BANK OF FINLAND DISCUSSION PAPERS

12/2000

Erkki Koskela – Rune Stenbacka

Research Department
2.10.2000

Agency Cost of Debt and Lending Market Competition: A Re-Examination

SUOMEN PANKIN KESKUSTELUALOITTEITA • FINLANDS BANKS DISKUSSIONSUNDERLAG

Suomen Pankki
Bank of Finland
P.O.Box 160, FIN-00101 HELSINKI, Finland
☎ + 358 9 1831

Erkki Koskela* – Rune Stenbacka**

Research Department
2.10.2000

Agency Cost of Debt and Lending Market Competition: A Re-Examination

* Research Department, Bank of Finland, P.O.Box 160, FIN 00101 Helsinki, Finland. E-mail: erkki.koskela@bof.fi

** Swedish School of Economics, P.O.Box 479, FIN 00101 Helsinki, Finland. E-mail: rune.stenbacka@shh.fi

ISBN 951-686-673-5
ISSN 0785-3572
(print)

ISBN 951-686-674-3
ISSN 1456-6184
(online)

Suomen Pankin monistuskeskus
Helsinki 2000

Agency Cost of Debt and Lending Market Competition: A Re-Examination

Bank of Finland Discussion Papers 12/2000

Erkki Koskela – Rune Stenbacka
Research Department

Abstract

We address how lending market competition, measured by banks' bargaining power, affects the agency costs of debt finance. We show that the threshold for obtaining loan finance is independent of the relative bargaining power of the financier. Moreover, intensified lending market competition leads to lower lending rates and to investment return distributions with lower and less risky returns. Hence increased lending market competition reduces the agency cost of debt financing. Our analysis does not support the view that there is a tradeoff between more intensive lending market competition and higher agency costs of debt finance.

Key words: bank competition, agency cost of debt

JEL classification: G21, G34, L11.

Lainamarkkinoiden kilpailun vaikutus velan agentuurikustannuksiin

Suomen Pankin keskustelualoitteita 12/2000

Erkki Koskela – Rune Stenbacka
Tutkimusosasto

Tiivistelmä

Tutkimuksessa analysoidaan, mikä vaikutus pankkien neuvotteluvoimalla mitatulla lainamarkkinoiden kilpailulla on projektien velkarahoituksen agentuurikustannuksiin. Vaikka lainarahoituksen saanti projekteihin ei riipu pankin neuvotteluvoimasta, kasvavan kilpailun lainamarkkinoilla osoitetaan johtavan alempiin lainakorkoihin ja sitä kautta heikompituottoisiin, mutta pienempiriskisiin projekteihin. Näin ollen lisääntyvä kilpailu lainamarkkinoilla supistaa velkarahoituksen agentuurikustannuksia. Tämä on vastoin melko tavanomaista käsitystä, jonka mukaan intensiivisempi kilpailu lainamarkkinoilla olisi yhteiskunnan kannalta haitallista, koska se lisää velkarahoituksen agentuurikustannuksia.

Asiasanat: pankkikilpailu, velan agentuurikustannukset

JEL-luokitus: G21, G34, L11.

Contents

1 Introduction

A dominant approach in modern research on credit markets starts from recognizing asymmetric information as an important source of fundamental imperfections in these markets. The magnitude of these imperfections determines how efficiently the credit market performs as a channel whereby projects generating high (social or private) returns are realized and whereby low-return projects are denied financing. Debt contracts incorporate a conflict of interest between lenders and borrowers and therefore this type of financial contracts forms the basis for an agency relationship between debtholders and projectholders. This contractual relationship causes agency costs because the investors cannot typically commit themselves to credibly act in the interest of lenders. Agency costs generated by debt financing imply that project selection will be distorted relative to the first-best benchmark of maximizing the expected project surplus in a world where agency-based incentive problems could be eliminated.

For more than two decades an extensive literature in financial economics has investigated various aspects of the agency costs of debt with a particular focus on exploring the implications of these agency costs for the optimal financial structure of firms (see Harris and Raviv (1991) for a comprehensive survey). Much less attention, however, has been paid to the fundamental issue of how competition in the lending market will impact on the agency costs of debt. In the present study we will systematically address precisely this issue by directly posing the following questions. Will an increased degree of competition between lenders promote efficiency of credit markets by reducing the agency costs of debt and will it, as is frequently argued, lead to increased credit market fragility in the sense of increasing the equilibrium bankruptcy risk of borrowers? Answers to these questions are central for all attempts to evaluate the potential welfare gains from the ongoing worldwide process of financial integration. For example, within the framework of the European Union one of the main goals of promoting financial integration, the process of which has culminated with a single banking license and common numeraire in the EMU-countries from the beginning of 1999, was to encourage competition in banking. This policy development can be seen in light of a number of influential studies such as the so-called Cecchini report (Price, Waterhouse (1988)) or the European Commission Study (Emerson (1992)), which *inter alia* emphasize the benefits of increased competition.

With the focus on loan markets a number of recent contributions has analysed important aspects of the relationship between lending market structure and credit market performance. Broecker (1990) and Riordan (1993) have studied the consequences of adverse selection resulting from the unobserved characteristics of borrowers. They argue that increased competition may make adverse selection problems more severe when borrowers that have been rejected at one bank can apply for loans at other banks so that the pool of funded projects will exhibit lower average quality as the number of banks increases.[1] Shaffer (1998) has extended the analysis of winner's curse problems in lending and has also reported empirical evidence about the nature and magnitude of these effects. Contrary to

---

[1] Gehrig (1998) as well as Kanniainen and Stenbacka (1998) extend this approach within the framework of models making it possible to explore the relationship between the incentives of banks for costly information acquisition based on ex ante monitoring efforts and the market structure of the banking industry.

the contributions mentioned above, by identifying the intensity of competition with the degree of product differentiation under asymmetric information Villas-Boas and Schmidt-Mohr (1999) have demonstrated how banks facing stronger competition may expose credit applicants to more precise screening. The central mechanism behind the result of Villas-Boas and Schmidt-Mohr relies on the argument that with stronger competition the banks have to compete more aggressively for the profitable projects. Therefore, welfare may actually decrease as competition becomes more intense.

In contrast to the models focusing on adverse selection, Koskela and Stenbacka (2000) use a model of mean-shifting investment technologies to study the relationship between market structure, risk taking and social welfare in lending markets. In their approach introduction of competition has been shown to reduce lending rates and to generate higher investments without increasing the equilibrium bankruptcy risk of borrowers. Thus, with investment volumes endogenized there need not be a tradeoff between market competition and financial fragility.

In a credit-rationing model that takes a Schumpeterian R&D perspective Petersen and Rajan (1995) have argued that credit market competition imposes constraints on the ability of borrowers and lenders to intertemporally share the surplus from investment projects so that lenders in a more competitive lending market may be forced to initially charge higher interest rates than lenders with more market power. Thus, as the market power of the bank increases, firms with lower credit quality obtain finance. In a different vein Dewatripont and Maskin (1995), who model the initial project choice as a problem of adverse selection and refinancing as one of moral hazard, have emphasized how credit market competition can offer a way not to refinance bad projects thus discouraging investors from undertaking them initially. Besanko and Thakor (1993) and von Thadden (1995)) have shown how banks with more market power might have stronger incentives to monitor the projects of borrowers and to establish long-term relationships. Subsequently, in the process of lending, the bank acquires information about borrowers' creditworthiness, which will constitute the basis for an informational monopoly relative to the bank's clients (see, also Dell'Ariccia (1998)). Insofar as creditworthy borrowers are unable to signal their quality to competing lenders, they are locked in a bank-client relationship and forced to pay borrowing rates above the competitive level.

Clearly, the existing literature gives mixed results concerning the relationship between lending market competition, interest rates and welfare. Therefore the relationship between credit market competition and the generated agency costs of debt is in need of further exploration. The present article offers a new analysis making it possible to explicitly address how lending market competition, measured by the bargaining power of banks, affects the agency costs of debt finance. In such a setting, we show that more intense competition in lending markets will decrease the interest rates and lead to less risky investment projects with a lower rate of return conditional on success as long as the credit market does not face "too strong" adverse selection problems. Thus the agency costs generated by debt financing will decrease with more intense competition in lending markets. This is in contrast with the finding by Petersen and Rajan (1995), who argue that more intense competition raises interest rates within an intertemporal framework of project funding.

We proceed as follows. The basic model of moral hazard describing the determination of investment projects for a given interest rate is presented in section 2. This section also delineates the first-best project selection as the benchmark for the evaluation of the impact of increasing degrees of lending market competition. Section 3 explores how the lending rate determination depends on the degree of competition. Here we formalize an analogy to the role played by bargaining power in wage negotiations in labor markets by modeling the lending rate determination as a solution to a Nash bargaining problem between a lender and a borrower. In section 4 we elaborate the relationship between the agency cost generated by debt financing and bank competition. Finally there is a brief concluding section.

2 A basic model of moral hazard

Consider an entrepreneur facing an investment opportunity, which requires exactly one unit of debt money.[2] The investment yields a random return x. Assume for simplicity that the investment project has two possible outcomes as follows

$$x = \begin{cases} R \text{ with probability } p(R) \\ 0 \text{ with probability } 1 - p(R). \end{cases} \tag{2.1}$$

The probability of success, p(R), is assumed to be a decreasing and convex function of the rate of return, R, so that $p'(R) < 0$ and $p''(R) > 0$. (2.1) is a general representation of the available investment opportunities and captures the natural feature that a higher rate of return can be achieved by sacrificing in terms of the success probability. In order to achieve analytical tractability for our analysis, and thereby also to exhibit the underlying economic intuition as transparently as possible, we will formally restrict our analysis to the following specification:

$$p(R) = e^{-\lambda(R-1)}. \tag{2.2}$$

The parameter λ captures the hazard rate of the project with the property that $p'(R) = -\lambda p(R) < 0$ and $p''(R) = \lambda^2 p(R) > 0$.[3] This functional form of the probability of success can be viewed as a reflection of a tradeoff whereby a more complex project generates a higher return conditional on success, but that the probability of success diminishes with project complexity. It can also be seen to exhibit a moral hazard effect. For instance, the effort of the entrepreneur, which is

---

[2] Since the analysis is focused on the relationship between lending market competition and the agency costs of debt, we directly restrict our attention to debt as the only available financial instrument without attempting to make the financial structure of firms an endogenous feature of our model. We regard this justified in light of the fact that a large number of studies in financial economics has concentrated on that issue. Also, we abstract from issues related to equilibrium credit rationing and refer to Bester and Hellwig (1987) for an extensive treatment of credit rationing in the context of moral hazard.

[3] In what follows the derivatives are noted by primes for functions with one argument and the partial derivatives by subscripts for functions with many arguments. Hence, for example $p'(R) = dp(R)/dR$, while $A_x(x,y) = \partial A(x,y)/\partial x$, etc.

not directly observable by the lender, may be a decreasing function of the interest rate (for an elaboration of this effect, see e.g. Clemenz (1986), 65–66).

The investor, assumed to be risk-neutral, finances the project with a debt contract governed by the principle of limited liability. The investor makes the project selection, R, so as to maximize the expected profit

$$\pi = p(R)[R-(1+r)], \tag{2.3}$$

where 1+r describes the interest rate factor. When the lender has committed itself to the debt contract, the projectholder's first-order optimality condition can be expressed as

$$\pi_R = p'(R)[R-(1+r)] + p(R) = 0. \tag{2.4}$$

Under the assumptions made, the second order condition $\pi_{RR} < 0$ holds so that (2.4) implicitly defines the optimal project selection, R*. This is structurally determined by (i) a moral hazard factor (i.e. the size of p', which incorporates the parameter λ) and (ii) the interest rate, r. Using the specification (2.2) the optimal project selection can be explicitly written as

$$R^* - (1+r) = \frac{1}{\lambda}, \tag{2.5}$$

which means that, if successful, the investor's optimal project selection is associated with a rate of return exhibiting a premium relative to the cost of debt finance and that premium decreases with the hazard rate λ. It is easy to see that a higher interest rate leads to a higher rate of return being realized conditional on success, i.e. $R_r^* > 0$. However, a higher interest rate implies a higher moral hazard effect through the selection of riskier investment projects[4] with lower probability of success. Furthermore, the interest rate elasticity of the project selection, $R_r^*(1+r)/R^*$, increases with the interest rate.

A slightly more general way of describing project selection would be to assume that a project with a risk characteristic θ yields a random return $R(\theta)$ with probability $p(\theta)$ and zero with probability $1-p(\theta)$. Under such circumstances the project's expected return varies with the chosen risk-return characteristics. It would be reasonable to assume that $R'(\theta) > 0$ so that the return in the case of success is higher as θ increases, while the probability of success decreases, i.e. $p'(\theta) < 0$. Such a formulation, however, leads to similar results as those reported in the present analysis.[5]

The bank is assumed to be risk neutral and we assume that the opportunity cost of granting loans is zero. Consequently, the expected profits of the bank can be written as

$$V = p(R)(1+r) - 1. \tag{2.6}$$

[4] See Stiglitz and Weiss (1981) for a seminal article about this effect.
[5] This kind of specification has been used in a different context by de Meza and Webb (1999).

As we will see later on, the determination of the lending rate, r, depends on the relative bargaining power of the bank vis-a-vis the investor. It turns out to be useful to study this question, as we will do in Section 3, by using the Nash bargaining approach. Such an approach incorporates the lending market structures of perfect competition and monopoly as special cases, and, what is important, allows us also to consider the full spectrum of intermediate degrees of competition. In the case of a lending monopoly, the bank sets the interest rate subject to the constraint determined by optimal project selection by the investor. Similarly, with perfect competition the interest rate is determined by the contestability condition with the expected zero profit for the bank.

2.1 The socially efficient project selection: a benchmark

Before initiating the analysis of the implications of changes in the degree of lending market competition for the interest rate and project selection, including the rate of return under success as well as the implied riskiness, it is useful to characterize a benchmark of the socially efficient project selection. Maximization of expected project surplus in a world where agency-based incentive problems could be eliminated constitutes a natural candidate for such a benchmark.

The socially efficient project selection (in a first-best sense) can be obtained as a solution to the following maximization problem

$$\mathrm{Max}_R\, W = p(R)R - 1, \tag{2.7}$$

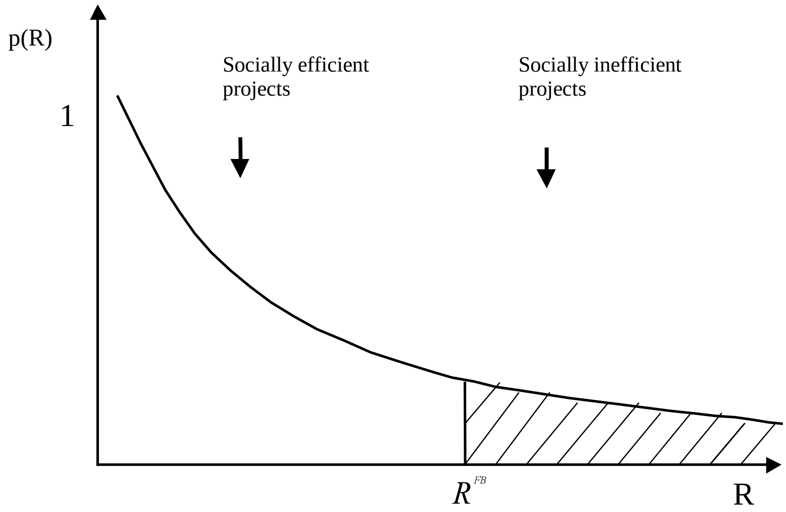
from which we can conclude that the resulting project selection, $R = R^{FB}$, has to satisfy $R^{FB} = 1/\lambda$. Such a socially efficient project selection will generate an expected project surplus $W = W^{FB}$ given by

$$W^{FB} = \frac{p\left(R^{FB}\right)}{\lambda} - 1. \tag{2.8}$$

Equation (2.8) indicates that for the project to be socially efficient, i.e. $W^{FB} > 0$, the probability of success p, which depends on the choice of project, has to exceed the hazard rate λ of the project, which describes how the probability of success diminishes with the project complexity. From a social point of view it is justified to implement a project if $p(R^{FB}) > \lambda$, while the projects with $p(R^{FB}) < \lambda$ should not be implemented, since these generate a negative expected surplus. Figure 1 describes the relationship between project selection, R, and the probability of success, p(R). The social surplus is positive for $R < R^{FB}$, while it is negative for $R > R^{FB}$, where $p(R^{RF}) = \lambda^{FB}$, i.e. $R^{FB} = 1 - \frac{1}{\lambda^{FB}} \ln \lambda^{FB}$. If we had a distribution of projects differing according to their inherent technological properties as captured by the hazard rate, λ^{FB} would determine the critical hazard rate above which it would be socially efficient to implement the project.

What is the relationship between the socially efficient project selection and the project the investor implements? Clearly, the nature of the project determines whether it creates value so as to justify its implementation. Equation (2.5) characterizes how optimal behavior on behalf of the projectholder will translate a particular debt contract (with interest rate r) and a particular type of project (measured by the hazard rate λ) into a project selection. Comparing this with the investor's optimal selection of project reveals that $R^* > R^{FB}$ and $p(R^*) < p(R^{FB})$. Hence, under limited liability one ends up with excessive risk taking from a social point of view, because the investor does not care about the whole distribution, but only about the upper tail of the project return distribution.

Figure 1. **The probability of success as a Function of potential project return**



What is the relationship between the socially efficient project and the nature of a debt-financed project that an investor would implement? Could the investor implement the project, which is socially inefficient in the sense defined above? One might argue that if the adverse selection problems associated with investment projects are not severe in the sense that the project has a sufficiently low hazard rate λ and if credit is available at a sufficiently competitive interest rate, then the probability of success, $p(R^*)$, will exceed the hazard rate, λ, and we would be on the left side of R^{FB}. Along similar lines one might argue that if the adverse selection problems are severe or if credit is offered at a sufficiently high interest rate, the lending market will generate a project selection which is to the right of R^{FB}. In such a case, the credit market imperfections would lead us to the implementation of projects, which are not justified from a social point of view. We will further analyze this question later on in our framework.

3 Lending rate determination as the outcome of Nash bargaining

In the literature there is no unique and standardized way to characterize the intensity of lending rate competition. In traditional oligopoly models the consequences of increased competition are analyzed by increasing the number of competing lenders. Another approach, frequently applied in the area of industrial organization, is to measure the intensity of competition by the degree of product differentiation like for example in the Hotelling type models of horizontal differentiation. A third way of capturing the degree of competition is to identify it with the lender's bargaining power relative to that of the borrower, i.e. to apply the Nash bargaining approach. This is the approach we will employ in the subsequent analysis. For our purposes this approach has two advantages: it both incorporates the monopoly bank and the perfectly competitive banking solutions as special cases and it avoids incorporation of market-specific, and often controversial, institutional details (like the precise type of competition) of loan markets as a part of the analysis.

The lending rate is assumed to be determined as the outcome of a bargaining process between the bank and the projectholder subject to the constraint that the investor unilaterally determines the level of investment. Such a constraint reflects the feature that the bank has no instrument for enforcing any particular project selection. In what follows we, further, assume that zero expected profit represents the threat point of both the projectholder and the bank. In such a situation the determination of the lending rate can be modeled as the solution to the following Nash bargaining problem

$$\mathrm{Max}_r \Omega = V^{\beta}\pi^{1-\beta} \quad \text{s.t.} \quad \pi_R = 0, \tag{3.1}$$

in which β and $1-\beta$ describe the relative bargaining power of the bank and the investor, respectively.[6] The first-order condition for this problem can be expressed as

$$\Omega_r = 0 \Leftrightarrow \beta\frac{V_r}{V} + (1-\beta)\frac{\pi_r}{\pi} = 0. \tag{3.2}$$

where V_r and π_r denote the partial derivatives with respect to the lending rate of the bank's and the investor's objective functions, respectively. Under the assumptions made, the second order condition $\Omega_{rr} < 0$ for the Nash bargaining holds, so that equation (3.2) implicitly defines the optimal lending rate as a function of the lender's relative bargaining power β and other exogenous parameters.

As the investor chooses the level of investment in an optimal way, we can apply the envelope theorem to see that $\pi_r = -p(R) < 0$. As for the effect of the lending rate on the expected profit of the bank we have $V_r = p(R^*) + (1+r)p'(R^*)R_r^* = p(R^*)[1-(1+r)\lambda]$, where we have utilized the specification (2.2) as well as equation (2.5). Clearly, it holds that $V_r > 0$ if $\beta < 1$. Formally, this feature expresses that there is a conflict of interest between the bank and the projectholder with respect to negotiation regarding the interest rate. Substituting the derivatives mentioned above as well as the objective functions of the bank and the investor into the first-order condition (2.8) establishes that

[6] This approach to bargaining can be justified either axiomatically (see Nash (1950)) or strategically (see Binmore, Rubinstein and Wolinsky (1986)). Within the context of a macroeconomic analysis of credit and labor market imperfections Wasmer and Weil (1999) have applied the Nash bargaining approach for the determination of loan repayments.

$$\Omega_r = 0 \Leftrightarrow \beta[1-(1+r)\lambda] = (1-\beta)\left[1+r-\frac{1}{p(R)}\right]. \tag{3.3}$$

Equation (3.3) describes the determination of the lending rate r as a solution to a Nash bargaining problem. Solving (3.3) explicitly yields the interest rate, $r = r^N$, associated with the Nash bargaining problem

$$r^N = \frac{\beta}{\lambda} + \frac{1-\beta}{p(R^N)} - 1, \tag{3.4}$$

where the R^N is determined by substituting $r = r^N$ into (2.5) (see the equation (3.6) later on). From the Nash bargaining solution we get as special cases the interest rates in a lending market characterized by monopoly and perfect competition, respectively, as

$$r^M(\beta=1) = \frac{1}{\lambda} - 1 \quad \text{and} \quad r^C(\beta=0) = \frac{1}{p(R^C)} - 1. \tag{3.5}$$

From equations (3.4) and (3.5) we can see that the impact on the lending rate of the bank's bargaining power depends on the relationship between the probability of success $p(R^N)$ and the hazard rate λ. Clearly, r^M >(<) r^C when $p(R^C)$ >(<) λ.

To characterize the relationship between the probability of success and the hazard rate and thereby the dependence of the lending rate on the degree of competition, we next investigate how the project selection R^N, the probability of success $p(R^N)$ and thereby the riskiness of investment project relate to the bargaining power of the financier. Substituting the lending rate r^N into equation (2.5) we can directly express the project selection in the Nash solution as a function of the bargaining power according to

$$R^N = \frac{1+\beta}{\lambda} + \frac{1-\beta}{p(R^N)}. \tag{3.6}$$

For the cases of the monopoly bank and perfectly competitive bank we have

$$R^M(\beta=1) = \frac{2}{\lambda} \quad \text{and} \quad R^C(\beta=0) = \frac{1}{\lambda} + \frac{1}{p(R^C)}, \tag{3.7}$$

respectively. By comparing the equations for R^M and R^C we see again that when a competitive lending market is monopolized, the effect on the optimal R, and on the probability of success p(R), depends on the relationship between the probability of success p(R) and the hazard rate λ.

One has to ask what is the critical project type, which determines the limit for the bank's participation as a financing institution? The participation constraint for the bank is defined by the bank's expected profit being non-negative under Nash bargaining. This can be obtained by substituting R^N and r^N into the bank's objective function (2.6) so as to get

$$V^N \geq 0 \Leftrightarrow p(R^N)\left(\frac{\beta}{\lambda}\right) + (1-\beta) \geq 1 \Leftrightarrow \frac{p(R^N)}{\lambda} \geq 1. \tag{3.8}$$

According to (3.8) the participation constraint for the bank eliminates the implementation of such projects, for which the probability of success would be below the hazard rate. Therefore, in all cases where the bank has some degree of market power so that the expected profits are positive, the probability of success will necessarily exceed the hazard rate. On the other hand, the expected profits of the projectholder under the Nash bargaining can be obtained by substituting R^N and r^N into the objective function (2.3) so as to yield $\pi^N = p(R^N)/\lambda$.

Formally, by differentiating the equations (3.4) and (3.6) with respect to the bank's relative bargaining power and using the specification (2.2) for the probability of success we find the following relationships to hold

$$R^N_\beta = A^{-1}\left(\frac{1}{\lambda} - \frac{1}{p(R^N)}\right) > 0 \quad \text{as} \quad p(R^N) > \lambda \tag{3.9}$$

and

$$r^N_\beta = A^{-1}\left(\frac{1}{\lambda} - \frac{1}{p(R^N)}\right) > 0 \quad \text{as} \quad p(R^N) > \lambda, \tag{3.10}$$

where $A = (1-(1-\beta)(\lambda/p(R^N))) > 0$.

The critical project type, $\tilde{\lambda}$, is defined by the bank's participation constraint $V^N = 0$, and consequently, it must satisfy

$$V^N = p(R^N)[1+r] - 1 = 0 \quad \text{for} \quad \lambda = \tilde{\lambda}. \tag{3.11}$$

How does this critical project type depend on the bank's relative bargaining power and thereby on the intensity of lending market competition? Differentiating equation (3.11) with respect to β and accounting for the fact that the probability of success depends on the bargaining power by affecting R^N both directly and indirectly via $\tilde{\lambda}$ gives

$$\tilde{\lambda}_\beta = 0, \tag{3.12}$$

where we have made use of the feature that the critical project type $\tilde{\lambda}$ is defined by $\tilde{\lambda} = p(R^N(\tilde{\lambda}))$. According to (3.12) the threshold in terms of project quality above which firms obtain loan finance does not depend on the bargaining power of the bank, because in the Nash bargaining game the bank's threat point is zero regardless of its relative bargaining power.

We are now in a position to summarize our findings in

Proposition 1: While the spectrum of project qualities obtaining loan finance is invariant to the bargaining power of the bank, intensified lending market competition will lead to lower lending rates and less risky projects.

Proposition 1 appeals to intuition in light of the fact that the critical project type is determined by the bank's participation constraint, which is independent of the lending market structure as measured by the bank's bargaining power. This feature is in contrast to Petersen and Rajan (1995), who argue that bank's willingness to lend in the initial stage of a dynamic banking relationship increases with the concentration of the lending market as well as to the models emphasizing the adverse selection aspect of loan markets (see e.g. Broecker (1990), Riordan (1993) and Shaffer (1998) or Villas-Boas and Schmidt-Mohr (1999)), where the argument is the reverse to that by Petersen and Rajan. Our model thus suggests that the intertemporal and adverse selection aspects represent crucial feature for generating a relationship between lending thresholds and lending market concentration.

4 Agency cost of debt and lending market competition

In the previous section we have analyzed the determination of interest rates, project selection and project riskiness as a function of the bank's bargaining power. We now turn to study the relationship between for the agency cost of debt financing and lending market competition and for this purpose we identify lending market competition with the investor's bargaining power.[7]

Under Nash bargaining the indirect profit functions of the projectholder as well as the bank can be written as follows

$$\pi^N = p(R^N)[R^N - (1 + r^N)] = \frac{p(R^N)}{\lambda} \tag{4.1}$$

and

$$V^N = p(R^N)[1 + r^N] - 1 = p(R^N)\left[\frac{\beta}{\lambda} + \frac{1-\beta}{p(R^N)}\right] - 1. \tag{4.2}$$

Hence, adding equations (4.1) and (4.2) yields the aggregate expected profits of the projectholder and the bank under Nash bargaining about the lending rate

$$W^N = \pi^N + V^N = p(R^N)\left[\frac{1+\beta}{\lambda} + \frac{1-\beta}{p(R^N)}\right] - 1. \tag{4.3}$$

The agency cost of debt financing associated with Nash bargaining, $a^N(\beta)$, can now be obtained as the difference between the expected project surplus generated by the by the socially optimal project selection and that generated through the process of Nash bargaining. Using equations (2.8) and (4.5) the agency cost of debt financing can be expressed as

[7] A related bargaining approach has been used in Haskel and Sanchis (1995) in order to evaluate the consequences of privatization for the firm's X-inefficiency. However, their analysis focuses on the intra-organizational agency costs rather than on the agency costs of debt financing.

$$a^{N}(\beta) = W^{FB} - W^{N} = \frac{p(R^{FB})}{\lambda} - p(R^{N})\left[\frac{1+\beta}{\lambda} + \frac{1-\beta}{p(R^{N})}\right]. \tag{4.4}$$

In particular, for the cases of a monopoly bank and banking market operating under perfect competition the expressions for the agency costs of debt are

$$a^{M} = \frac{p(R^{FB})}{\lambda} - p(R^{M})\frac{2}{\lambda} \quad \text{and} \quad a^{C} = \frac{p(R^{FB})}{\lambda} - p(R^{C})\left[\frac{1}{\lambda} + \frac{1}{p(R^{C})}\right], \tag{4.5}$$

respectively.

Differentiating the agency cost of debt financing under Nash bargaining, i.e. equation (4.4), with respect to the bank's relative bargaining power parameter β and accounting for the effect of β on the rate of return, as captured by (3.9), and thereby on the probability of success according to (2.2), yields

$$a_{\beta}^{N} = p(R^{N})(1+\beta)R_{\beta}^{N} + \left(1 - \frac{\lambda}{p(R^{N})}\right) > 0 \Leftrightarrow p(R^{N}) > \lambda. \tag{4.6}$$

Thus, taking the participation constraint for the bank into account, the effect of lending market competition on the agency cost of debt finance can now be summarized in

Proposition 2: Intensified lending market competition will decrease the agency cost of debt finance by leading to lower lending rates and less risky projects.

Hence, our present analysis does not lend support to the commonly held view that there would be a trade-off between more intense lending market competition and higher agency costs of debt finance as has been argued for example, by Broecker (1990) and Riordan (1993). They have focused on how the phenomenon of adverse selection might present mechanisms demonstrating that more intense lending market competition may damage market performance. Although severe adverse selection problems leading to a sufficiently low probability of success might suggest that intensified lending competition could, in principle, increase the agency cost of debt finance, our analysis finds that such a possibility would be eliminated by the bank's participation constraint. As the bank does not find it worthwhile to finance such projects it follows that the lending market would break down in those cases. In the absence of sufficiently severe adverse selection problems Proposition 2 sends a strong message. Intensified lending market competition will decrease the agency cost of debt finance by leading to lower lending rates and less risky projects.

5 Concluding comments

In this paper we have addressed the question of how lending market competition, measured by the bargaining power of banks, affects the agency costs of debt finance. It has been shown that intensified lending market competition will lead to lower lending rates and investment return distributions which are shifted towards lower, but less risky returns. Because intensified lending market competition induces such an effect on the distribution of investment returns it follows that increased lending market competition will reduce the agency cost of debt financing. Hence our analysis does not lend support to the commonly held view that there would be a trade-off between more intensive lending market competition and higher agency costs of debt finance.

While our model predicts that intensified lending market competition will reduce the agency cost of debt, the spectrum of project qualities obtaining loan finance is invariant to the bargaining power of the bank. This feature is in contrast to Petersen and Rajan’s (1995) intertemporal model as well as to the models emphasizing the adverse selection aspect of loan markets (see e.g. Broecker (1990), Riordan (1993) and Schaffer (1998) or Villas-Boas and Schmidt-Mohr (1999)). In these models more intense lending competition either increases or decreases the threshold of obtaining loan finance depending on whether the intertemporal aspect or the adverse selection aspect dominates. Thus, our result suggests that the conclusions reached in the literature are sensitive to the presence of long-term lending relationships and adverse selection, which lie outside the scope of our model.

Our analysis has focused on a very simple and stylized model within the framework of which we have been able to explicitly address the relationship between the market power of banks and agency costs induced by debt contracts as financial instruments. As the analysis of Brander and Poitevin (1992) demonstrates there might be important interactions between agency costs at different hierarchical levels. An interesting direction for further research might be to investigate the interactions between the agency costs of debt identified in the present model with aspects of internal agency relationships within firms obtaining loans. Similarly, it might also be interesting to investigate how the agency costs of debt are related to strategic product market interaction between funded projects.

References

Besanko, D. – Thakor, A. (1993) **Relationship Banking, Deposit Insurance and Bank Portfolio.** In Mayer, C. and Vives, X. (eds.). Capital Markets and Financial Intermediation. Cambridge: Cambridge University Press, 292–319.

Bester, H. – Hellwig, M. (1987) **Moral Hazard and Equilibrium Credit Rationing: An Overview of the Issues.** In Bamberg G. and Spreeman K. (eds.). Agency Theory, Information and Incentives: Berlin: Springer-Verlag.

Binmore, K. – Rubinstein, A. – Wolinsky, A. (1986) **The Nash Bargaining Solution in Economic Modelling.** Rand Journal of Economics, 17, 176–188.

Brander, J. – Poitevin, M. (1992) **Managerial Compensation and the Agency Cost of Debt Finance.** Managerial and Decision Economics, 13, 55–64.

Broecker, T. (1990) **Credit-Worthiness Tests and Interbank Competition.** Econometrica, 58, 429–452.

Clemenz, G. (1986) **Credit Markets with Asymmetric Information.** Berlin: Springer-Verlag.

Danthine, J.-P. – Giavazzi, F. – Vives, X. – von Thadden, E.-L. (1999) **The Future of European Banking.** Monitoring European Integration Series 9, Centre for Economic Policy Research, London.

Dell'Ariccia, G. (1998) **Asymmetric Information and the Structure of the Banking Industry.** IMF Working Paper 98/92.

De Meza, D. – Webb, D. (1999) **Wealth, Enterprise and Credit Policy.** The Economic Journal, 109, 155–163.

Dewatripont, M. – Maskin, E. (1995) **Credit and Efficiency in Centralized and Decentralized Economies.** Review of Economic Studies, 62, 541–555.

Emerson, M. (1992) **One Market, One Money.** Oxford: Oxford University Press.

Freixas, X. – Rochet, J.-J. (1997) **Microeconomics of Banking.** Cambridge: The MIT Press.

Gehrig, T. (1998) **Screening, Cross-Border Banking and the Allocation of Credit.** Research in Economics, 52, 387–407.

Harris, M. – Raviv, A. (1991) **The Theory of Capital Structure.** Journal of Finance, 46, 297–355.

Haskel, J. – Sanchis, A. (1995) **Privatisation and X-Efficiency: A Bargaining Approach.** Journal of Industrial Economics, XLIII, 301–321.

Kanniainen, V. – Stenbacka, R. (1998) **Lending Market Structure and Monitoring Incentives.** Working paper, Swedish School of Economics.

Koskela, E. – Stenbacka, R. (2000) **Is There a Tradeoff between Bank Competition and Financial Fragility?** Journal of Banking & Finance, forthcoming.

Nash, J. (1950) **The Bargaining Problem.** Econometrica, 18, 155–162.

Petersen, M. – Rajan, R. (1995) **The Effect of Credit Market Competition on Lending Relationships.** Quarterly Journal of Economics, 110, 407–443.

Price Waterhouse (1988) **The Cost of Non-Europe in Financial Services.** In Research of the Cost of Non-Europe, vol. 9, Commission of the European Communities, Brussels.

Riordan, M. (1993) **Competition and Bank Performance: A Theoretical Perspective.** In Mayer, C. and Vives, X. (eds.). Capital Markets and Financial Intermediation, Cambridge: Cambridge University Press, 328–343.

Shaffer, S. (1998) **The Winner's Curse in Banking.** Journal of Financial Intermediation, 7, 359–392.

Stiglitz, J.E. – Weiss, A. (1981) **Credit Rationing in Markets with Imperfect Information.** American Economic Review, 71, 393–410.

Villas-Boas, M. – Schmidt-Mohr, U. (1999) **Oligopoly with Asymmetric Information: Differentiation in Credit Markets.** Rand Journal of Economics, 30, 375–396.

von Thadden, E.-L. (1995) **Long-term Contracts, Short-term Investment, and Monitoring.** Review of Economic Studies, 62, 557–575.

Wasmer, E. – Weil, P. (1999) **The Macroeconomics of Labor and Credit Market Imperfections.** Mimeo, October.

BANK OF FINLAND DISCUSSION PAPERS

ISSN 0785-3572, print; ISSN 1456-6184, online

1/2000 Jussi Snellman – Jukka Vesala – David Humphrey **Substitution of Noncash Payment Instruments for Cash in Europe.** 2000. 39 p. ISBN 951-686-647-6, print; ISBN 951-686-648-4, online. (TU)

2/2000 Esa Jokivuolle – Samu Peura **A Model for Estimating Recovery Rates and Collateral Haircuts for Bank Loans.** 2000. 22 p. ISBN 951-686-649-2, print; ISBN 951-686-650-6, online. (RM)

3/2000 Risto Herrala **Markets, Reserves and Lenders of Last Resort as Sources of Bank Liquidity.** 2000. 24 p. ISBN 951-686-653-0, print; ISBN 951-686-654-9, online. (TU)

4/2000 Pekka Hietala – Esa Jokivuolle – Yrjö Koskinen **Informed Trading, Short Sales Constraints and Futures' Pricing.** 2000. 29 p. ISBN 951-686-655-7, print; ISBN 951-686-656-5, online. (RM)

5/2000 Mika Kuismanen **Labour Supply and Income Tax Changes: A Simulation Study for Finland.** 2000. 36 p. ISBN 951-686-657-3, print; ISBN 951-686-658-1, online. (TU)

6/2000 Ralf Pauli **Payments Remain Fundamental for Banks and Central Banks.** 2000. 40 p. ISBN 951-686-659-X, print; ISBN 951-686-660-3, online. (RM)

7/2000 Yuksel Gormez – Forrest Capie **Surveys on Electronic Money.** 2000. 46 p. ISBN 951-686-661-1, print; ISBN 951-686-662-X, online. (TU)

8/2000 Markus Haavio – Heikki Kauppi **Housing Markets, Liquidity Constraints and Labor Mobility.** 2000. 26 p. ISBN 951-686-663-8, print; ISBN 951-686-664-6, online. (TU)

9/2000 Ari Hyytinen – Otto Toivanen **Monitoring and Market Power in Loan Markets.** 2000. 49 p. ISBN 951-686-667-0, print; ISBN 951-686-668-9, online. (RM)

10/2000 Ari Hyytinen – Tuomas Takalo **Enhancing Bank Transparency: A Re-assessment.** 2000. 34 p. ISBN 951-686-669-7, print; ISBN 951-686-670-0, online. (RM)

11/2000 David G Mayes – Matti Virén **Asymmetry and the Problem of Aggregation in the Euro Area.** 2000. 39 p. ISBN 951-686-671-9, print; ISBN 951-686-672-7, online. (TU)

12/2000 Erkki Koskela – Rune Stenbacka **Agency Cost of Debt and Lending Market Competition: A Re-Examination.** 2000. 20 p. ISBN 951-686-673-5, print; ISBN 951-686-674-3, online (TU)