Discussion Paper Series A No.470

Relationship Banking and SMEs
A Theoretical Analysis

Timo Baas
(DIW Berlin [German Institute for Economic Research])
and
Mechthild Schrooten
(Associate Professor, The Institute of Economic Research,
Hitotsubashi University
／ DIW Berlin [German Institute for Economic Research])

December, 2005

The Institute of Economic Research
Hitotsubashi University
Kunitachi, Tokyo, 186-8603 Japan

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This version: December 2005

by

Timo Baas and Mechthild Schrooten **

* We are grateful to Franziska Holz, Caroline Kip, Claudia Nassif, Dorothea Schaefer, Philipp Schroeder, the DIW financial market group and an anonymous referee for valuable comments on an earlier version of the paper.

** Timo Baas, DIW Berlin (German Institute for Economic Research) Koenigin-Luise-Str. 5, 14195 Berlin, Germany, email: tbaas@diw.de and University Potsdam, Faculty of Economics, August-Bebel-Str. 89, 14482 Potsdam baas@rz.uni-potsdam.de. Mechthild Schrooten DIW Berlin (German Institute for Economic Research) Koenigin-Luise-Str. 5, 14195 Berlin, Germany, email: mschrooten@diw.de and Hitotsubashi University, 2-1 Naka Kunitachi, Tokyo, Japan email: mechtild@ier.hit-u.ac.jp. Corresponding author: Mechthild Schrooten, German Institute for Economic Research (DIW Berlin), Koenigin-Luise-Str. 5, D-14195 Berlin, Germany. email: mschrooten@diw.de; mechtild@ier.hit-u.ac.jp

Suggested abbreviation of the title: Relationship banking

Relationship Banking and SMEs

A Theoretical Analysis

Abstract:

Reliable information on small and medium sized enterprises (SMEs) is rare and costly for financial intermediaries. Therefore relationship banking is often considered as the appropriate lending technique. In this paper we offer a theoretical model to analyze relationship banking and the pricing behavior of banks in a Bertrand competition framework with monitoring costs. We show that the lack of reliable information leads to comparably high interest rates even if a long-term relationship between borrower and bank exists. The paper offers a theoretical explanation why SMEs often are faced with borrowing constraints. (91 words)

Keywords: Relationship Banking, Financial Constraints, Small and Medium Sized Enterprises, Accounting

JEL-classification: D43, D 82, G21, M41

1. Introduction

Typically in industrialized countries, small- and medium-sized enterprises (SMEs) account for more than 90 percent of all firms, they employ about two-thirds of the workforce, and contribute to nearly 50 percent of the value added in non-agricultural production. They are often considered to play an important role in growth promotion and poverty reduction (Bank 1994, 2002, 2004; Beck et. al 2003; Wagenvoort 2003). Nevertheless, it seems to be a global phenomenon that SMEs are confronted with relatively harsh credit constraints (Beck and Maksimovic 2002; European Commission 2002; Beck et. al. 2004).

Until now the analytical framework concerning price-setting behavior of banks and information availability on SMEs the has been underdeveloped. Since reliable information on SMEs is rare and costly, relationship lending is often considered as the most appropriate lending technique for collecting information on SMEs (Boot and Milbourn 2002): the firm and the bank enter in a long-term relationship that assures the firm's access to credit and gives the bank access to information about the firm (Allen and Saunders 1991; Nakamura 1992; Berger et. al. 1999; Boot 2000). One important characteristic of such a relation is the increase of the value of the information (Schaefer 2003). Therefore, one could expect that loan interest rates should decline over time. However, recent empirical and theoretical literature on relationship banking offers ambiguous results: Peterson and Rajan (1994) suggest that loan interest rates decline with relationship lending.[1] The opposite effect is described by Greenbaum et. al. (1989) and Sharpe (1990); they demonstrate conditions under which lenders subsidize borrowers in early periods and are reimbursed in later periods.[2] Based on so-called "soft" information, this lending technique is mainly generated by the bank's past experience with a given lender.

Here, we take a closer look at this problem and develop a theoretical model to analyse the effects of the lending technique on the interest rate. Previous studies, where perfect competition is impeded by asymmetric information, show that professional financial intermediaries like banks can benefit from economies of scale in obtaining information about borrowers (Stiglitz and Weiss 1981; Diamond 1984, 1991; Ramakrishnan and Thakor 1984; Boyd and Prescott 1986).[3] The main difference between our article and these previous studies is that we focus on profit maximization of banks and take into account the specific lending technique used by banks.

We show that the choice of the lending technique is crucial for the cost function of the bank. These costs occur from the costs of monitoring borrowers, the costs of refinancing credits and the costs of lending to borrowers who cannot pay back their credit (bad loans). The lending technique affects two components of the costs of a bank. First, the lending technique determines the monitoring cost curve. Second, it affects the efficiency of monitoring and therefore the share of bad loans in the portfolio of banks.

We argue on the basis of a Bertrand competition framework - frequently used in the credit market literature (Dell´Ariccia et. al. 1999; Jun and Vives 2004). An important advantage of this type of competition is that polypoly effects are generated in the duopoly case. Therefore differences in lending techniques are not superposed by duopoly –effects, i.e. by strategic interactions between banks or firms. The lack of borrower market power is a key assumption of Bertrand competition (Gal-or 1986; Bracoud 2002). We show that there exist linkages between the chosen lending technique and the loan interest rate. The major finding of our paper is that with a longer duration of the lending relationship, loan interest rates are not reduced. Furthermore, we show that in markets where banks rely on relationship lending, borrowers are charged higher interest rates compared to markets where relationship lending and credit scoring/financial statement lending coexist.

The remainder of the paper is organized as follows: in section 2 we develop a model of banking with different lending techniques. In section 3 we discuss the results of the model, while section 4 offers conclusions.

2. The Model

Financial intermediaries need information on potential borrowers. Only on the base of sufficient information they can make an efficient decision whether to finance a given investment project or not. Nevertheless, reliable information on firms is not always publicly available. Especially SMEs usually are not forced to use sophisticated accounting techniques and to publish their balance sheets. Therefore information on these enterprises is relatively costly. In such a case a financial intermediary might try to use relationship banking to collect information on the potential borrower over time.

In general, a bank has the possibility to monitor borrowers and to gain information on potential investment projects. Monitoring causes costs (t). The incentive for banks to

monitor arises from the assumption of prohibitive costs in the case of non-monitoring. If a bank chooses the relationship lending technique monitoring costs are a function of the maturity of the bank-borrower relation. In the case of financial statement lending they are constant and do not vary with the duration of the bank-borrower relationship (table 1). Consequently, if banks differ with respect to the lending technique, they will have different (monitoring) cost curves (box 1). But does relationship lending lead to lower interest rates for borrowers with long-term relationships?

<insert table 1>

<insert box 1>

2.1 The general structure of the model

We assume a number (A) of borrowers. Each of them wants to realize a single investment project that requires one unit of funding and generates a random return. These borrowers are atomic and therefore have no market power. Market demand for finance is generated by a continuum of investors represented by the atomic probability space (A, A, v). Let the demand function $d : \mathbb{R}_{++} \times A \to \mathbb{R}$ be such that the integral $D(p) = \int_A d(r,a)dv(a)$ is well defined for every $r \in \mathbb{R}_{++}$. For any borrower $a \in A$, $d(r,a)$ specifies his demand if he can borrow at any given (positive) interest rate r. The total market demand function $D(\cdot)$ indicates the aggregate amount of credit that all investors together are willing to take at a given (positive) interest rate (e.g. Allen and Hellwig 1993).

The firms can have either good or bad investment opportunities, so that there is a share of (q) good and $(1-q)$ bad investment projects. The return of the projects $g(z)$ is characterized by a binary random variate (z) which can adopt the values 0 or 1; $z \in \{0,1\}$. If z is 1, then the project is successful and the return is non-zero; if z is 0, then the return of the project is zero as well.

It is assumed that average return $\lambda^G g(1)$ of good projects (q) is higher than the “save" loan interest rate: $\lambda^G g(1) \geq r_s$. Conversely, for bad projects $(1-q)$ the average return falls below the safe loan interest rate: $\lambda^B g(1) < r_s$. Because even the firms with bad opportunities can be

successful with their projects and even the firms with good opportunities can fail, parameter $\lambda^G \leq 1$ defines the probability of success for good and the parameter $\lambda^B < 1$ for bad projects.

We further assume that there exist two banks, i and j; at least one of them relies on relationship lending. Banks are the unique providers of funds and have access to competitive capital markets where they can fund themselves at the exogenous interest rate p.

For simplification we assume that the distribution of borrowers regarding the maturity of their bank relationship is a continuous line with one borrower at every point, like pearls at a pearl necklace. A bank does not know the behavior of the other bank and thus tests if it can underbid its competitor by setting lower loan interest rates. It is further assumed that a bank knows the share of good projects in its portfolio. Hence the expected ($\hat{\varphi}$) and real shares of good projects (φ) are assumed to be equal $(\hat{\varphi} = \varphi)$. This leads to the typical Bertrand demand function, where a bank can obtain the entire market, if it can underbid its competitors.

$$R_i\left(r_r, r_j\right) = \begin{cases} r_i \min\left[q_i, D(r_i)\right], & r_i > r_j \\ r_i \min\left[q_i, D(r_i)\dfrac{q_i}{q_i + q_j}\right], & r_i = r_j \\ r_i \max\left\{0, \min\left[q_j, D\left(r_j\right)\left(\dfrac{1-q_j}{D(r_i)}\right)\right]\right\} & r_i < r_j \end{cases}$$

with $R_{i,j}$ as payoff function,

$D(r_{i,j})$ as demand for credits, i for banks $i = 1,2$ and $i \neq j$.

Consequently, the banks in the market maximize profits and play a non-cooperative Bertrand-Nash competition game. In this setting, the payoff function shows what each player will receive as the outcome of the game in terms of market share. In the following sub-sections we turn to the bank side of the game. There we show the possible interest rates which a bank can charge according to its specific cost function.

2.2 The benchmark model: a relationship lending duopoly

Consider a market with two banks that rely on the relationship lending technique. This means that every bank has “soft” information about the business of a firm (e.g. reliability of the borrower, history of the firm, firm’s perspective and new markets). Monitoring firms is costly,

therefore both banks only monitor their own share of the market ((x) or $(1-x)$).[4] Each borrower is causing different monitoring costs depending on the maturity of the lending relationship. In general, there are two explanations for the assumption of a decline in monitoring costs over time: first, because of better knowledge of e.g. the quality of intangible goods, the firm's local market, and export opportunities, the quality of information rises and the costs of additional data collection diminish. Second, asset-based lending is used as a substitute when the relationship is in an infant state (Boot 2000); since this lending technique is cost-intensive, switching to relationship lending reduces these costs.

The banks *i* and *j* identify potentially good investment projects with a monitoring efficiency of $\phi_{i,j}$ and lend to firms with these investment opportunities. Since both banks are relationship banks, monitoring efficiency is the same, $\phi_i = \phi_j$. Due to the assumed perfect foresight, the marginal costs $mc_{i,j}$ are:

(1.1) $$mc_{i,j} = (f_{i,j} + t(1-x)) / \hat{\varphi}_{i,j}$$

where $\hat{\varphi}_{i,j}$ is the expected share of successful projects based on information from previous periods, $f_{i,j}$ is the cost function of a specific bank and *t(1-x) reflects the actual monitoring costs* . For each credit, both banks face funding costs $p_{i,j}$. The cost function of the banks is:

(1.2) $f_{i,j} = [q\phi_{i,j} + (1-q)(1-\phi_{i,j})]p_{i,j}$ [5], with q reflecting the share of good and 1-q the share of bad projects.

The share of successful projects $\varphi_{i,j}$ becomes obvious

(1.3) $$\varphi_{i,j} = q\phi\lambda_{i,j}{}^{G} + (1-q)(1-\phi_{i,j})\lambda^{B}.$$

This leads to the profit function of the bank i:

$$(1.4) \qquad \pi_i(r_i, r_j) = \begin{cases} \int_{x=0}^{1} \left[A r_{i,j} D(x) \varphi_{i,j} - f_{i,j} - At(1-x) \right] dx & r_i > r_j \\ \int_{x=0}^{\frac{1}{2}} \left[A r_{i,j} D(x) \varphi_{i,j} - f_{i,j} - At(1-x) \right] dx & r_i = r_j \\ 0 & r_j > r_i \end{cases} \text{ with}$$

Knowing the profit function of the banks, we can think about the possibility of any positive interest rate a relationship bank can charge in this Bertrand-Nash game. On the lower range of possible interest rates (interest rates below marginal costs (MC) $\mu_{i,j}\left(\right]0, r_{i,j}^{MC}\left[\right)$[6]) neither bank assigns positive probability. This is obvious since the corresponding profit $\pi_{i,j}$ would be negative for both banks. The medium range of possible interest rates is defined by $\mu_{i,j}\left(\left[r_{i,j}^{MC} + \varepsilon, r_{i,j}^{LBMC} \right[\right)$ with the parameter $\varepsilon > 0$; if ε equals one this means marginal cost pricing. The range of this interval is defined from marginal cost pricing to least borrower marginal cost pricing (LBMC). For this entire interval the probability of realization is 0 since there exists at least one slightly higher interest rate which results in larger profits. This is caused by monitoring costs rising marginal costs above the average level. Therefore if a bank i can underbid its competitor j by a marginal reduction of r, this bank i would gain the whole market, but because of rising monitoring costs would lose profit even if it does not serve the whole market. There is only one interval of possible interest rates left: $\mu_{i,j}\left(\left[r_{i,j}^{LBMC} + \varepsilon, \infty \right[\right)$. In Nash equilibrium, if a bank charges interest rates above marginal costs $\varepsilon > 0$, expected profits will be zero since this bank expects the other bank to underbid its interest rate. Therefore the probability of a bank choosing a higher interest rate than least borrower marginal cost is zero.

Result 1:

> Bertrand competition does not lead to marginal cost pricing.[7] This is caused by monitoring cost advantages of relationship banks that prevent (perfect) competition except market border competition. Consequently, the banks have no incentive to price-discriminate, i.e to charge loan interest rates equal to marginal costs. The banks use

uniform pricing and charge all borrowers marginal costs of short relationship borrowers.

In the usual reasoning, the unique pure strategy Bertrand-Nash equilibrium equals marginal costs $p_i^* = p_j^* = mc_{i,j}$. As Harrington (1989) pointed out this is the only equilibrium outcome when firms produce at constant marginal costs and market demand is bounded, continuous, downward sloping and has a finite choke-price. In this model we assume information asymmetries caused by the different length of lending relationships. As our result shows there is only one possible equilibrium: an interest rate (price) equal to the least borrower marginal cost. Figure 1 provides an illustration. Due to the assumed symmetry of banks this is exactly a market share of one half for each bank:

$$\frac{1}{2} = \frac{\varphi_i f_j + \varphi_i t - \varphi_j f_i}{t(\varphi_j + \varphi_i)} \tag{1.5}$$

This equilibrium, market share enables the banks to make positive profits. Profits are F1 for bank i and F2 for bank j. Charging the least borrowers marginal cost is reflected in point a in figure 1.

<insert figure 1>

2.3 Differences in Lending Techniques - the Access of SMEs to External Funds

We now turn to cases where SMEs are forced to make financial reports that can be used in financial statement lending or credit scoring. We assume that bank *i* relies on relationship lending and bank *j* on financial statement lending. As mentioned in section 2.1, monitoring costs for the bank with relationship lending differ between the borrowers. In contrast, the bank with financial statement lending faces the same monitoring costs for each borrower, $\overline{t}_j$.

We further assume that the average monitoring costs of both banks are equal:

$$\frac{\int_{x=0}^{\frac{1}{2}} (t_i \cdot x)}{\varphi_i} = \frac{\overline{t}_j}{\varphi_j}(1-x) \text{ with } \varphi_i = \varphi_j .$$ [8]

For banks engaging in financial statement lending, Bertrand competition implies loan interest rates equal to marginal costs:

(2.1) $$r_j = \frac{f_j + \bar{t}_j}{\varphi_j}$$

The marginal cost pricing of financial-statement-lending banks results in zero profits:

(2.2) $$\pi_j = A\left(\varphi_j r_j - f_j - \bar{t}_j\right) = 0$$

Since the financial statement bank's information is publicly available, market entry of another financial statement banks is likely if the financial statement bank charges loan interest rates higher than marginal costs.

The average loan interest rate charged by banks engaged in a market where financial statement lending is possible is lower than the average interest rate in a pure relationship lending market.

(2.3) $$r_j = r_i = \frac{f_j + \bar{t}_j}{\varphi_j} = \frac{f_i + \left(\int_{x=0}^{0,5} t_i x dx / 0,5A\right)}{\varphi_i} < \frac{f_i + \frac{1}{2}t_i}{\varphi_i}$$

As a consequence, equilibrium loan interest rate is lower than the marginal costs of relationship lending banks (least borrower marginal cost). Therefore this bank serves only the part of the market which is below the point where the sum of monitoring costs and funding costs equals the equilibrium loan interest rate:

(2.4) $$r_i = r_j = \frac{f_i + t_i x^*}{\varphi_i} \text{ with } x^* < 0,5^{9}.$$

$$\pi_i(r_i, r_j) = \left\{ \begin{array}{ll} \int_{x=0}^{1} \left[A r_{i,j} D(x) \varphi_{i,j} - f_{i,j} - At(1-x) \right] dx & r_i > r_j \\ \int_{x=0}^{\frac{1}{2}} \left[A r_{i,j} D(x) \varphi_{i,j} - f_{i,j} - At(1-x) \right] dx & r_i = r_j \\ 0 & r_j > r_i \end{array} \right\} \text{ with}$$

On the lower range of possible interest rates, just like in 2.2 $\mu_{i,j}\left(\left]0, r_{i,j}^{MC}\right]\right)$, again none of the banks assigns a positive probability. This is obvious since even in this case the corresponding $\pi_{i,j}$ would be negative for both firms. However, in this case marginal costs differ. There are three possible cases:

Result 2a)

In the first case, marginal costs caused by the borrower with the longest relationship are above the marginal costs of the financial statement lending bank. Therefore, anticipating the possibility to underbid the competitor, the financial statement lending bank would charge marginal costs and gain the whole market. This bank could increase its profits with higher prices, so it raises interest rates until a level slightly below marginal costs of the relationship lending bank's long duration borrowers.

Result 2b)

The second possible case is that the marginal costs caused by the relationship lending bank's borrower with the longest relationship equals marginal costs of the financial statement lending bank. In this case the Bertrand-Nash game leads to zero profits for both banks.

Result 2c)

In the third case marginal costs of the relationship lending bank are below the marginal costs of the financial statement lending bank. In this case the medium range of possible interest rates is defined by $\mu_{i,j}\left(\left]r_{i,j}^{MC}+\varepsilon, r_{i,j}^{LBMC}\right[\right)$, with $\varepsilon > 0$, which means marginal cost pricing. For this result the probability is 0 for the relationship lending bank since there exists a slightly higher interest rate which results in larger profits. This is due to the monitoring costs which cause marginal costs to rise above the average level. Therefore, if the relationship bank can underbid its competitor by a marginal reduction of r, this bank would gain the whole market, but due to rising monitoring costs the bank would lose profit even if it does not serve the whole market. Again there is only one interval of possible interest rates left, $\mu_{i,j}\left(\left]r_{i,j}^{LBMC}+\varepsilon, \infty\right[\right)$. If a bank would charge interest rates above marginal costs of financial statement lending bank, $\varepsilon > 0$, expected profits would be zero since this bank expects the other bank to

underbid its interest rate. Therefore the probability of one bank choosing a higher interest rate than the financial statement bank's marginal cost is be 0.

Figures 2 and 3 illustrate the case 2c for two scenarios of high and low financial statement marginal costs. If one argues that the market for loans to SMEs is characterized by a low level of available information, this would result in a market for relationship lending as it is shown in figure 1 or it would lead to relatively high marginal costs of the financial statement lending, as it is shown in figure 2. With rising information, like it is the case for large companies, marginal costs of financial statement lending are reduced. This is shown in figure 3, where the relationship lending bank has only a small share of the market compared to the financial statement lending bank.

Furthermore, figure 2 reflects two possible extensions. If we assume a need to get at least half of the market, the relationship lending bank would subsidize the area F1b with the area F1a. This would be the case if the bank has to gain young borrowers which have, by assumption, high monitoring costs. The second additional assumption is the possibility of switching the lending technique from relationship lending to financial statement lending. The prevailing lending technique would in this case be relationship lending until a critical market share, and after this point financial statement lending (dotted line in figure 2). In figure 3 both assumptions are included, but with low marginal costs of financial statement lending; the area F1b extends the are F1a. Therefore subsidizing young borrowers is no longer possible without profits to be less than zero.

<insert figure 2 and figure 3>

3. Interpretation of the Results

In our model we analyze the impact of the lending technique on SME finance and we explain the behavior of a relationship bank in different market environments. We show that in three variations of the model, relationship lending has advantages for a bank – but not necessarily

for the borrower. Additionally, we show that if there is a bank which is engaged in financial statement lending, this bank is restricting the advantages of the relationship lending bank.

The central results of the model are:

- Relationship-lending banks exploit information advantages that result from their lending technique.
- If one bank relies on financial statement lending, this bank drives down the profits of the relationship lending bank by reducing the market price.
- In the case of low monitoring costs for financial statement lending, the relationship lending bank serves only a small fraction of the market. Loan interest rates are directly proportional to financial statement monitoring costs.
- Average monitoring costs are lower in the case of relationship lending. Nevertheless, the cost advantages of relationship lending do not necessarily lead to a lower interest burden for SMEs.

The model yields interesting results. First, relationship lending leads to relatively high loan interest rates compared to other lending techniques. Second, when assuming a lower efficiency of credit scoring, this type of market structure leads to lower interest rates than relationship lending. Third, the lowest interest rates are realized in a market with one of the banks being a financial statement bank.

The model results stress the importance of the availability of different lending techniques to reduce borrowers' loan interest rates. In practice, especially the market of SMEs lacks high quality accounting data, which makes these firms more dependent on relationship banking than large companies. Since relationship lending leads to high loan interest rates, SMEs suffer from high costs of external funding. For large companies, a much higher degree of information is public and therefore available without any costs to financial intermediaries. This enables the banks to apply transaction based lending (financial-statement-lending or credit-scoring) which reduces loan interest rates.

4. Conclusions and Outlook

SMEs seem to suffer from limited access to external financial resources all over the world. Banks usually are reluctant to provide credit to this type of enterprises. This behavior is due to the relatively limited publicly available information about SMEs. Legal accounting requirements for these enterprises are low, so that managers of SMEs have only small incentives to invest in detailed information practices. It is often argued that this specific lack of information can be compensated by relationship banking, which enables banks to collect detailed information about an individual firm over time. Nevertheless this information is exclusive. That's why there exists a close linkage between the lending technique of a bank and the interest rate offered to a firm. While relationship lending leads to relatively high interest rates the burden is much lower in the case of financial statement lending.

These results have far-reaching implications for the recent discussion on the introduction of international accounting standards in Europe. There are strong arguments for an improvement of the current design of accounting standards specifically for SMEs. First, in order to be efficient, international accounting standards should apply to all types of enterprises. Second, additional information gained through this process would lead to an improvement in decision-making. Both banks and enterprises would be the beneficiaries of such a change in the institutional framework. Third, the introduction of international accounting standards would have a self-containing, positive impact on competition within the banking sector.

Given the large interest on the interdependence of banking and SME finance further research is necessary. Since our model is limited to the supply side, adding borrower demand would be a natural extension of the model. In such an extended framework interest rate effects are expected to be supplemented by reduced demand for credit.

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Figure 1

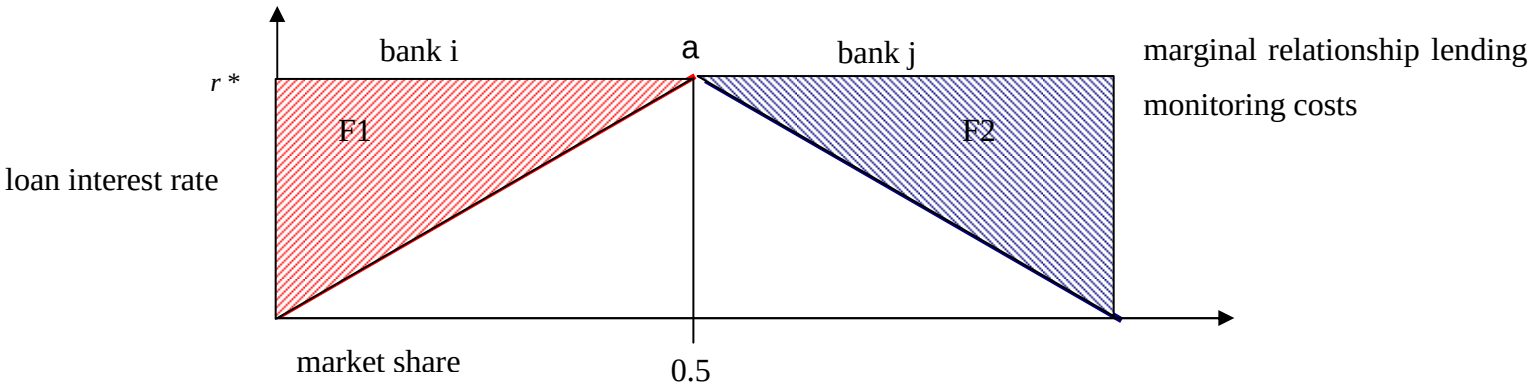

bank i
a
bank j
marginal relationship lending
r *
monitoring costs
F1
F2
loan interest rate
market share
0.5

Figure 2

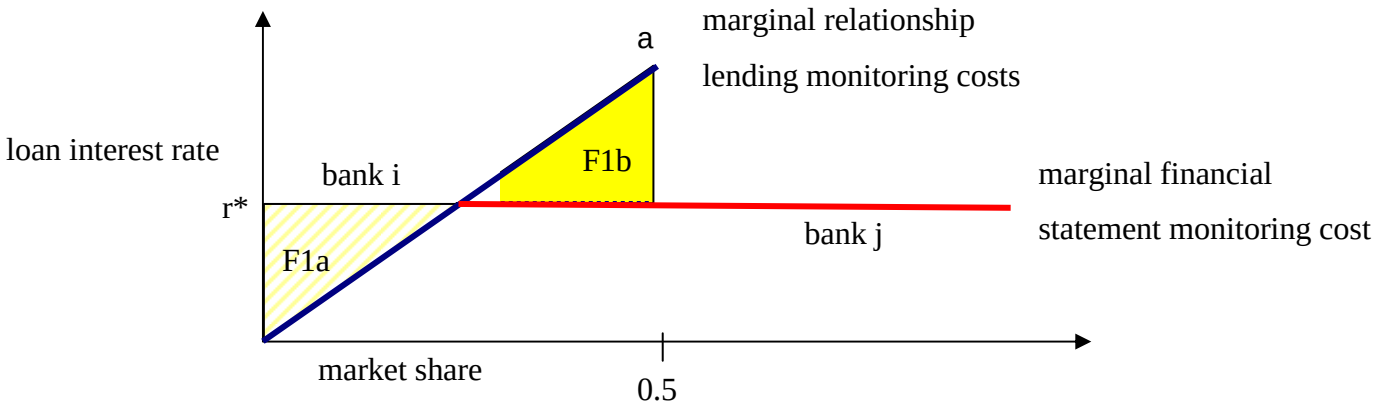
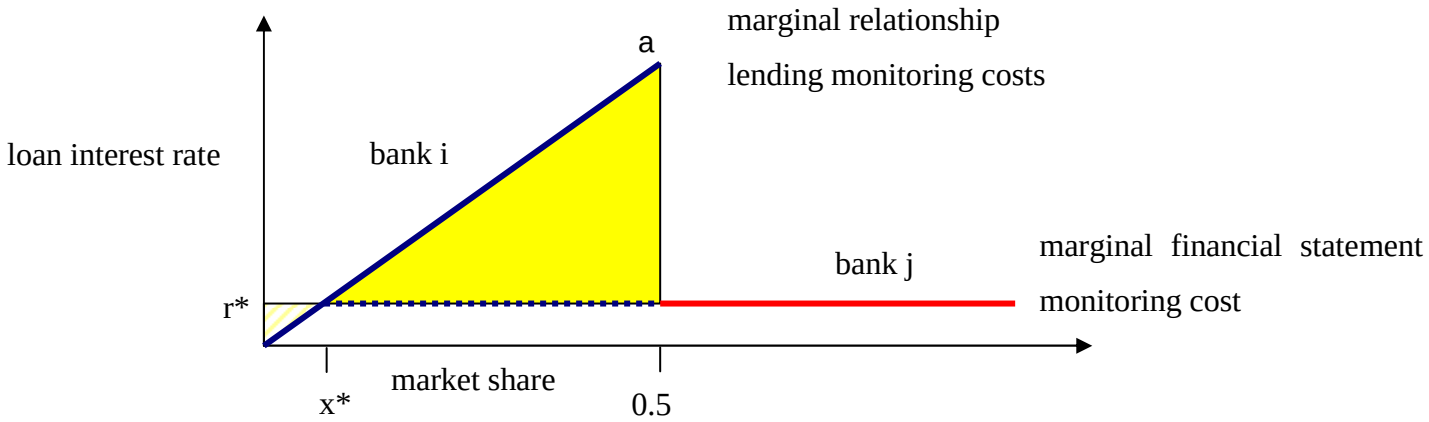

marginal relationship
lending monitoring costs
a
loan interest rate
bank i
F1b
marginal financial
statement monitoring cost
r*
bank j
F1a
market share
0.5

Figure 3


marginal relationship
lending monitoring costs
a
loan interest rate
bank i
bank j
marginal financial statement
monitoring cost
r*
market share
x*
0.5

Box 1:

Lending techniques reconsidered

In general, lending can be categorized into at least four[10] distinct lending techniques. These practices differ mainly by the usage and generation of information (table 1):

Relationship lending is based on the experience of a given bank with a specific borrower and therefore on "soft" information collected over time. Hence, if financial data is limited, relationship banking is the technique of choice.

Financial statement lending is based on evaluating information from the firms' financial statements. The decision to lend depends largely on the strength of the balance sheet and income statements. Since SMEs face less legal requirements than large companies to publish financial data, financial statement lending is likely to be the technique of choice in bank lending to large firms (Udell 2004).

In the case of *asset-based lending*, credit decisions are principally based on the quality of the available collateral. This type of lending causes high monitoring costs and requires high-quality receivables and inventory available to pledge (Berger and Udell 1995, 1998, Boot 2000). That is why it is generally used as a substitute for relationship lending if the term of the relationship is short.

Small business credit scoring is an adaptation of statistical techniques used in consumer lending. In addition to information about the financial statements, the creditworthiness and history of the owner is heavily weighted (Frame et. al. 2001). In practice, small business credit scoring is mostly used for micro enterprises (Saunders 2001) and is a substitute for financial statement lending with few monitoring costs but a high possibility of wrong declarations by the borrower.

The most important characteristic of the first type of lending is that it is based on "soft" information. Banks may acquire information through the relationship by monitoring borrower performance over time under credit arrangements and/or through the provision of other services such as deposit accounts. In contrast to this, the other three types of lending are based on "hard" information. Thus, the main difference between these two groups of lending is the availability of information to competing banks. Relationship banking is based on collecting information over time and therefore produces private information that is only available to the specific bank or to a banking network. Since this information cannot be interpreted out of this specific context, the relationship-lending bank gains an advantage over its competitors.

Table 1: Lending Techniques

	Type of information	Efficiency	Approximation in the model	Type of information
Relationship lending				
	private information about the firm and the owner	depends on the tightness of banking relationship	decreasing monitoring costs	"soft" information:
Financial statement lending				
	standardized financial reporting data	depends on the quality of the available data		"hard" information:
Asset based lending				
	credit collateral	no credit loss if credit volume is in the limit of collateral value	not modeled	
Credit scoring				
	standardized financial data of owner and firm	depends on the quality of the available data but can be only a proxy of financial insight	flat rate monitoring cost	"hard" information:

Source: authors'.

Footnotes

[1] In concentrated relationship-lending markets, Petersen and Rajan (1994) find that loan interest rates decline less than in competitive markets because they are subsidized in favor of young relationships. This supports somewhat Greenbaum et. al. (1989) and Sharpe (1990).

[2] By engaging in long-term relationships, firms transmit information about the company and its projects to the bank and can therefore reduce loan interest rate and collateral requirements (Alen, Sounders and Udell 1991; Nakamura 1993). Boot and Thakor (1994) demonstrate this relationship in a theoretical model without learning effects.

[3] An article similar in spirit to ours is Rajan (1992), which discusses the incentive of firms to prevent banks from extracting surplus from them.

[4] We assume that a part of the market x is served by bank i and the other part $(1-x)$ is served by bank j.

[5] It is assumed that the bank knows which share of projects will be successful, but does not know the probabilities of success of a single investment project. The bank does not lend to projects which are identified as bad (the bank lends to $q\phi_i$ identified good and $(1-q)(1-\phi)_i$ wrongly identified bad creditors)

[6] With μ as the function of possible interest rates.

[7] The Bertrand type competition does not lead to extreme outcomes because of non-homogeneity of monitoring costs. However, if the Bertrand-competing banks prefer activity, a reduction in loan interest rate r* would lead to a marginal profit below marginal costs. We follow Bracoud (2002) in arguing that even if banks prefer activity, it does not lead to irrational behavior in enhancing market share even if marginal profits are lower than marginal costs.

[8] We will get comparable results to this case if we consider a credit-scoring bank alternatively to the financial statement lending bank. The only difference between the two techniques simply is a lower level of monitoring efficiency for the credit scoring bank:

$\phi_{creditscoring} < \phi_{financialstatement} = \phi_{relationshiplending}$ reconsider that ϕ is assigned as monitoring efficiency of banks.

[9] This equilibrium is static and does not hold for a dynamic case since no new borrowers are served. In a dynamic case, it is suggested that the bank subsidizes new borrowers by lending at the cost of old borrowers.

[10] Mostly two lending technologies are described in literature – relationship lending and transaction based lending. For our purpose we follow Berger and Udell (2002) which is a bank based view rather than the broader six technique view in Udell (2004) who includes factoring and trade credit.