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Integrating with Their Feet: Cross-Border Lending at the German-Austrian Border

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Cross-Border Lending at the German-Austrian Border[*]

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Abstract

The current economic policy discussion on financial integration in the European Union concentrates on cross-border mergers. We study the impact of cross-border lending in a theoretical model where banks acquire either hard or soft information on borrowing firms and predict that the closer firms are to the border the more likely banks are to offer them cross-border loans. This hypothesis is confirmed in the ifo Business Climate Survey that reports the perceptions of German firms on banks' lending behavior between 2003 and 2006. In contrast to the policy of harmonization, differences in bank regulations may provide incentives for cross-border lending. Thus, we show that financial integration may take place from the bottom up.

Keywords: Financial Integration, SMEs, Banking Supervision, Business Surveys, Threshold Analysis.
JEL Classification: G18, G21, C25.

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1. Introduction

In Europe, integration of the banking market has been expected for many years but so far little progress has occurred in this respect (ECB, 2007). Integration in credit markets happens through cross-border lending or foreign bank entry, through either greenfield investment or acquisition. For Europe, cross-border mergers are expected to drive financial integration. Cross-border mergers often mean that the distance between customers and their banks will increase, and information problems will become more severe. From the literature on distance and lending we know that (both physical and functional) distance crucially influences the financing conditions of firms. Consequently, cross-border mergers may render it more difficult for informationally opaque firms, in particular small- and medium-sized enterprises (SMEs), to get access to loans (Barros et al., 2005).

Cross-border lending as a means of integration is often neglected in this debate. However, we could expect that it has a positive effect on access to loans for SMEs. Before the foreign bank lends cross-border, firms are deprived of access to loans from banks that are close but in another country (see the literature on border effects).[1] Thus, cross-border lending may be especially beneficial for SMEs for whom distance is particularly relevant. Therefore, we want to know how firms benefit from integration through cross-border lending. What is the role of distance in cross-border lending?

To answer these questions, we derive in the first part of the paper a theoretical model in which a German and an Austrian bank compete on the credit market for German firms. Due to regulatory requirements, the German bank must use hard information about the firm's creditworthiness. While hard information is costly, its quality is independent of the distance to firms. By contrast, the Austrian bank can decide whether to use hard information after making some additional investment or to rely on soft information. However, the quality of soft information decreases in the distance between bank and firm.

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[1] Border effects in trade are intensively discussed in literature (see the seminal paper McCallum, 1995). Borders reduce trade between industrialized countries by 20 to 50 per cent (Anderson and van Wincoop, 2003). Similar effects are documented for portfolio holdings (Obstfeld and Rogoff, 2000).

We show that the Austrian bank decides to use costless soft information about German firms. The reason is that if the Austrian bank used hard information as well, competition between the German and the Austrian bank would drive banks profits to zero. This would not allow the Austrian bank to recover the fixed costs it had to incur to use hard information on German firms. Given this choice, the Austrian bank is informed less than the German bank, and it faces an adverse selection problem because all non-creditworthy firms apply there. As a result, with positive probability the Austrian bank decides against making loans offers to German firms at all. The further away German firms are from the Austrian border the higher is the probability that the Austrian bank decides against offering loans to them at all.

In the second part of the paper, we study the cross-border lending at the German-Austrian border where Austrian banks started to grant loans to German firms in 2004. This phenomenon became widely known because German banks complained about increasing competition from Austrian banks. We use a unique dataset, the ifo Business Climate Survey, in which firms assess the supply of bank loans. Our empirical observation yields two main results. First, German firms benefit from cross-border lending by having better access to credit. Second, distance also matters in cross-border lending. The further away a German firm is to the Austrian border, the less likely it is to perceive the banks' lending behavior as accommodating. Up to a distance of 100 kilometers, an increase in distance by ten kilometers from a potential Austrian lender decreases the probability that the firms see the credit supply as accommodating by 0.52 percentage points.

Our paper is related to two strands in the literature: the role of distance in lending and financial market integration. In their seminal paper, Petersen and Rajan (2002) document that the physical distance between borrower and bank in the U.S. has increased significantly during the last decades and attribute this development to changes in information technology.[2] The idea is that, through better information processing systems, banks can get access to more hard (and verifiable) information, and thus the need to collect soft information decreases. Soft information consists of all the pieces of

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[2] Petersen and Rajan (2002) use survey data. Other studies are based on information about individual loans (for instance, De Young et al., 2007). Independent of the data used, the results remain the same.

information a bank gains through a business relationship with or through proximity to a firm (Stein, 2002). But soft information is more difficult to process over distance (Hauswald and Marquez, 2006). This relationship between distance and the availability of soft information explains why price discrimination exists, as documented by Degryse and Ongena (2005) and Agarwal and Hauswald (2007). Both studies find that as the distance between a borrower and his bank increases, the interest rate on loans decreases, but as distance between the borrower and the competing bank increases, the interest rate increases. These results are due to the hold-up problem a borrower faces by its incumbent bank. Agarwal and Hauswald (2007) also show that distance not only influences the loan rate but also the availability of loans. The closer a borrower is to his bank, the more likely he is to get an offer from it but the less likely it is that the competing bank makes an offer.[3] All these papers study distance between a borrower and a bank operating in a single country. In contrast, we investigate the role of distance in cross-border lending.[4]

Our model is most closely related to the model on distance in lending by Hauswald and Marquez (2006). In their model, one bank uses a screening technology that gives an imperfect signal, and the quality of the signal decreases in the distance between bank and firm. The other bank offers a pooling contract. As a result, there exists an asymmetric information problem between banks. The informed bank does not offer loans to firms with a bad signal. They, however, can apply at the uninformed bank. Since the quality of the signal is better, the closer a firm is to the bank, the worse is the pool of firms applying at the uninformed bank. In order to avoid making losses, the uninformed bank may decide not to offer a loan at all to firms from a particular location. It can be shown that the probability that the uninformed bank makes a loan increases in the distance between the informed bank and the firm. Due to the fact that the screening technology is imperfect and that one bank does not screen at all, the model predicts that

[3] Evidence from Italy confirms that a borrower's financing constraint increases in functional distance, meaning the distance between a borrower and a bank's location where decisions about loans are taken (Alessandrini et al., 2006).

[4] Somewhat in between these studies and ours is Huang (2008) who studies the impact of branching deregulation in the U.S. Although the data is for one country, the regulatory environment differs between states.

the distance between the uninformed bank and the firm does not matter. In our model by contrast, banks rely on the two different types of information, hard and soft, so that none of them is fully agnostic about the creditworthiness of its borrowers.

There is a huge literature about financial integration, in particular about Europe. Several reports try to quantify the degree of integration by measuring interest rate convergence, cross-border capital flows, or mergers.[5] The common conclusion is that the credit market is the least integrated market. This applies, in particular, to loans for SMEs, while there is one (European) market for loans to big and transparent (and mostly multinational) corporations. The other common view is that mergers will drive integration. Mostly focusing on domestic mergers, it is shown that such an event changes the loan policy of the new bank and renders it more difficult for SMEs to get access to finance (Sapienza, 2002; Bonaccorsi di Patti and Gobbi, 2007).[6] However, the effect vanishes over time as other banks enter the market to serve those firms which fall out of the target market of the merged institution (Berger et al., 1998). To the best of our knowledge, there are no studies on the effect of cross-border lending.

The paper is organized as follows: section 2 presents some stylized facts on the German banking sector. In section 3, we set up a theoretical model of competition between banks that use different types of information, while testable hypotheses are derived in Section 4. We describe the data used in section 5. The relationship between cross-border lending and the firm's perception of the banks' lending behavior are tested empirically in section 6. Section 7 presents a threshold analysis between distance and the lending behavior of banks as perceived by the firms as a part of our robustness analysis. We conclude in section 8.

2. Banking Sector in Germany

Before we set up the theoretical model and derive testable hypotheses, we want to describe some particular characteristics of the German banking system. It is a three

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[5] These surveys include Baele et al. (2004), Barros et al. (2005), Dermine (2006), ECB (2007), and Kleimeier and Sander (2007).

[6] Sapienza's (2002) analysis is based on information about individual loan contracts from Italy. In contrast, Scott and Dunkelberg (2003) do not confirm the result using survey data from the US.

pillar system, consisting of private commercial banks, cooperative banks, and public banks. If all market segments are considered, each of these has about the same market share (Brunner et al., 2004; Krahnen und Schmidt, 2004). However, the big commercial banks play only a limited role in financing SMEs. With respect to corporate loans, in 2005 public banks (most importantly "Sparkassen", i.e. saving banks owned by communities) provided 61 percent, followed by cooperative banks ("Genossenschaftsbanken", usually "Raiffeisenbanken") with 27 percent and private commercial banks with 12 percent (Bundesbank, 2007). Savings banks and cooperative banks have very similar attitudes towards financing SMEs (Prantl et al., 2006). Both cooperative and savings banks operate on a regional principle, meaning that they finance firms in their own "district" but hardly any firms located elsewhere. Given the results from the literature on distance and lending, this could be the result of an optimization of the bank's lending area. Usually, however, this restriction is even more severe as savings and cooperative banks are not allowed to lend outside their community.

During the period analyzed, Germany faced a dramatic decrease in financial intermediation. The aggregate volume of credit to the private sector relative to GDP in Germany contracted by about 25 percent between 2001 and 2006 (Kunkel, 2007). In particular, it became very difficult for SMEs to receive loans during this period. According to a Eurobarometer published by the European Commission in October 2005, 73% of German SMEs consider their financing situation as sufficient, but 20% of them look for easier access to means of financing. To put these figures into perspective, the share of SMEs for EU15 (Austria) that consider their financing situation as sufficient is 77% (85%) and those that look for easier access to finance is 14% (11%) (Eurobarometer, 2005). A possible, and often heard, explanation for why banks were reluctant to lend is that they adjusted the measurement of risk in their credit evaluation to the Basel II standards. Other reasons were the economic downturn and the significant share of problem loans in the portfolio of German banks (Westermann, 2007).

An interesting phenomenon was observed during this period. German firms located close to the Austrian border were granted loans across the border by Austrian banks. One reason might be that the regulation of banks in Austria was different with respect to the implementation of the Basel II standards. A survey conducted between December

2005 and February 2006 shows that particularly smaller banks and regional banks in Austria have not yet implemented risk-adjusted pricing as suggested by the Basel II framework (Jäger and Redak, 2006).

Besides these differences of "regulation in action" there were also differences in the "regulation on the books" between the countries. In both countries, debtors must provide information, such as financial statements, about their economic situation so that the supervisory authority can verify the bank's creditworthiness test. In Germany, this information had to be provided for loans exceeding EUR 250,000 (according to § 18 Kreditwesengesetz).[7] In Austria, however, the threshold value for providing this information was, and still is, EUR 750,000 (according to Art. 27 Bankwesengesetz). As a reaction to this asymmetry, the German legislation increased the threshold value to EUR 750,000 in May 2005 (Economist, 2005). The adjustment of the threshold value in Germany is in line with the Lamfalussy approach which intends to reduce the difference in financial regulation and supervision. Although these different threshold values exemplify the difference in regulation very well, more fundamental differences in the implementation of regulation still prevail.

Moreover, Austria has also actively promoted SME financing in various areas. In 2005, for example, a major Austrian bank, Bank Austria Creditanstalt (BACA), received a loan of EUR 200 million from the European Investment Bank to support regional loans and loans to SMEs, including in other countries where BACA operates (thus also encompassing Southern Germany). Finally, Austrian banks offer financing packages that differ from those of German banks and not infrequently include foreign currency loans.[8]

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[7] This requirement could be avoided if the debtor pledges a sufficient amount of collateral.

[8] Recently, Austrian banks have specialized in loan issues in foreign currencies (see Tzanninis, 2005). Although these loans (issued mainly in Swiss francs and Japanese yen) are associated with significantly higher risk exposure, they may be attractive for selected German companies as they are generally available with comparably lower expected interest rates. OeNB (2007) argues that the developments have contributed to the good performance of Austrian banks up to now.

3. Model of Cross-Border Lending

We capture the situation described above in the following model. There exists a continuum of firms, the number of which is normalized to 1. They are distributed uniformly on a Hotelling line of length 1. Firms want to undertake an investment project that costs I. However, they do not have the funds to finance the projects themselves and therefore need to finance the investment with credit. We have two types of firms: good firms that will be successful with probability p and bad firms that will always fail. If successful, a firm generates a return of X. If it fails, the return is 0. We assume that the expected profit of a good project is positive, i.e. $pX-I > 0$. The share of good firms in the population is α. We restrict attention to parameter values such that the average profitability of all projects is positive, i.e. $\alpha pX-I > 0$.

The firm can demand a loan from either a German bank or an Austrian bank. The two banks are located at the opposite ends of the Hotelling line. Banks can observe a firm's location but not its creditworthiness. Thus, banks make their offers contingent on the firm's location; they price-discriminate. Banks demand repayments R if a firm is successful, where R^G denotes the repayment of a German bank and R^A the repayment of an Austrian bank. The two banks have the same costs of refinancing which we normalize to zero.[9]

Banks can gather two different types of information, hard and soft. They get hard and verifiable information, for instance, from the firm's balance sheet, by conducting a creditworthiness test. We capture screening as a procedure that causes costs of c but gives the bank a perfect signal about the firm's type. Alternatively, they can rely on soft information which consists of insights gained during the personal interaction of the loan officer with the firm's manager. The bank receives a signal that reveals the firm's type correctly with probability s, $s \leq 1$.[10] However, it becomes more difficult for the banker to acquire and deal with soft information the further away a borrower is. The quality of the signal s decreases in the distance d between the firm and the bank, i.e. $\dfrac{\partial s(d)}{d} < 0$.

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[9] The interbank lending rates in Germany and Austria are indeed the same.

[10] Note that, for $s \leq 0.5$, the signal is uninformative and will not be used by the bank.

We will focus on firms that demand loans of a size for which regulation differs between Germany and Austria. Due to regulatory requirements, the German bank must screen its applicants. The idea is that the bank generates hard and verifiable information that can be communicated to the regulator. Therefore the costs of generating this information do not depend on the distance between firm and bank. The Austrian bank is not forced to screen. It receives an imperfect signal about a firm's creditworthiness. But by investing K it can implement the technology that generates hard and verifiable information on German firms.

The timing of events is as follows. In the first stage, the Austrian bank decides whether to use hard or soft information for the credit evaluation. In the second stage, banks simultaneously decide whether or not to offer contracts (and this offer is binding) and announce the repayments they require from the applicant. At the third stage, firms decide where to submit a credit proposal. Submitting a credit proposal is binding in the sense that the firm must take the loan when it receives a positive signal. Then banks receive signals about the firm's creditworthiness and decide which firm they actually offer a loan. Finally, payoffs are realized.

We solve the game through backward induction and start by analyzing the bank's decision to grant a loan. We know that the German bank uses hard information and suppose that the Austrian bank relies on soft information. The German bank will finance only good firms because financing bad firms yields a loss. Likewise, the Austrian bank only offers loans to firms with a positive signal.

Next, we study the firm's decision at which bank to apply. Bad firms always have an incentive to apply at the Austrian bank because they know that the Austrian bank is wrong with positive probability whereas they will never get a loan from the German bank. When good firms submit their credit proposal they take into account that they do not get a loan with certainty from the Austrian bank. Therefore, a good firm will be indifferent between applying for a loan at a German or at an Austrian bank when

$$p\left(X - R^D\right) = s(d)p\left(X - R^A\right) \tag{1}$$

Both banks need certain minimum repayments to break even. These repayments are denoted by $\underline{R}^G$ and $\underline{R}^A$, respectively. If both banks demand their minimum repayment,

the firm has a higher repayment with the loan from the Austrian bank if $c < \hat{c} = \frac{(1-s)}{\alpha}\left(\alpha(pX - I) + (1-\alpha)I\right)$. We characterize the equilibrium in proposition 1:

Proposition 1: Suppose the Austrian bank uses soft information. Contingent on the location of the firm which determines s, banks make the following offers and the get the following profit per customer:

(1) If the Austrian bank has a cost advantage, i.e. $c > \hat{c}$, an equilibrium in pure strategies exists. The German bank offers $\underline{R}^G$ and makes $\Pi^G=0$. The Austrian bank offers the equivalent of $\underline{R}^G$ and makes $\overline{\Pi}^A = -\alpha pX(1-s) + I\left((1-2\alpha)(1-s) + \alpha s\right) + \alpha c$.

(2) If the German bank has a cost advantage, i.e. $c \le \hat{c}$, an equilibrium in mixed strategies exists. The German bank offers repayments in the range between the equivalent of $\underline{R}^A$ and X according to the cumulative density function $F^G(R) = 1 - \frac{(1-\alpha)(1-s)I}{\alpha s(pR - I)}$ and demands X with probability $1 - F^G(X)$. It makes $\overline{\Pi}^G = \alpha p(1-s)X + I\left((1-\alpha)(1-s) + \alpha s\right) - \alpha c$. The Austrian bank offers repayments in the interval $[\underline{R}^A, X)$ according to the cumulative density function $F^A(R) = 1 - \frac{\alpha p(1-s)X - (2\alpha - 1)(1-s)I - \alpha c}{\alpha(pR - I - c)}$ and does not offer loans with probability $1 - F^A(X)$. It makes $\Pi^A=0$.

Proof: See Appendix A.

If the Austrian bank has a cost advantage (which happens if the quality of the imperfect signal is high), the Austrian bank demands the equivalent of $\underline{R}^G$. The German bank offers $\underline{R}^G$ where it makes zero expected profits by financing good firms, taking into account that it has to screen them and – given they have a positive signal – they are obliged to take the loan. Therefore, the German bank is indifferent between offering this repayment and not offering loans at all. The Austrian bank can, by matching this rate, attract good firms (in addition to the bad firms that always apply).

If the German bank has a cost advantage, there is no equilibrium in pure strategies because the German bank has superior information. Suppose the German bank undercuts the offer of the Austrian bank, which demands $\underline{R}^A$. Then, the Austrian bank would make an expected loss with this repayment because the bad firms would still apply. Therefore, the Austrian bank decides to make no offers to German firms. However, given that the Austrian bank does not offer a loan, the German bank could ask the highest repayment possible, X. As a result, the Austrian bank makes zero expected profits because it stays out of the credit market with positive probability. Due to the better information the German bank possesses through the creditworthiness test, it makes a positive expected profit.

Finally, we study the decision of the Austrian bank on which type of information to use and state the result in the following proposition:

Proposition 2: The Austrian bank does not invest into screening and uses soft information.

Proof: See Appendix A.

The Austrian bank does not have an incentive to screen. This is obvious in the case where the Austrian bank has a cost advantage. In the other case, the reason is that there would be perfect competition if both banks used hard information. This would drive profits in the credit market game down to zero. Thus, the Austrian bank could not recover the fixed costs K for implementing the credit evaluation technique that uses hard information on German firms.[11]

Ultimately, we are interested in the impact of distance on lending. Comparative statics yield the following interesting result:

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[11] Indeed, Austrian banks do rely on soft information. One of the regional banks active in cross-border lending emphasizes how important qualitative factors (beside quantitative factors) are for evaluating the creditworthiness (Oberbank, 2008).

Proposition 3: The closer a firm is located to the Austrian border, the higher is the probability that both banks offer loans.

Proof: See Appendix A.

Here, we focus on the probability $F^i(R \leq X)$, $i = G, A$, that banks offer loans at all (stage 2) because we want to study the lending policy of banks in general. This means we do not study the probability that an individual firm gets a loan. For the German bank the probability that it offers loans to firms at a particular location does not depend on the distance between bank and firm.

The Austrian bank finances both good firms and also some bad firms because its signal is imperfect. Since the Austrian bank has better information about firms that are closer to Austria, it faces less risk in financing these firms. The further away from the border firms are located, the less soft information the Austrian bank has about them and the less informative is the signal. Thus, the bank offers loans to fewer good firms and more bad firms as distance increases. This implies that the bank faces the risk of ending up with a relatively high share of bad firms in its portfolio. Thus, the Austrian bank will decide to offer a loan to the more distant borrowers with a lower probability. Accordingly, the behavior of the Austrian bank drives the result in Proposition 3.

Here, we also have to take into account the particular situation of the German banking system. Due to the regional principal, savings and cooperative banks operate in their own district and are not allowed to offer loans to firms outside this. In terms of our model, this could be captured as follows: along the Hotelling line there are several banks. Each of these banks competes with the Austrian bank that is located at one end of the Hotelling line (border), but German banks do not compete with each other. Proposition 3 implies that the bigger the distance between a German and Austrian bank, the less precise the Austrian bank's signal about the creditworthiness of a firm and the lower the probability that the Austrian bank offers loans to firms at that location at all.

Figure 1: Distance and Probability that Banks offer Loans
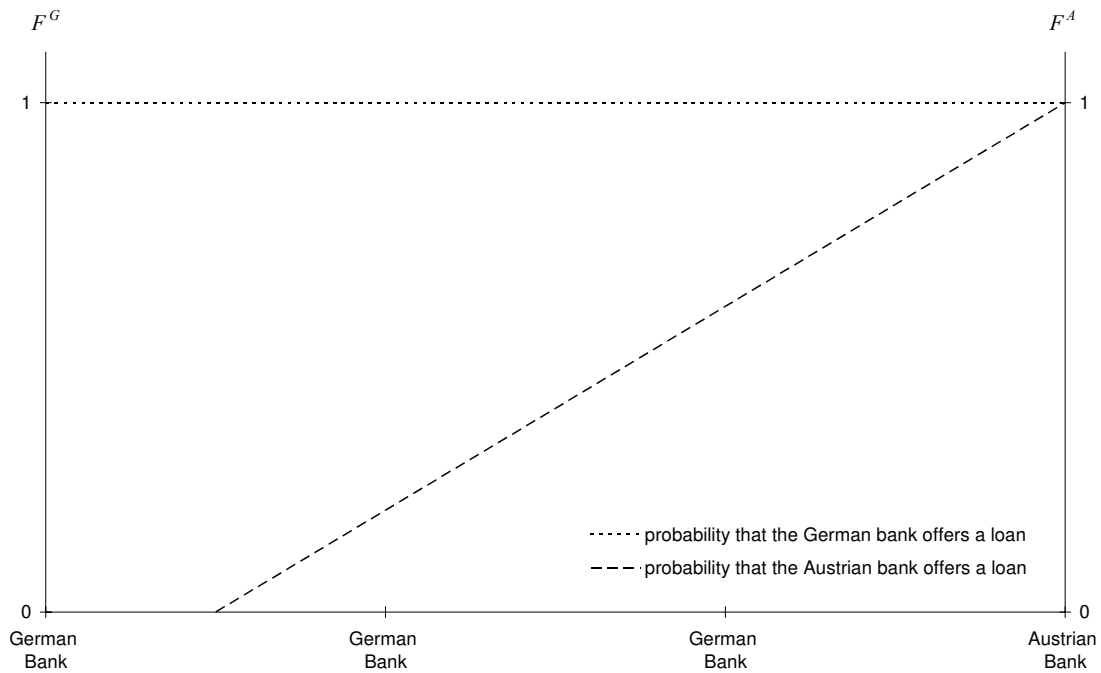
The probability that the German and the Austrian banks offer loans at all, i.e. $F^i(R \leq X)$, $i=G, A,$ is depicted in Figure 1 (for a linear relationship between distance and the quality of the signal). Since the German bank uses hard information, the distance between bank and firm no longer matters for the probability that the bank makes an offer. Often there will be two German banks (a savings bank and a cooperative bank) at the same location. Since they both must use hard information, they both offer loans to good firms with probability one. As described in Proposition 3, the probability that the Austrian bank makes an offer to firms with a good signal is equal to one in the region closest to the border. The further away the firm is, the lower is the probability that the Austrian bank makes an offer.

4. Testable Hypotheses

We want to study the effect of cross-border lending on the firm's access to loans and the role of distance in cross-border lending. Ideally, we would use data on individual loans, which, however, cannot be observed. Instead, we measure the cross-border lending by Austrian banks indirectly by the perception of German firms of the banks' lending

behavior. In Proposition 3 this has been captured by the probability $F(R \leq X)$ that banks offer loans at all.[12]

Hypothesis 1: Up to a certain distance, the closer a firm is located to a bank in Austria, the more likely it perceives bank lending behavior to be accommodating.

Without cross-border lending, we expect that access to loans is more difficult for firms in the border region. As long as foreign banks do not lend to firms, firms can get loans only from the few domestic banks in the border region. The entry of Austrian banks increased the availability of loans for firms in the border region. Thus, our proposition implies that otherwise identical firms will perceive the bank's lending behavior with a higher probability as accommodating if they are located closer to the Austrian border. Distance is often found to be a major determinant of international financial flows (see Egger and Pfaffermayr, 2004, Buch and Lipponer, 2004, and Heuchemer et al., 2008).

Hypothesis 2: The firm's state of business and its perception of banks' lending behavior are positively correlated.

However, the state of business of the individual firms should play an important role in the banks' decision on lending. This indicator should capture the usual hard information on enterprise performance, but it should also capture soft information. If banks get informative signals about a firm's creditworthiness, the correlation between the perception of the banks' lending behavior and the enterprise's state of business is expected to be positive.

5. Data Description

The ifo Business Climate Survey provides a unique source of information on perception of the bank's lending behavior by German manufacturing firms. It became available for

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[12] Note that this probability is different from the probability that an individual firm receives a loan after its application was evaluated.

research only very recently and therefore has hardly been used in the literature. The surveys are available on a semiannual base (March and August) from August 2003 to August 2006.[13] Firms are asked: *"How do you assess the readiness of the banks to provide loans to enterprises?"* The possible answers include restrictive, normal and accommodating. A specific point of the question is that the first two choices are possibly not mutually exclusive.[14] In particular, restrictive and normal are likely to represent a joint category. This can be especially important for Germany with a long tradition of conservative lending policy, which was perceived positively by the population. Therefore, we comprise the answers as two categories, namely accommodating versus non-accommodating (which is normal and restrictive). The appropriateness of this approach is also tested in Appendix C.

Furthermore, we use information on the business development of firms surveyed. In this respect, we concentrate on the major part of the survey, which is concerned with the state of business of the responding firms. Similarly to the previous case, the answers include bad (coded as 1 in the data set), satisfying (2), and good (3). The response rate to both questions is generally very high.

The ifo survey also provides a number of qualitative indicators which specify the firm's economic situation in more detail. These contain, for example, the stock of orders, and the assessment of the previous developments as well as expected ones. The data show a high correlation between the assessment of the current state of business and the previous expectations. Therefore, we only included the current state of business, which also performed the best in the regression analysis. This result is similar to findings by Westermann (2007).

As a further control for the regional business development we use unemployment rates. These reflect regional developments very well and are available on a very disaggregated level. Monthly data on regional unemployment for about 140 districts in Bavaria and Baden-Wuertemberg is taken from the German Federal Employment Office (BA, 2008).

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[13] In August 2003 this question was asked for the first time.

[14] We appreciate a comment by Natalja Menold from the Centre for Survey Research and Methodology on this point.

In our further analysis, we focus on the states of Bavaria and Baden-Wuerttemberg because they are in the closest proximity to Austria.[15] We also restrict our sample to firms with less than 500 employees because we want to focus on SMEs. This provides us with about 4,500 observations. Figure 2 shows the development of financial conditions and the state of business for our sample of SMEs in Bavaria and Baden-Wuerttemberg.

Unfortunately, we do not have information about which banks a firm has a business relationship with, because this goes beyond the survey's scope. With only few exceptions, all firms have the possibility of contacting at least one bank which is located directly in their municipality. The majority of firms are located in municipalities with two or more financial institutions. The number of banks should not influence the perception of the financial conditions. Moreover, according to our model, the lending policy of German banks does not depend on the distance to the Austrian border.

To proxy for the firm's opportunity to get a loan from an Austrian bank, we include the great circle distance to about 50 selected communities with at least one bank office in Austria. We use the shortest distance to a financial institution in Austria for each firm. This measure of distance ranges between 14 km and about 300 km.

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[15] Baden-Wuerttemberg does not have a direct border with Austria, but it is located at Lake Constance (Bodensee), which represents the border between Austria and Germany.

Figure 2: Financial Access and Business Climate in Bavaria and Baden-Wuerttemberg
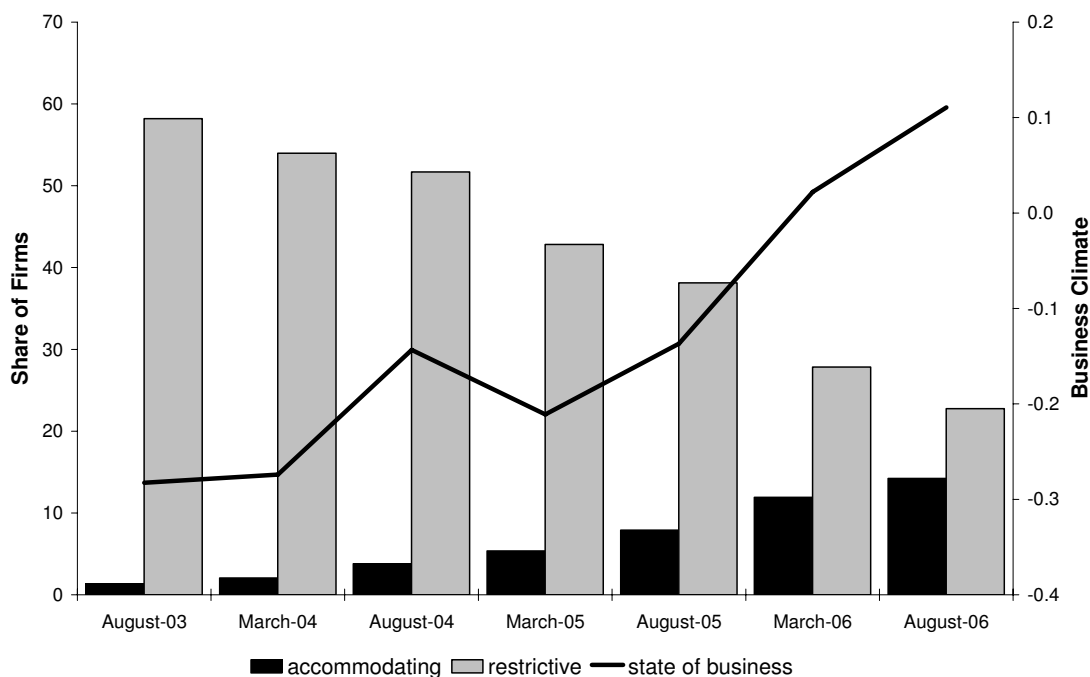
Note: Business climate is defined as the share of firms assessing their state of business as good less the share assessing it as bad. Only manufacturing firms with less than 500 employees are included.
Source: ifo Institute, own calculations.

6. Cross-Border Lending and Firm's Perception of Banks' Lending Behavior

We estimate several specifications of linear probability models (OLS), as well as probit and logit models, for the assessment of individual enterprises in Bavaria and Baden-Wuerttemberg concerning the lending behavior of banks between August 2003 and August 2006. Our dependent variable is the conditional probability, c, that a firm i at time t assesses the banks' lending behavior as accommodating.

On the right-hand side, we use firms' assessment of their state of business, b_i, distance, d_i, regional unemployment rate by districts indexed by r, u_{rt}, and a vector of additional control variables, $\mathbf{Z}_{it}$, including dummies for the size of the firms and time effects (that is, the period of the biennial surveys) with the corresponding coefficient vector γ. Time effects reflect all time specific factors including e.g. business cycles as discussed by Blum and Hellwig (1995), refinancing costs, or regulatory differences in both countries. Thus, we can specify the model as

$$P(c_{it} = 1) = \beta_1 + \beta_2 b_{it} + \beta_3 d_i + \beta_4 u_{rt} + \mathbf{Z}_{it}\gamma + \varepsilon_{it}, \qquad (2)$$

where ε_i is the error term with the standard statistical properties (i.i.d.).

Table 1 reports OLS, logit, and probit estimation of (2).[16] Both hypotheses are confirmed for all specifications. The evaluation of the firm's own state of business is positively correlated with the assessment of the perception of the banks' lending behavior. Thus, enterprises with a good state of business seem to also have better access to loans. In turn, the banks are efficient in selecting enterprises with positive development and provide them the necessary financial means.[17]

Distance has negative effects on the perception of the banks' lending behavior. The estimated effects may appear to be relatively small at first glance. However, the differences in the distance between the firms are also large. The marginal probability estimates of the probit specification indicate that each ten kilometers of distance to the Austrian border lower the probability of the firms viewing the credit supply as accommodating by 0.1 percentage points.

Distance could also capture regional developments in Germany if they vary with distance to Austria. We control for regional development by regional unemployment rates because these have the advantage of being available on a very detailed level. We find that unemployment has no effect on the firm's perception of the banks' lending behavior.

Furthermore, the regression largely confirms the stylized facts of the loan supply in the period analyzed. The coefficients of time dummies show that the perception of the banks' lending behavior has been continuously improving during this time. The differences between financial supervision in Germany and in Austria were reduced in May 2005, when the threshold values above which banks must provide information about the credit worthiness of the borrowers to the supervisory authority were unified. Actually, the time dummy of 2006 is no longer significant, although this is most likely also caused by the economic upturn in Germany.

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[16] Below, we consistently report marginal probability effects for probit estimations in our paper.

[17] However, there is a possible endogeneity problem as firms with access to loans may also face better economic prospects. The results remain largely unchanged if we use alternative variables (e.g. orders) with fewer endogeneity problems.

Somewhat surprisingly, the medium-size enterprises (between 50 and 1999 employees) seem to assess the credit supply as more accommodating than the smaller (below 50 employees) and larger (200 to 499 employees, which represent the base group) enterprises.

We applied several sensitivity tests to our results.[18] First, we use time-specific coefficients for the distance to Austria, which might reflect the changes in the regulatory requirements during the period analyzed. We do not find any significant changes of distance effects during the analyzed period, while the pattern of time effects is also confirmed by further sensitivity analysis in Appendix B. Second, we include dummies for Munich and the major cities in Bavaria and Baden-Wuerttemberg. Surprisingly, the effects of the cities are less important than we expected. Third, we replace state of business with firms' expectations for their commercial operations. The results prove the overall stability of our findings, which may reflect correlation between state of business and expectations. If both variables are included in estimations, only state of business remains significant.

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[18] The results of sensitivity analyses described below are available upon request from authors.

**Table 1: Financial Access and Distance in Bavaria and Baden-Wuerttemberg, August 2003 – August 2006**

Variable	OLS	Logit	Probit[A]
State of business	0.050***	0.863***	0.040***
Distance (in 100 km)	-0.011**	-0.194**	-0.010**
Regional Unemployment	-0.001	-0.020	-0.001
Year 2003:08	-0.104***	-2.101***	-0.055***
Year 2004:03	-0.097***	-1.648***	-0.050***
Year 2004:08	-0.087***	-1.196***	-0.041***
Year 2005:03	-0.068***	-0.764***	-0.031***
Year 2005:08	-0.043**	-0.354*	-0.017**
Year 2006:03	-0.013	-0.055	-0.003
Size (1-49 employees)	0.015	0.302	0.015
Size (50-199 employees)	0.026***	0.499***	0.023***
Constant	0.041*	-3.635***	
Number of observations	4319	4319	4319

Note: A - Probit coefficients report changes in the probability for an infinitesimal change in continuous explanatory variables and a discrete change in the probability for dummy variables. ***, **, and * denote significance (using heteroscedasticity robust standard errors) at 1 per cent, 5 per cent, and 10 per cent, respectively.

7. Robustness Analysis – Threshold Effects

The previous analysis looked at a relatively large region with firms being located up to approximately 300 km away from the Austrian border. However, it is rather unlikely that firms and banks are in direct contact at distances close to the upper level of the interval. The effects of distance may diminish after a threshold is reached. However, any a priori selection of the sub-sample would be questionable. While 300 km represents a possible upper bound of significant effects, we should analyze whether the effects are stable over this interval. Hansen (2000) proposes the threshold model for such situations, which can be stated as

Figure 3: Identification of Threshold
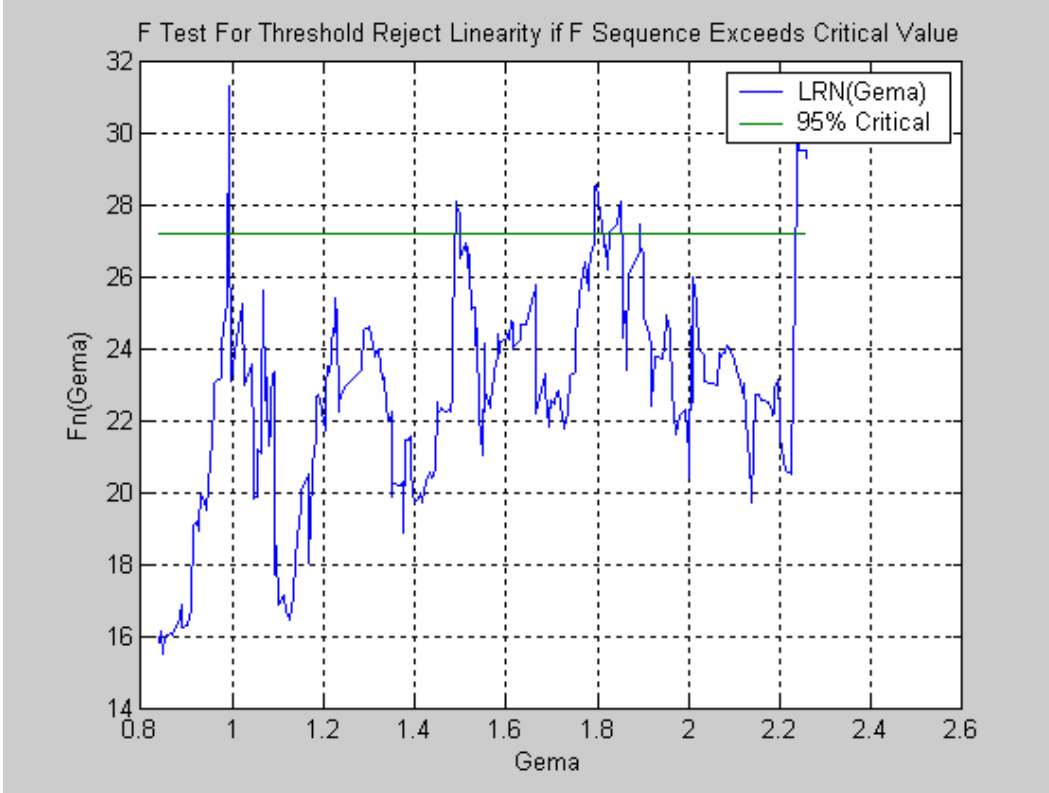
Threshold Estimate (km):	99.131
LM-test for no threshold:	31.314
Bootstrap p-Value:	0.008

Note: Number of bootstrap replication was 1000, the trimming equals 15%.

$$c_{it} = \beta_1 + \beta_2 b_{it} + \theta_1 d_i + \beta_4 u_{it} + \mathbf{Z}_{it}\gamma + \varepsilon_{it} \quad \text{if} \quad d_i \leq \delta, \tag{3.a}$$

$$c_{it} = \beta_1 + \beta_2 b_{it} + \theta_2 d_i + \beta_4 u_{it} + \mathbf{Z}_{it}\gamma + \varepsilon_{it} \quad \text{if} \quad d_i > \delta, \tag{3.b}$$

where δ is the threshold level of the distance. We can rewrite the model in one estimation equation with a dummy variable, $D(\delta)$, which equals 1 for distance below the analyzed level of possible threshold, δ, and 0 otherwise. Thus, the model takes the form

$$c_{it} = \beta_1 + \beta_2 b_{it} + \beta_3 d_i + \beta_4 u_{it} + \beta_5 D(\delta) d_i + \mathbf{Z}_{it}\gamma + \varepsilon_{it}, \tag{4}$$

where $\theta_1 = \beta_3 + \beta_5$ and $\theta_2 = \beta_5$. In our empirical application, we expect that θ_1 is negative and larger in absolute value than θ_2, which may be no longer significantly different from zero.

The threshold level, δ, is unobservable. Hansen (2000) shows that it can be estimated by the regression which yields the lowest sum of the squared errors for all possible levels of the threshold. Furthermore, we can test whether the threshold is significantly different from zero by the heteroskedasticity-consistent Lagrange

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multiplier (*LM*) test for a threshold for coefficient β_4. The level of threshold is selected by the *LM* statistics yielding the highest particular statistics in Figure 3. We also report bootstrap *p*-values using 15 per cent trimming shares and 1000 replications. For the identification of the threshold, we estimate a linear probability model, while Table 2 also presents the estimations for logit and probit.[19]

Table 2: Distance Threshold Effects in Bavaria and Baden-Wuerttemberg, August 2003 – August 2006, Answer "Accommodating"

Variable	OLS	Logit	Probit[A]
State of business	0.050***	0.873***	0.041***
Distance (in 100 km)	-0.021***	-0.368***	-0.018***
Distance less than Threshold (99 km)	-0.044***	-0.745**	-0.034**
Regional Unemployment	-0.000	-0.013	-0.001
Year 2003:08	-0.104***	-2.103***	-0.054***
Year 2004:03	-0.097***	-1.648***	-0.049***
Year 2004:08	-0.088***	-1.202***	-0.041***
Year 2005:03	-0.068***	-0.779***	-0.031***
Year 2005:08	-0.043**	-0.355*	-0.017*
Year 2006:03	-0.014	-0.072	-0.003
Size (1-49 employees)	0.014	0.285	0.014
Size (50-199 employees)	0.026***	0.487***	0.023***
Constant	0.060**	-3.333***	
Number of observations	4319	4319	4319

Note: A - Probit coefficients report changes in the probability for an infinitesimal change in continuous explanatory variables and a discrete changes in the probability for dummy variables. ***, **, and * denote significance (using heteroscedasticity robust standard errors) at 1 per cent, 5 per cent, and 10 per cent, respectively.

Figure 3 shows the results of threshold tests applied sequentially for the linear probability models. If the dependent variable is defined for firms viewing the lending policy as accommodating, the Hanson's LM test identifies a threshold level of distance at 99 km, which is significant at 5% level. Table 2 reports the estimation results. We can

[19] Sequential Chow tests following Stock and Watson (2006), that we used in the robustness analysis, estimate the same threshold level using linear probability models and logit and probit models.

see that the marginal effects of distance on the probability that a firm views the credit supply as accommodating is relatively high (0.034 for probit model), in addition to the distance effects found for the whole sample (0.018). Both effects are also highly significant. The tests reject a second threshold for the distance variable, while no differences throughout the sample are found for state of business.

8.   Conclusions

We started this paper with the observation that financial integration in Europe is low in relationship lending and retail banking. However, the fragmentation of these markets should not be too surprising given that the borrowers are opaque SMEs. Because there are significant problems of asymmetric information, distance therefore plays an important role.

We investigate this situation in a theoretical model in which, due to regulatory requirements, the German bank must use hard and verifiable information which is perfect (and thus is independent of the distance between bank and firm). In contrast, the Austrian bank bases its creditworthiness test on soft information, the precision of which decreases with distance. In such a situation the Austrian bank possesses less information about applicants than the German bank and therefore faces an adverse selection problem. Consequently, the Austrian bank does not offer loans with certainty and the probability that it offers loans at all decreases as a firm is located further away from the Austrian border. Indeed, our data show that German firms that are located closer to the Austrian border are more likely to perceive the banks' willingness to lend as accommodating. Thus, our first result is that German firms benefit from cross-border lending by easier access to loans.

As a second result we show that distance matters for cross-border lending, as well. We can therefore argue that cross-border lending plays an important role for financial integration. Banks located in the neighboring country can grant loans based on soft information up to a certain distance. Therefore, as a mode of integration, cross-border lending might be more favorable to SMEs than cross-border mergers. And, through cross-border lending, foreign banks might serve markets that have been neglected by merged banks or other domestic banks.

In our case of the German-Austrian border, the German banks were rather reluctant to lend during the first five years of the decade. This reluctance was particularly pronounced for SMEs. Among the explanations is the implementation of Basel II. And, indeed, it seems that there is a major difference between German and Austrian banks because particularly small and regional Austrian banks have not yet adopted Basel II (Jäger and Redak, 2006). Furthermore, up to May 2005 there was also an explicit difference between supervision regulations in the two countries. We interpret the initial difference in "regulations on the books" as one example for the differences that exist in the general in the design and implementation of the supervision in Austria and Germany. Thus, differences in bank regulations may provide incentives for cross-border lending.

The German-Austrian border has some special characteristics that foster cross-border lending because both countries share a common language and legal origin. However, there are many borders in Europe which share these characteristics. There is, for example, also anecdotal evidence about German banks lending to Danish firms. Thus, this form of integration seems to take place without there being much attention paid to it.

The trade literature suggests that trade in goods (in our case services) is often followed by foreign direct investment (FDI). Thus, cross-border lending might only be the first step towards bottom-up integration. Very recently, we have observed that Austrian banks founded new subsidiaries in the border regions of Germany and Italy, which favors this argument. This certainly indicates that integration is taking place on many layers, both at the top through cross-border mergers and also at the bottom.

Appendix A: Model of Cross-Border Lending – Proofs

Proof of Proposition 1:

Suppose that the German bank screens and that the Austrian bank offers loans – based on the imperfect signal it obtains – to all firms with a good signal. A firm is indifferent between borrowing from a German and an Austrian bank if

$$p(X\text{-}R^G) = sp(X\text{-}R^A) \qquad (A.1)$$

We have to determine the repayments offered by the German and the Austrian bank. The German bank will grant loans only to good firms. Thus, the German bank's profit is $\Pi^G = \alpha(p\,R^G - I - c)$. The minimum repayment necessary to break even is $\underline{R}^G = \dfrac{I+c}{p}$. The Austrian bank grants loans to those firms with a good signal. Thus, the Austrian bank's profit is $\Pi^A = \alpha s(p\,R^A - I) - (1-\alpha)(1-s)I$. The minimum repayment necessary to break even is $\underline{R}^A = \dfrac{I\big((1-\alpha)(1-s)+\alpha s\big)}{\alpha s p}$.

Case 1: Assume $p(X\text{-}\underline{R}^G) < sp(X\text{-}\underline{R}^A)$.

The Austrian bank could marginally undercut the German bank by demanding a repayment that is slightly below the equivalent of $\underline{R}^G$. Then, the German bank makes zero expected profits if it offers $\underline{R}^G$ and does not serve any customers. The Austrian bank makes an expected profit of $\overline{\Pi}^A = -\alpha p X(1-s) + I\big((1-2\alpha)(1-s)+\alpha s\big) + \alpha c$. The Austrian bank does not have an incentive to demand a lower repayment because it would forgo profits. It does not have an incentive to demand a higher repayment either because it would lose all the good customers to the German bank and make an expected loss from financing the bad firms.

Case 2: Assume $p(X\text{-}\underline{R}^G) > sp(X\text{-}\underline{R}^A)$

There is no equilibrium in pure strategies. Suppose the German bank offers a repayment that is equivalent to $\underline{R}^G - \varepsilon$. At this repayment, the Austrian bank would no longer offer loans. Given that the Austrian bank does not offer loans, it would be optimal for the German bank to demand X. Thus, we next derive the equilibrium in mixed strategies.

We start by deriving the offers of the German bank using the fact that the Austrian bank must be indifferent between all repayments in the range $[\underline{R}^A, X)$ and not making an offer at all, that is:

$$\Pi^A = F^G(R)\left(-(1-\alpha)(1-s)I\right) + \left(1-F^G(R)\right)\left(\alpha s(pR-I) - (1-\alpha)(1-s)I\right) = 0$$

As a result, $F^G(R) = 1 - \dfrac{(1-\alpha)(1-s)I}{\alpha s(pR-I)}$. With probability $1 - F^G(X) = \dfrac{(1-\alpha)(1-s)I}{\alpha s(pX-I)}$ the German bank will demand X.

The German bank must be indifferent between all repayments in the range $[(1-s)X + s(\underline{R}^A), X)$, that is $\Pi^G = F^A(R)0 + \left(1-F^A(R)\right)\left(\alpha(pR-I-c)\right)$. The expected payoff from all repayments must be equal to the repayment the German bank obtains when demanding the equivalent of $\underline{R}^A$, i.e.:

$$\overline{\Pi}^G\left((1-s)X + s(\underline{R}^A)\right) = \alpha p(1-s)X + I\left((1-\alpha)(1-s) + \alpha s\right) - \alpha c.$$

As a result, $F^A(R) = 1 - \dfrac{\alpha p(1-s)X - (2\alpha-1)(1-s)I - \alpha c}{\alpha(pR-I-c)}$. With probability

$1 - F^A(R) = \dfrac{\alpha p(1-s)X - (2\alpha-1)(1-s)I - \alpha c}{\alpha(pX-I-c)}$ the Austrian bank does not offer loans.

Q.E.D.

Proof of Proposition 2:

Suppose the Austrian bank would invest K to implement a screening technology. Then both banks would use hard information. This would drive profits in the credit market game down to zero. Thus, the Austrian bank could not recover the fixed costs for implementing the credit evaluation technique that uses hard information on German firms. Therefore, the Austrian bank does not have an incentive to screen.   Q.E.D.

Proof of Proposition 3:

The German bank will always make an offer to good firms and never offer loans to bad firms, independent of the distance between the bank and the firm or between the

Austrian bank and the firm. The Austrian bank does not offer loans with probability 1-

$F(X) = \dfrac{\alpha p (1-s) X - (2\alpha - 1)(1-s) I - \alpha c}{\alpha (pX - I - c)}$. The partial derivative with respect to s is:

$$\frac{\partial (1 - F(X))}{\partial s} = \frac{-\alpha pX + \alpha I - (1-\alpha) I}{\alpha (pX - I - c)} = -\frac{\alpha (pX - I) + (1-\alpha) I}{\alpha (pX - I - c)} < 0 \, . \qquad \text{Q.E.D.}$$

Appendix B: Stability Tests

The cross-border lending as a new phenomenon in the European integration process may be expected to change during the period analyzed. Indeed, some incentives for cross-border lending may change as a response to changes in banking supervision. In particular, section 2 has shown that the threshold value for providing loan information to the supervision authority was lower in Germany (EUR 250,000) than in Austria (EUR 750,000) until May 2005, when it was unified to the higher threshold value.

Therefore, we test the stability of the cross-border lending between Austria and Germany. In particular, we extend equation (2) by a set of time-specific coefficients of distance,

$$P(c_{it} = 1) = \beta_1 + \beta_2 b_{it} + \sum_{k=1}^{6} \tau_k d_i \theta_k + \mathbf{Z}_{it} \gamma + \varepsilon_{it}, \qquad (B.1)$$

where θ stands for time effects such that the parameters τ are estimated for the individual surveys, and the remaining variables and parameters are defined as before. Although we can see some differences between the surveys (see Table B.1), they are not very large. Thus, this sensitivity analysis confirms the results in Tables 1 and 2. The stability of the results may correspond to the large similarities between the Austrian and the German legal and supervisory frameworks. Furthermore, significant differences in the implementation of bank supervision (or "regulation in action") are still in force, despite the recent steps towards policy synchronization.

Table B.1: Sensitivity Analysis – Time-Specific Coefficients for Distance

	OLS	Logit	Probit[A]
State of business	0.050***	0.867***	0.040***
Regional Unemployment	-0.001	-0.019	-0.001
Distance (2003:08)	-0.003	-0.508	-0.020
Distance (2004:03)	-0.008	-0.349	-0.015
Distance (2004:08)	-0.024	-0.740**	-0.032**
Distance (2005:03)	0.008	0.183	0.009
Distance (2005:08)	-0.008	-0.108	-0.005
Distance (2006:03)	-0.009	-0.083	-0.004
Distance (2006:08)	-0.036**	-0.293	-0.017*
Year 2003:08	-0.157***	-1.822**	-0.053***
Year 2004:03	-0.142***	-1.573**	-0.050***
Year 2004:08	-0.107***	-0.591	-0.029
Year 2005:03	-0.139***	-1.516***	-0.050***
Year 2005:08	-0.088**	-0.638	-0.029
Year 2006:03	-0.057	-0.381	-0.020
Size (1-49 employees)	0.015	0.304	0.014
Size (50-199 employees)	0.026***	0.498***	0.023***
Constant	0.082***	-3.498***	
Number of observations	4319	4319	4319

Note: A – Probit coefficients report changes in the probability for an infinitesimal change in continuous explanatory variables and a discrete change in the probability for dummy variables. ***, **, and * denote significance at 1 per cent, 5 per cent, and 10 per cent, respectively.

Appendix C: Test of the Parallel Regression Assumption

The answers to both survey questions are ordinal variables ranking either the economic situation or the lending policy of the banks. However, the answers "restrictive" and "normal" are not mutually exclusive as a restrictive lending behavior of banks can be considered to be a normal type of behavior for banks.

Therefore, we test whether the parallel regression assumption – which shows whether the relationship for different answers to our question (that is, restrictive, normal, and accommodating) – is the same (see Long and Freese, 2006.). The results of an approximate likelihood-ratio test[20] of whether the coefficients are equal across categories are shown in Table C.1. The parallel regression assumption is clearly rejected for both logit and probit models. Correspondingly, we cannot use ordinary logit or probit model for analysis of perceptions on banks' lending behavior. Given the possible ambiguity on the construction of the question, we concentrate on firms assessing the lending behavior as accommodating in the empirical part of our paper.

Table C.1: Test of the Parallel Regression Assumption

	Logit	Probit
LR Test Statistics (χ^2)	46.87	43.13
p-value	0.000	0.000

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[20] We use commands 'omodel logit' and 'omodel probit' which are available in stata.

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