$

Pr (true type is C$|\sigma = $ C′, failure in first period, true type was A in period one) =

$$\hat{a} = \phi a[\phi a + (1 - \phi)(1 - a)]^{-1}.$$

Pr (true type is C$|\sigma = $ C, failure in first period, true type was B in period one) =

$$\beta' = \beta[1 - \phi][\beta(1 - \phi) + [1 - \beta]\phi]^{-1} \in (\beta, 1)$$

Pr (true type is C$|\sigma = $ C′, failure in first period, true type was B in period one) =

$$\hat{\beta} = \phi\beta[\phi\beta + (1 - \phi)(1 - \beta)]^{-1}.$$

It is clear that $\alpha' > \hat{\alpha}$ and $\beta' > \hat{\beta}$.

Given this screening technology, we can compute the minimum interest factor an outside bank can charge a borrower who failed in the first period. Consider first a borrower whose first-period risk class was A, who failed in the first period and for whom $\sigma = \text{C}$. If an outside bank assumes that a borrower of second-period risk class C will choose $e = 1$, then the bank's breakeven rate $i'_{\text{min}}(\text{A}, \sigma = \text{C})$ will make it just indifferent between making bank loans and investing in the risky marketable security. Given that the marketable security is priced to prevent arbitrage, the breakeven rate satisfies

$$i'_{\text{min}}(\text{A}, \sigma = \text{C})[\alpha' \delta_{\text{C}}(1) + (1 - \alpha')\delta_{\text{C}}] = r_{\text{f}}.$$

That is,

$$i'_{\text{min}}(\text{A}, \sigma = \text{C}) = \frac{r_{\text{f}}}{\alpha' \delta_{\text{C}}(1) + [1 - \alpha']\delta_{\text{C}}}. \tag{1}$$

If $\sigma = \text{C}'$ for such a borrower, then

$$i'_{\text{min}}(\text{A}, \sigma = \text{C}') = \frac{r_{\text{f}}}{\hat{\alpha} \delta_{\text{C}}(1) + [1 - \hat{\alpha}]\delta_{\text{C}}}. \tag{2}$$

Similarly, if the borrower's first-period risk class was B, they failed in the first period, and the bank's screening reveals $\sigma = \text{C}$, the bank's breakeven rate (assuming that $e = 1$ will be chosen by a borrower of risk class C) $i'_{\text{min}}(\text{B}, \sigma = \text{C})$ is

$$i'_{\text{min}}(\text{B}, \sigma = \text{C}) = \frac{r_{\text{f}}}{\beta' \delta_{\text{C}}(1) + [1 - \beta']\delta_{\text{C}}}. \tag{3}$$

And, if the screen reveals $\sigma = \text{C}'$, it is

$$i'_{\text{min}}(\text{B}, \sigma = \text{C}') = \frac{r_{\text{f}}}{\hat{\beta} \delta_{\text{C}}(1) + [1 - \hat{\beta}]\delta_{\text{C}}}. \tag{4}$$

Since $\alpha' > \hat{\alpha}$ and $\delta_{\text{C}}(1) > \delta_{\text{C}}$, it is clear that $i'_{\text{min}}(\text{A}, \sigma = \text{C}) < i'_{\text{min}}(\text{A}, \sigma = \text{C}')$. Likewise, $i'_{\text{min}}(\text{B}, \sigma = \text{C}) < i'_{\text{min}}(\text{B}, \sigma = \text{C}')$.

Now, the expected utility of a borrower of risk class C is

$$\delta_{\text{C}}(e)[R_2 - \text{i}] - We,$$

where i is the interest factor on the borrower's \$1 loan. Suppose there exists a value of ϕ, call it ϕ^*, such that if the 'error probability' associated with the signal σ is ϕ^*, i.e. the signal is $\sigma(\phi^*)$, then

$$\begin{aligned}&\delta_{\text{C}}[R_2 - i'_{\text{min}}(j, \sigma(\phi^*) = \text{C})] \\ &\quad = \delta_{\text{C}}(1)[R_2 - i'_{\text{min}}(j, \sigma(\phi^*) = \text{C})] - W.\end{aligned} \tag{5}$$

It follows then that the left-hand side (LHS) of (5) will exceed the right-hand side (RHS) if $\phi > \phi^*$ and the LHS will be less than the RHS if $\phi < \phi^*$. We will assume henceforth that $\phi > \phi^*$.

Given this assumption, the outside bank's belief that the borrower of risk class C will choose $e = 1$ is incorrect, regardless of whether the borrower was of risk class A or B in the first period. Hence, the minimum interest factors an incumbent bank can charge a borrower in the second period if the borrower failed in the first period are based on the belief that the borrower of risk class C will choose $e = 0$, and are as follows:

$$\begin{aligned} i_{\min}(\mathrm{A}, \sigma = \mathrm{C}) &= i_{\min}(\mathrm{A}, \sigma = \mathrm{C}') = i_{\min}(\mathrm{B}, \sigma = \mathrm{C}) \\ &= i_{\min}(\mathrm{B}, \sigma = \mathrm{C}') \equiv i_{\min} = r_f[\delta_{\mathrm{C}}]^{-1}. \end{aligned} \tag{6}$$

It is transparent that

$$\delta_{\mathrm{C}}[R_2 - i_{\min}] > \delta_{\mathrm{C}}(1)[R_2 - i_{\min}] - W, \tag{7}$$

so that the borrower of risk class C will indeed choose $e = 0$ when faced with $i_{\min}$.

3.1.2 Interest factors charged by incumbent banks

We now wish to examine the interest factors that the incumbent bank would charge the different borrowers in the second period. We denote these interest factors by i_{2j}^k, where k denotes the borrower's first-period risk class and j denotes their second-period risk class. Since the incumbent bank knows the borrower's second-period risk class precisely, it can compute the maximum interest factor it can charge the borrower before he switches to effort $e = 0$. For the borrower whose risk class is C, this interest factor, $i_{\max}$, is given by

$$\delta_{\mathrm{C}}[R_2 - i_{\max}] = \delta_{\mathrm{C}}(1)[R_2 - i_{\max}] - W. \tag{8}$$

Now, the expected second-period profit of the incumbent bank if it charges this interest factor is $\delta_{\mathrm{C}}(1)[i_{\max} - r_f]$. Note that $i_{\max} < i_{\min}$. If the bank charges a higher interest factor, then it might as well set the rate as high as $i_{\min}$. Thus, its expected profit will be $\delta_{\mathrm{C}}[i_{\min} - r_f]$. We now assume that

$$\delta_{\mathrm{C}}(1) > \frac{\delta_{\mathrm{C}}[i_{\min} - r_f]}{[i_{\max} - r_f]}, \tag{9}$$

with $i_{\min}$ given by (6) and $i_{\max}$ given by (8). Given (9), the incumbent bank will find it optimal to set

$$i_{2\mathrm{C}}^{\mathrm{A}} = i_{2\mathrm{C}}^{\mathrm{B}} = i_{\max} = \frac{R_2[\delta_{\mathrm{C}}(1) - \delta_{\mathrm{C}}] - W}{[\delta_{\mathrm{C}}(1) - \delta_{\mathrm{C}}]}. \tag{10}$$

The incumbent bank's optimal pricing strategy will be to charge the borrowers in risk class C′ a rate that leaves them indifferent between borrowing from the incumbent bank and an outside bank. The incumbent bank knows that, if such a borrower approaches an outside bank, they will be offered a rate of $i_{\min}$.[7] If the banking industry were perfectly competitive (with its competitiveness constrained only by the incumbent bank's informational advantage), then the incumbent bank would set $i^{A}_{2C'} = i_{\min}$ and $i^{B}_{2C'} = i_{\min}$. But with an imperfectly competitive banking industry, the incumbent bank may set $i^{A}_{2C'}$ and $i^{B}_{2C'}$ higher.[8] Let M_{2A} and M_{2B} represent the positive second-period 'mark-ups' over $i_{\min}$ for borrowers of first-period risk classes A and B respectively such that the incumbent bank can charge these mark-ups and still leave the borrower in risk class C′ indifferent between staying with the incumbent bank and switching to an outside bank. Thus, the incumbent bank will set

$$i^{A}_{2C'} = i_{\min} + M_{2A} \tag{11}$$

$$i^{B}_{2C'} = i_{\min} + M_{2B} \tag{12}$$

With this set-up, all borrowers who are successful in the first period go to the commercial paper market in the second period. All borrowers who default on first-period loans solicit offers simultaneously from all sources. Those who belong to risk class C accept offers from their incumbent banks, whereas those who are in risk class C′ are indifferent between borrowing from their incumbent banks and from competing banks.

The assumptions made thus far fix the outcome in period two. Imperfect competition at date 0 will determine the mark-ups M_{1A} and M_{1B} of the first-period interest rates offered by the incumbent bank over the respective one-period breakeven rates. That is, borrowers in risk class A will receive loans priced at $r_f/\delta_A + M_{1A}$ and borrowers in risk class B will receive loans priced at $r_f/\delta_B + M_{1B}$.

3.2 *Banks' portfolio decisions*

The focus of the remaining analysis is on a bank's first-period portfolio decision. Each bank must choose the fraction λ of its $\$D$ in deposits to be loaned to type A borrowers and the fraction $1 - \lambda$ to be loaned to type B borrowers. For simplicity, we set $D = 1$ and focus our analysis on the polar case in which borrower returns are perfectly correlated *within* risk classes but are independent *across* risk classes.

The assumption of perfect correlation within risk classes implies either all of a bank's type A borrowers succeed or all fail. Similarly, type B borrowers all succeed or fail. This means that, for a given bank, there are

Table 10.1. *Financial states of the world for the bank at the end of the first period*

State	Description	Probability of state	Bank's first-period cash flow	Bank's survival
I	Both types succeed	$\delta_A \delta_B$	$\lambda\left(\frac{r_f}{\delta_A} + M_{1A}\right) + (1-\lambda)\left(\frac{r_f}{\delta_B} + M_{1B}\right) - r_f$	Bank survives
II	Type As succeed Type Bs fail	$\delta_A(1-\delta_B)$	$\max\left[\lambda\left(\frac{r_f}{\delta_A} + M_{1A}\right) - r_f, 0\right]$	Bank fails if $\lambda < \delta_A r_f (r_f + \delta_A M_{1A})^{-1}$
III	Type As fail Type Bs succeed	$\delta_B(1-\delta_A)$	$\max\left[(1-\lambda)\left(\frac{r_f}{\delta_B} + M_{1B}\right) - r_f, 0\right]$	Bank fails if $\lambda < 1 - \delta_B r_f (r_f + \delta_B M_{1B})^{-1}$
IV	Both types fail	$(1-\delta_A)(1-\delta_B)$	0	Bank fails.

four relevant states in period one, which we denote I–IV. Table 10.1 describes the relevant properties of these states as a function of the portfolio decision λ.

It is useful to summarize the information in Table 10.1 graphically. This is done in Figures 10.2 and 10.3. Figure 10.2 shows first-period cash flows as a function of λ from low- and high-risk borrowers, respectively. When the cash flows from a given borrower class are positive, the bank survives in the states in which that borrower class succeeds while the other fails. For example, if $\lambda > \delta_A r_f(r_f + \delta_A M_{1A})^{-1}$, the bank will survive if the type As succeed but the type Bs fail. Note that there are two cases, depending on whether $\delta_A r_f(r_f + \delta_A M_{1A})^{-1} + \delta_B r_f(r_f + \delta_B M_{1B})^{-1} > 1$ or $\delta_A r_f(r_f + \delta_A M_{1A})^{-1} + \delta_B r_f(r_f + \delta_B M_{1B})^{-1} < 1$. Henceforth, to simplify notation, let $a \equiv r_f(r_f + \delta_A M_{1A})^{-1}$ and $b \equiv r_f(r_f + \delta_B M_{1B})^{-1}$.

Figure 10.3 shows the bank's survival probability as a function of λ. As before, there are two cases. When $a\delta_A + b\delta_B < 1$, the bank's survival probability is maximized over an interior range $[a\delta_A, 1 - b\delta_B]$. When $a\delta_A + b\delta_B > 1$, the bank's survival probability is maximized over the end range $[a\delta_A, 1]$. A discussion of the economics of these relationships will be deferred until we discuss the bank's profit-maximizing portfolio choice.

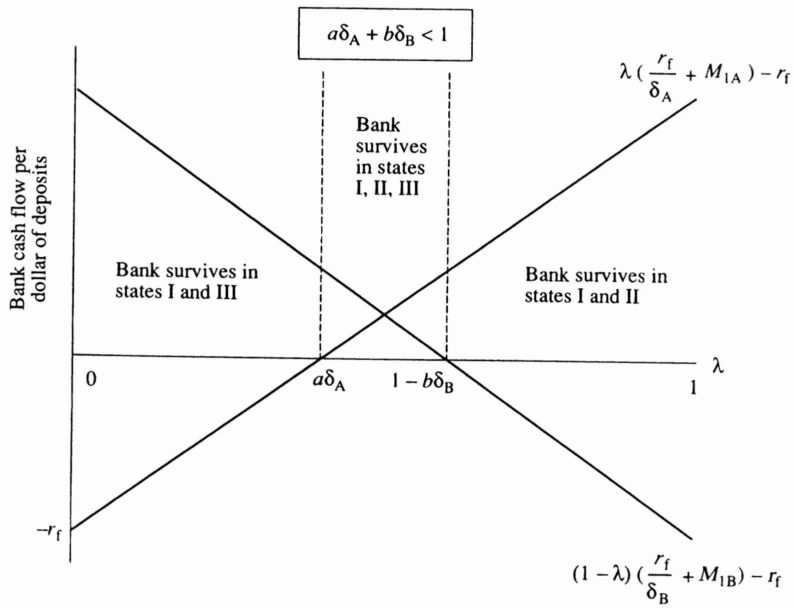
Table 10.1 in conjunction with the figures enables us to calculate the bank's first-period expected profit per dollar of deposits, $E\Pi_1(\lambda)$. For the case of $a\delta_A + b\delta_B < 1$, we have

$$E\Pi_1(\lambda) = \delta_A \delta_B(\Delta + \Lambda - 1) r_f + \begin{cases} \delta_B(1 - \delta_A)(\Lambda - 1) r_f & \lambda \in [0, a\delta_A] \\ \left\{\begin{matrix}[\delta_B(1 - \delta_A)(\Lambda - 1) r_f + \\ \delta_A(1 - \delta_B)(\Delta - 1) r_f]\end{matrix}\right\} & \lambda \in [a\delta_A, 1 - b\delta_B] \\ \delta_A(1 - \delta_B)(\Delta - 1) r_f & \lambda \in [1 - b\delta_B, 1] \end{cases}$$

where $\Delta \equiv \lambda / a\delta_A$ and $\Lambda \equiv (1 - \lambda)/b\delta_B$. For the case of $a\delta_A + b\delta_B > 1$, we have

$$E\Pi_1(\lambda) = \delta_A \delta_B(\Delta + \Lambda - 1) r_f + \begin{cases} \delta_B(1 - \delta_A)(\Lambda - 1) r_f & \lambda \in [0, 1 - b\delta_B] \\ 0 & \lambda \in [1 - b\delta_B, a\delta_A] \\ \delta_A(1 - \delta_B)(\Delta - 1) r_f & \lambda \in [a\delta_A, 1] \end{cases}$$

The expected first-period profit function is displayed in Figure 10.4 for the case in which $M_{1A} = M_{1B} = 0$. In this case, first-period expected profit is maximized by choosing the riskiest portfolio, $\lambda = 0$. In general, it is straightforward to establish that $E\Pi_1(\lambda)$ either has the shape shown in Figure 10.4 (i.e. has an interior minimum) or it is strictly monotone in λ. Thus, the portfolio that maximizes first-period expected profit is either



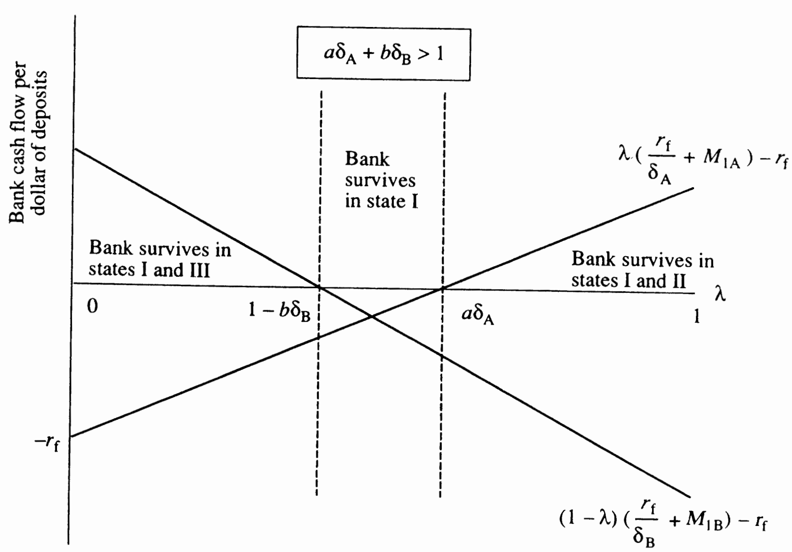


Figure 10.2 Bank's cash flow per dollar of deposits as a function of portfolio choice λ

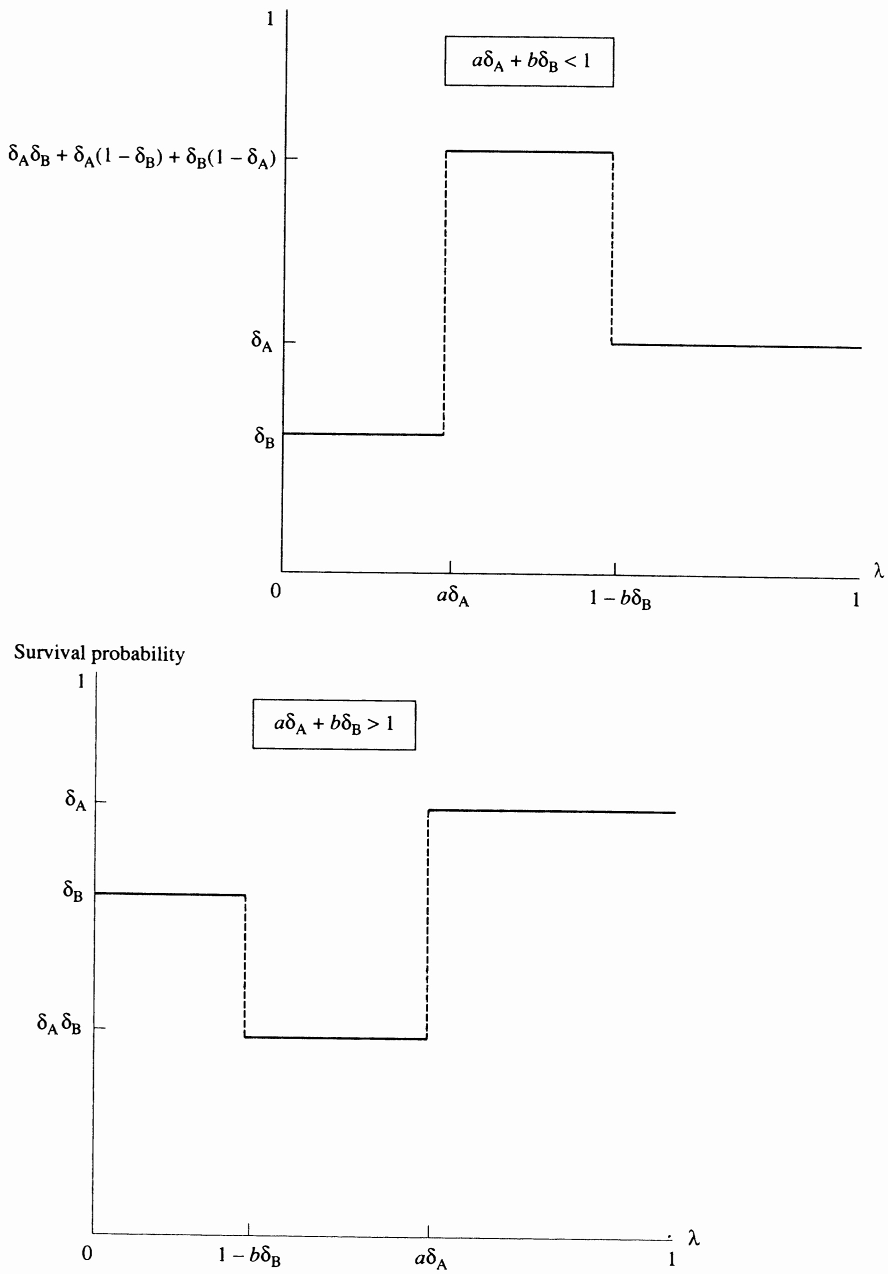


Figure 10.3 **Bank's survival probability as a function of portfolio choice λ**

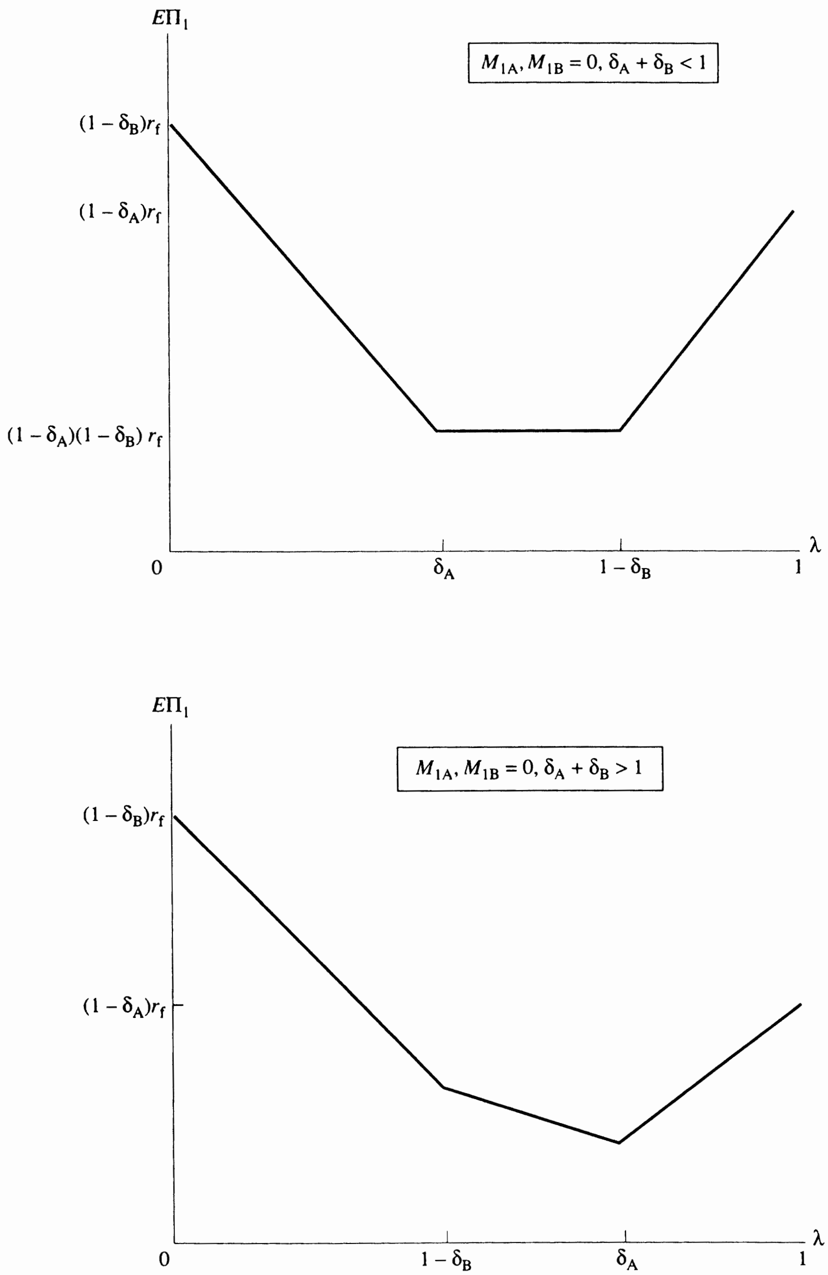


Figure 10.4 Bank's first-period expected profit as a function of portfolio choice λ

$\lambda = 0$ or $\lambda = 1$. In general, $\lambda = 0$ maximizes first-period expected profit if and only if

$$(\delta_A - \delta_B) r_f \geq \delta_A M_{1A} - \delta_B M_{1B}. \tag{13}$$

Hereafter we assume that condition (13) holds.

The bank's second-period cash flow is also dependent on the four states identified in Table 10.1. In states I and IV, the bank's second-period cash flow is zero. In state IV, this occurs because the bank fails. In state I, this occurs because both borrower types succeed and can thus gain access to the commercial paper market at the riskless rate. In states II and III, the bank's period two cash flows are positive because the bank has survived but is faced with at least one type of borrower who failed and must therefore rely on the bank to finance the risky second-period project. The bank's second-period expected profit per dollar of deposits, $E\Pi_2(\lambda)$, is given as follows. For $a\delta_A + b\delta_B < 1$,

$$E\Pi_2(\lambda) = \begin{cases} \lambda J_2 & \lambda \in [0, a\delta_A] \\ \lambda J_2 + (1-\lambda) K_2 & \lambda \in [a\delta_A, 1 - b\delta_B] \\ (1-\lambda) K_2 & \lambda \in [1 - b\delta_B, 1], \end{cases}$$

where

$$J_2 \equiv (1 - \delta_A)\delta_B\{a\delta_C(1)[i_{2C}^A - r_f] + (1-a)\delta_C[i_{2C'}^A - r_f]\}.$$

$$K_2 \equiv (1 - \delta_B)\delta_A\{\beta\delta_C(1)[i_{2C}^B - r_f] + (1-\beta)\delta_C[i_{2C'}^B - r_f]\}.$$

If, by contrast, $a\delta_A + b\delta_B > 1$, then

$$E\Pi_2(\lambda) = \begin{cases} \lambda J_2 & \lambda \in [0, 1 - b\delta_B] \\ 0 & \\ (1-\lambda) K_2 & \lambda \in [a\delta_A, 1]. \end{cases}$$

Period two expected profits as a function of λ are displayed in Figure 10.5 for the case in which $M_{1A} = M_{1B} = 0$.

The bank will make its portfolio decision to maximize the present value of first- and second-period profits. The solution to this problem is difficult to characterize because the discontinuous piecewise linearity of the objective function gives rise to a host of different cases. What is clear, however, is that there are only four possible solutions to the bank's portfolio problem: $\lambda = 0$, $\lambda = a\delta_A$, $\lambda = 1 - b\delta_B$, and $\lambda = 1$. But given (13), we can immediately rule out $\lambda = 1$. This is because $E\Pi_1(0) > E\Pi_1(1)$ and $E\Pi_2(0) = E\Pi_2(1) = 0$. Thus, it is never optimal for a bank to lend solely to the low-risk borrowers. The reason for this is that if $\lambda = 1$ and the bank survives in period one, it can only be because the type A borrowers succeeded in period one. But in that case these borrowers will gain access

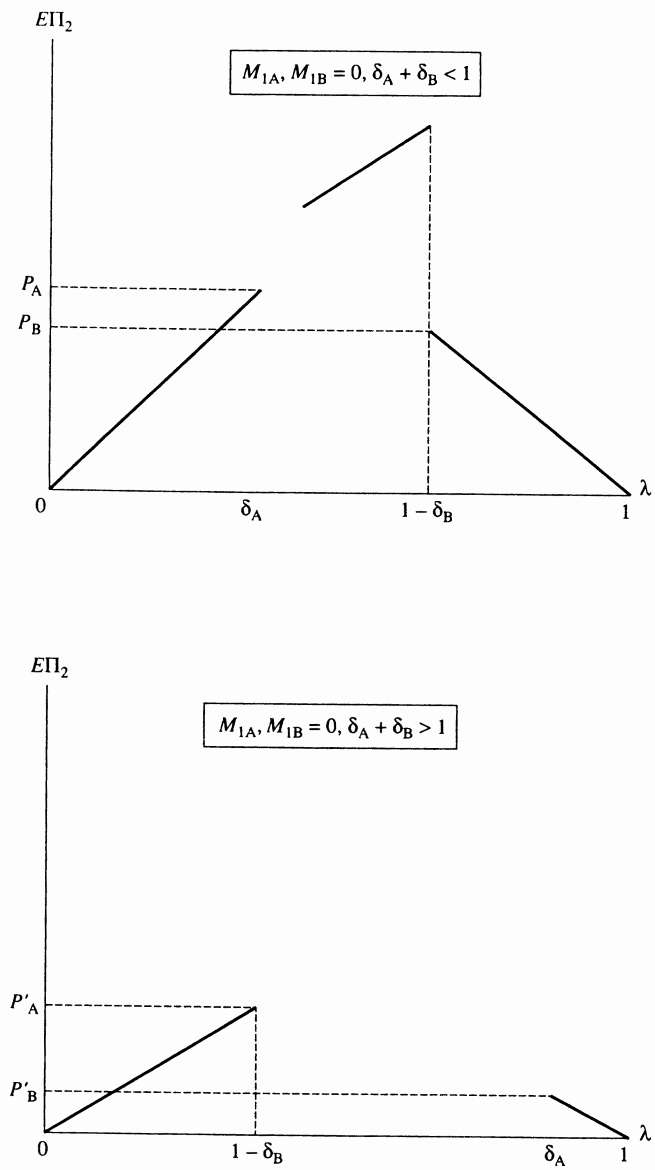


Figure 10.5 **Bank's second-period expected profit as a function of portfolio choice λ**

to the commercial paper market and the bank earns nothing in period two. Thus, there is no second-period gain to offset the deposit insurance put option effect in period one.

The bank's first-period portfolio choice will be interior if either $\lambda = a\delta_A$ or $\lambda = 1 - b\delta_B$ dominates $\lambda = 0$. Setting $\lambda = 0$ gives the bank an expected profit $(1 - \delta_B)r_f + \delta_B M_{1B}$ in period one and zero in period two (period two profit is zero because all borrowers either succeed or fail; if they succeed, the bank loses them to the commercial paper market; if they fail, the bank fails). When $a\delta_A + b\delta_B < 1$, setting $\lambda = 1 - b\delta_B$ gives the bank a period one expected profit of $(1 - \delta_A)[1 - b\delta_B]r_f + \delta_A(1 - b\delta_B)M_{1A} + \delta_A b\delta_B^2 M_{1B}$ and a period two expected profit given by $(1 - b\delta_B)J_2 + b\delta_B K_2$. The corner solution will be dominated if J_2 and K_2 are sufficiently large, which will be true if the period two interest factors i^A_{2C}, i^B_{2C}, $i^A_{2C'}$, $i^B_{2C'}$ are sufficiently large, δ_C and $\delta_C(1)$ are sufficiently large, or a and β are sufficiently large.

If $a\delta_A + b\delta_B > 1$, and the bank chooses $\lambda = 1 - b\delta_B$, it achieves first-period profit equal to $\delta_B(1 - b\delta_B)r_f + (b - 1)\delta_A\delta_B r_f + \delta_A\delta_B(1 - b\delta_B)M_{1A} + \delta_A b\delta_B^2 M_{1B}$ and a second-period expected profit equal to $(1 - b\delta_B)J_2$. The corner solution will be dominated if J_2 is sufficiently large, which is true if i^A_{2C}, $i^A_{2C'}$ are large, δ_C and $\delta_C(1)$ are large, and a is large.

To summarize this discussion, we state:

Proposition 1: A bank's first-period portfolio problem will have an interior solution ($\lambda \in (0, 1)$) if one or more of the following conditions hold:

(i) the period two interest factors, $i^A_{2C'} = i^B_{2C}$, $i^A_{2C'}$, and $i^B_{2C'}$, are sufficiently large,
(ii) δ_C and $\delta_C(1)$ are sufficiently high,
(iii) a and β are sufficiently high.

Proposition 1 confirms the intuition that the prospect of second-period rents counteracts the perverse risk incentives created by deposit insurance in period one.

3.3 *Perfect competition*

When the banking industry is perfectly competitive, the second-period mark-ups M_{2A} and M_{2B} are zero so that $i^A_{2C'} = i^B_{2C'} = i_{min} = r_f/\delta_C$ and the first-period mark-ups M_{1A} and M_{1B} must be such that a bank's two-period profit is zero, given its optimal first-period portfolio choice. That is, M_{1A} and M_{1B} must be such that

$$0 = \underset{\lambda}{\mathrm{Max}}\ \{E\Pi_1(\lambda) | M_{1A}, M_{1B}) + E\Pi_2(\lambda | M_{1A}, M_{1B})\}, \tag{14}$$

where $E\Pi_2$ is evaluated at $i^{A}_{2C'} = i^{B}_{2C'} = i_{\min}$ and $i^{A}_{2C} = i^{B}_{2C} = i_{\max}$. Because $E\Pi_2(\lambda \mid M_{1A}, M_{1B}) \geq 0$ for all M_{1A}, M_{1B}, it follows that M_{1A} and M_{1B} must be such that expected profits in period one are less than or equal to zero. In particular, it is straightforward to show that either M_{1A} or M_{1B} must be non-positive. Because (14) is a single equation in two unknowns, the mark-ups are not determined uniquely. Thus, (14) describes a locus of equilibrium mark-ups, M_{1A} and M_{1B}.

An important issue is whether there are conditions under which the bank has a unique interior portfolio choice when there is perfect competition. The next proposition shows that there are constellations of parameter values under which an interior optimum exists.

Proposition 2: There exist constellations of parameters under which, given perfect competition, the bank's optimal first-period portfolio choice is interior.

Proof: Suppose $\delta_A \approx 1$, and let $M_{1A} = 0$ so that $a = 1$ (recall M_{1A} and M_{1B} are not unique so that this is without loss of generality). Since $\delta_A \approx 1$, the relevant case is thus $a\delta_A > 1 - b\delta_B$.

Let λ^* be a candidate equilibrium portfolio choice, and note that λ^* will be an interior optimum if there exists M^*_{1B} such that

$$E\Pi_1(\lambda^* \mid M^*_{1B}) + \lambda^* J_2 = 0 \tag{15}$$

and

$$E\Pi_2(0 \mid M^*_{1B}) < 0.$$

This last condition is equivalent to:

$$M^*_{1B} < \frac{-(1-\delta_B)}{\delta_B} r_f. \tag{16}$$

We now show that (15) implies (16). Suppose (15) holds but $M^*_{1B} \geq [-(1-\delta_B)r_f]/\delta_B$. Note that λ^* must equal either δ_A or $1 - b\delta_B$. In either case, given $M_{1A} = 0$,

$$E\Pi_1(\lambda^* \mid M^*_{1B}) = \delta_A \delta_B \left[\frac{\lambda^*}{\delta_A} + \frac{(1-\lambda^*)}{\delta_B} + \frac{(1-\lambda^*)}{r_f} M^*_{1B} - 1\right] r_f.$$

Thus, if $M^*_{1B} \geq [(1-\delta_B)/\delta_B] r_f$, then

$$\begin{aligned}
0 &= E\Pi_1(\lambda^* \mid M_{1B}) + \lambda^* J_2 \\
&\geq \delta_A \delta_B \left[\frac{\lambda^*}{\delta_A} + \frac{(1-\lambda^*)}{\delta_B} - \frac{(1-\lambda^*)(1-\delta_B)}{\delta_B} - 1\right] r_f + \lambda^* J_2 \\
&\geq \delta_A \delta_B \left[\frac{\lambda^*}{\delta_A} - \lambda^*\right] r_f + \lambda^* J_2 > 0,
\end{aligned}$$

a contradiction. Thus, the equilibrium portfolio choice cannot be at a corner in this case. QED

3.4 Implications for borrower welfare

We now turn to an analysis of borrower welfare. A first-period borrower has an *ex ante* interest in the incumbent bank's survival because of the possibility of sharing the gains from the informational surplus generated by their relationship with the bank.

A borrower who is in risk class A in the first period computes their expected utility, conditional on receiving bank financing in the first period, as

$$U_A = \delta_A\{R_1 - r_f\delta_A^{-1} + S - r_f\} + [1-\delta_A]\left\{\begin{array}{l}\xi[\alpha\{\delta_C(1)[R_2 - i_{2C}^A] - W\} + (1-\alpha)\delta_C[R_2 - i_{2C'}^A]] \\ + [1-\xi]\delta_C[R_2 - i_{2C'}^A]\end{array}\right\} \quad (17)$$

where S is the payoff on the borrower's second-period project if they succeed in the first period and is thus riskless in the second period, and ξ is the probability that the incumbent bank survives after the first period. Note that, if the incumbent bank survives, the borrower gets their second-period loan at i_{2C}^A (and they choose $e = 1$) if they are in risk class C, and $i_{2C'}^A$ if they are in risk class C′. If the incumbent bank fails, the borrower must rely exclusively on outside banks. If they are in risk class C or C′, they will receive a loan at the interest factor $i_{\min}$, and borrowers in risk class C gaining access to outside banks will choose $e = 0$.

In similar fashion, we can write the expected utility of a borrower who is in risk class B in the first period, as follows

$$U_B = \delta_B\{R_1 - r_f\delta_B^{-1} + S - r_f\} + [1-\delta_B]\left\{\begin{array}{l}\xi[\beta\{\delta_C(1)[R_2 - i_{2C}^A] - W\} + (1-\beta)\delta_C[R_2 - i_{2C'}^B]] \\ + [1-\xi]\delta_C[R_2 - i_{2C'}^B]\end{array}\right\}. \quad (18)$$

We can now see the impact of ξ on the borrower's welfare. We know that

$$\delta_C(1)[R_2 - i_{2C}^l] - W = \delta_C[R_2 - i_{2C}^l] > \delta_C[R_2 - i_{2C'}^l], \quad l \in \{A, B\},$$

since $i_{2C}^l < i_{2C'}^l$. Thus, the term multiplying ξ in (17) is strictly greater than the term multiplying $1 - \xi$. Thus, $\partial U_l/\partial\xi > 0$ for $l \in \{A, B\}$, i.e. both types of borrower are better off as one improves ξ, the survival probability of the bank, holding everything else fixed.

Any factor that increases the likelihood of an interior optimal solution to the bank's portfolio problem will enhance the bank's survival probability and work to increase borrower welfare. One such factor is *bank* *market structure*. As market structure becomes less competitive, there is an increase in the bank's mark-ups M_{2A} and M_{2B} on loans to borrowers in risk class C′ in the second period and hence the bank is more likely (i.e. for a larger set of exogenous parameter values) to make interior optimal portfolio choices, as indicated in Proposition 1. Of course, making the market structure less competitive also hurts borrowers directly because the risk class C′ borrowers pay higher interest rates. Thus, it is not obvious that the overall impact on borrower welfare is positive. However, one can assert that there are parameter shifts that do result in an improvement in borrower welfare. Suppose $a\delta_A + b\delta_B < 1$, and assume that exogenous parameter values are such that the bank is just below the point at which it is indifferent between $\lambda = 0$ and $\lambda = 1 - b\delta_B$. In this case, the bank's optimal portfolio choice is $\lambda = 0$ and its survival probability is $\xi = \delta_B$. Now suppose the banking market becomes slightly less competitive so that $i^A_{2C'}$ and $i^B_{2C'}$ increase by infinitesimal amounts. The bank's optimal portfolio choice switches from $\lambda = 0$ to $\lambda = 1 - b\delta_B$. From Figure 10.3, we see that this increases the bank's survival probability from δ_B to $\delta_B + \delta_A[1 - \delta_B]$. The increases in $i^A_{2C'}$ and $i^B_{2C'}$ have a negative, but infinitesimal, impact on the borrower's *ex ante* expected utility, but the positive effect of the discrete jump in the bank's survival probability implies an increase in overall borrower welfare.

When $a\delta_A + b\delta_B > 1$, the bank's survival probability is maximized with a portfolio choice of $\lambda = a\delta_A$. In this case, the welfare implications of making banking less competitive are not clear because whether $\lambda = a\delta_A$ or not depends on the relative magnitudes of $i^A_{2C'}$ and $i^B_{2C'}$, among other things. Making bank market structure less competitive has an ambiguous effect on the bank's survival probability and a directly negative effect on the borrowers through an increase in their expected borrowing cost. We summarize this discussion in the following proposition.

Proposition 3: (a) If $a\delta_A + b\delta_B < 1$, making bank market structure less competitive works to enhance the bank's survival probability, which may benefit the borrowers. (b) If $a\delta_A + b\delta_B > 1$, making bank market structure less competitive has an ambiguous effect on the bank's survival probability.

We can also use this framework to analyse the implications of improving capital market access to a given set of borrowers. Suppose, in contrast to the above analysis, that a type A borrower who fails in period one and becomes a type C′ borrower in period two can be distinguished as such by the commercial paper market. Thus, unlike the above situation in which a borrower of this sort was captive to an imperfectly competitive banking market, now this borrower can gain access to the commercial paper market in period two. This means that the interest rate charged by banks,

$i^{A}_{2C'}$, can no longer exceed the competitive level, r_f/δ_C. Thus, the effect of improving capital market access to a given subset of borrowers is analogous to a decrease in the second-period interest rates for these borrowers. This directly benefits these borrowers, but it may also exert a negative externality on the other class of borrowers. Specifically, for the case in which $a\delta_A + b\delta_B < 1$, a reduction in $i^{A}_{2C'}$ makes an interior solution to the bank's portfolio problem less likely to occur (recall Proposition 1). If improved capital market access causes a switch from $\lambda = 1 - b\delta_B$ to $\lambda = 0$, then, from Figure 10.3, the bank's survival probability will drop, and this will reduce the *ex ante* welfare of type B borrowers who receive bank loans. In effect what has happened here is that improved capital market access for a subset of a bank's borrower pool reduces the value of the bank's relationship portfolio and distorts the bank's asset portfolio choice in the direction of greater risk. This hurts borrowers whose capital market access has not improved.

4 Policy implications

Our analysis produces a number of implications for various banking issues that are being currently debated. We discuss each in turn below.

4.1 Banks' portfolio choices

When relationship banking is important, we have shown that commercial banks' asset portfolio choices depend on a variety of factors: the size of the deposit insurance subsidy, banking market structure, and the size of an incumbent bank's informational advantage relative to competing banks and the capital market. The deposit insurance subsidy effect raises interesting regulatory issues, which we discuss shortly. We have shown that, conditional on the assumed closure policy, the prospect of dealing repeatedly with borrowers has a potentially significant effect on the bank's *ex ante* portfolio choice. In general, of course, the bank's optimal portfolio choice will depend also on the regulatory closure policy and will deviate further from the risk-minimizing solution if the bank is faced with something less severe than the most draconian bank closure policy of certain charter termination upon failure that we have assumed here. But the broader point remains valid: a concern with protecting rents that arise from relationship-specific informational advantages will work to offset the distortionary effects of the deposit insurance put option and will thus improve bank safety.

Banking market structure and the size of an incumbent bank's informational advantage will also impinge on the bank's portfolio choice.

Greater competition and/or a smaller informational advantage in dealing repeatedly with borrowers will induce greater portfolio risk. Intertemporal linkages in borrowers' risk classes are important as well. If borrowers' future risk classifications are extremely sensitive to cash flow realizations, so that poor realizations lead to borrowers becoming poor credit risks and good realizations lead to relatively easy access to alternative credit sources, then too will banks be induced to choose high levels of portfolio risk.

From a policy standpoint, this suggests that regulators face a complex task in coming up with reforms aimed at improving banking stability. Restricting entry into banking to retard interbank competition will enhance stability, and this is a choice variable for regulators. However, this regulatory initiative will be of limited help if capital markets become more efficient in processing credit information and/or the interbank flow of borrower-specific information itself improves so much that incumbent banks cannot retain significant proprietary rights to information about their borrowers. Apart from relaxed barriers to entry into US banking, these other factors also appear to have played a contributing role in increasing the fragility of US depository institutions. For instance, commercial paper issues in the US have grown sixfold in dollar volume in the last two decades. It is difficult to visualize much regulatory control over these developments.

4.2 Borrower welfare and banking deregulation

Our analysis exposes the fallacy of the 'common wisdom' that the lowering of the price of credit due to increased competition in banking will be good for all borrowers. Increased competition leads to lower bank charter values, which in turn leads to riskier (endogenously determined) asset portfolio choices by banks. With relationship banking, one can expect banks and borrowers to share the informational surplus arising from their relationship. Hence, the higher bank insolvency probability resulting from riskier loans increases the likelihood of disruption of bank–customer relationships and the associated destruction of valuable information. The cost of this for some borrowers may exceed the benefit of lower loan interest rates.

From the vantage point of regulators, this implies that striking a delicate balance between the cost of reduced bank safety for borrowers and the benefit of lower loan interest rates for borrowers must be a consideration in determining whether banking should be made more competitive. Of course, by choosing not to close failed institutions, regulators can protect the sanctity of bank–borrower relationships. But this comes at a cost. As the probability of closing a failed bank declines, banks will find the pursuit of risk more attractive. This raises a fundamental *time consistency* issue in bank closure policy, and is at the heart of the debate on the 'too big to fail' controversy in the US.

Another interesting issue has to do with the manner in which improved capital market access for *some* borrowers affects *other* borrowers. Suppose that a subset of the bank's currently profitable borrowers now find it preferable to go to the capital market. This depletes banks' charter values and induces greater portfolio risk. The borrowers who do not enjoy capital market access still have something to gain from relationship banking, but find that the higher risk in banking reduces the value of relationship banking to them. Hence, these borrowers are worse off even though some other borrowers are better off owing to their own improved access to the capital market. This implies that the welfare implications of reducing the *uniqueness* of banks are ambiguous.

4.3 The role of regulatory subsidies

One implication of our analysis is that regulators may wish to adopt a deposit insurance pricing scheme that links the premium charged to the bank's performance. As the number of periods over which the bank has survived without regulatory assistance grows larger, the bank's premium per dollar of insured deposits should decline. Indeed, a point should be reached beyond which the premium is subsidized. The enticement of access to future regulatory subsidies (which could go beyond just deposit insurance subsidies) will be a powerful deterrent to risk taking for the bank.

If the banking industry is highly imperfectly competitive, the importance of regulatory subsidies as a risk deterrent is diminished because bank charters have high value without subsidies. Subsidies grow in importance, however, as banking becomes more competitive and/or capital markets provide access to more firms. The irony is that *financing* subsidies through general tax revenues becomes increasingly expensive as greater competitiveness is achieved through an increase in the number of banks.

4.4 Post-unification European banking

What European unification means for banks in Europe will depend on three factors: the impact of unification on the competitiveness of European credit markets, the impact of unification on the political/economic feasibility of government subsidies for banks, and the evolution of (integrated) European capital markets in the post-unification era. As for the first effect, it is not obvious to us what the overall impact of unification will be on competition. In some parts of Europe, it is reasonable to expect unification to increase competition as new arrivals – encouraged by unification – begin to develop 'toe-holds' in previously unexplored markets. But in other parts of Europe, it may well be that unification leads to *consolidations* that *reduce* competition. If unification indeed leads to greater competition, then its effect will be to increase banking industry risk in Europe.

As for the second effect, it is likely that unification will make it more difficult for governments to subsidize banks headquartered in their own countries because of the obvious political ramifications of endowing these banks with an 'unfair' advantage relative to their European competitors. This will result in greater portfolio risks being chosen by European banks.

Finally, a big question mark hangs over the issue of what unification will entail for European capital markets. Because of the traditional dominance of banks in Europe, capital markets in European countries are generally not as well developed as in the US. It is possible that the increased mobility of capital facilitated by unification will lead to a growth in the scope/sophistication of European capital markets. Our analysis implies that this is likely to induce banks to choose riskier asset portfolios.

5 Conclusion

We have examined a host of issues related to interbank competition and competition between banks and the capital market in a setting of relationship banking. Our focus has been on banks' asset portfolio choices and their consequences for *borrowers'* welfare. We have shown that increased interbank competition *may* actually make *all* borrowers worse off. Moreoyer, improved capital market access for some borrowers may make other borrowers worse off. These observations raise fundamental issues related to bank market structure and the relationship between the bank credit market and the capital market that deserve further study.

NOTES

We thank Richard Gilbert, Carmen Matutes and Xavier Vives for their comments. Only the authors are responsible for any remaining infelicities.

1 Chan, Greenbaum and Thakor (1992) show that *risk-sensitive* deposit insurance pricing may not be feasible in a competitive banking environment.
2 Keeley (1990) provides empirical support for the hypothesis that a sufficiently large bank charter value restrains risk taking.
3 Sharpe (1990) and Rajan (1991) also show that informational rents can arise from bank–customer relationships. See the discussion of this in Bhattacharya and Thakor (1991).

4 See, for example, Bryant (1980), Diamond and Dybvig (1983) and Chari and Jagannathan (1988).

5 This means we do not endogenize the debt contract as, for example, in Townsend (1979).

6 We do not address the time consistency issues this raises. In this respect, our set-up is similar to the rationing policy in Stiglitz and Weiss (1983).

7 One possible strategy for an outside bank would be to try and use the result of its screening to distinguish among various borrower types. The lowest rate that the bank could charge a borrower with first-period type j and a signal σ about the borrower's second-period type is $i'_{min}(j,\sigma)$. If this rate were lower than i_{max} for some $(j,\sigma = C)$ combination, then the outside bank would be able to offer a rate between $i'_{min}(j,\sigma = C)$ and i_{max} to those borrowers, screen out other borrowers and make a profit. To preclude this, we assume

$$r_f[\sigma_C(1)]^{-1} < i_{max} < i'_{min}(A,\sigma = C).$$

Since $i'_{min}(A,\sigma = C) < i'_{min}(B,\sigma = C)$, the above inequality ensures that outside banks cannot bid away borrowers who are being offered i_{max} by the incumbent bank, recalling that outside banks cannot see the offers made by incumbent banks. Thus, the outside bank can only attract borrowers with success probability δ_C, and hence its equilibrium rate is i_{min}. We thank the discussant, Carmen Matutes, for raising this issue with us.

8 The excess of $i^{A}_{2C'}$ and $i^{B}_{2C'}$ over i_{min} respectively may be due to spatial considerations as in Besanko and Thakor (forthcoming).

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