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Working Paper

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CESifo Working Paper, No. 2279

Provided in Cooperation with:

Ifo Institute – Leibniz Institute for Economic Research at the University of Munich

Suggested Citation: Fidrmuc, Jarko; Hainz, Christa (2008) : Integrating with their feet: cross-border lending at the German-Austrian border, CESifo Working Paper, No. 2279, Center for Economic Studies and ifo Institute (CESifo), Munich

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

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CESIFO WORKING PAPER NO. 2279
CATEGORY 10: EMPIRICAL AND THEORETICAL METHODS
APRIL 2008

PRESENTED AT CESIFO CONFERENCE ON “FINANCIAL MARKET REGULATION IN EUROPE”, JANUARY 2008
SUPPORT BY THE WGL LEIBNIZ ASSOCIATION WITHIN THE PROJECT “HOW TO CONSTRUCT EUROPE”

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Abstract

The financial integration in Europe concentrates on cross-border mergers rather than cross-border lending and emphasizes the need for harmonizing bank regulation and supervision. We study the impact of cross-border lending in a theoretical model where banks acquire either hard or soft information of borrowing firms. We test the model's predictions using the ifo business climate survey that reports the perceptions of German firms' credit availability between 2003 and 2006. Our results show that distance matters for cross-border lending, especially for the SMEs. In contrast to the policy of harmonization, differences in bank regulations may have speeded up the cross-border lending.

JEL Code: G18, G21, C25.

Keywords: financial integration, SMEs, banking supervision, business surveys, threshold analysis.

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April 2008

The authors would like to thank Hannah Hempell, André Kunkel, Stefan Mittnik, Karen Pence, Monika Schnitzer, John Wald, Frank Westermann and seminar participants at the ifo Conference on Survey Data in Economics – Methodology and Applications in Munich, the ZEW Conference on Banking Regulation-Integration and Financial Stability in Mannheim, the CESifo Conference “Financial Market Regulation in Europe”, the Midwest Finance Association conference in San Antonio, the Free University Berlin, the University of Munich and the Genossenschaftsverband Bayern for helpful comments and suggestions. We also would like to thank the ifo Institute for providing the data. Olga Kviatovich and Xia Yin provided excellent research assistance. The usual disclaimer applies.

1. Introduction

Integration in credit markets happens through cross-border lending or foreign bank entry via either Greenfield investment or acquisition. 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). The idea is that it is cross-border mergers, mostly between the big players in the national markets, that drive integration. From the literature on distance and lending we know that (both physical and functional) distance crucially influences the financing conditions of firms. Cross-border mergers mean that the distance between customers and their banks will increase, and information problems will become more severe. As a result, it may become more difficult for informationally opaque firms, in particular SMEs, to get access to loans (Barros et al., 2005). Cross-border lending has the opposite effect. Before the foreign bank lends cross border, firms are deprived of access to loans from banks that are close but in another country. Thus, cross-border lending may be especially beneficial for SMEs for whom distance is particularly relevant. Up to now, cross-border lending as a means of integration has been neglected and important questions remain. How does integration through cross-border lending take place? What is the role of distance in cross-border lending?

To answer these questions, we derive - as a first step - a theoretical model in which a German and an Austrian bank compete. The banks acquire either hard or soft information, and their choice determines both their lending rates and the probability that they will offer loans. We show that the closer a firm is located to the Austrian border, the more likely it is to receive loan offers. Interestingly, Austrian banks started to grant loans to German firms in the border region in 2004. This phenomenon became widely known because German banks complained about increasing competition from Austrian banks.

In a second step, we study actual cross-border lending at the German-Austrian border. We use a unique dataset, the ifo Business Climate Survey, in which firms assess the supply of bank loans in biannual surveys. Our empirical observation yields two main results. First, the closer a German firm is to the Austrian border, the less likely it is to perceive the banks' lending behavior as 'cautious'. Up to a distance of 174 kilometers, a change in distance by ten kilometers from a potential Austrian borrower increases the probability that the firms see the credit supply as cautious by 0.7 percentage points.

Second, SMEs benefit most from the geographical proximity to foreign banks. Thus, integration through cross-border lending has beneficial effects for this group of borrowers who often find themselves in a somewhat disadvantaged situation on the credit market.

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 the information technology.¹ 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 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 loan rate increases. 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.

It is, however, not only physical distance that matters but also functional distance, meaning the distance between a borrower and a bank's location where decisions about loans are taken. The idea is that soft information is more difficult to communicate across hierarchies than is hard information (Stein, 2002). Evidence from Italy confirms that a borrower's financing constraint increases in functional distance (Alessandrini et

¹ 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.

al., 2006). 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.²

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 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 pool of firms applying at the uninformed bank is worse, the closer the firms' location is to 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 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.³ 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

² Somewhat in between these studies and ours is Huang (2008) who studies the impact of branching deregulation in the US. Although the data is for one country, the regulatory environment differs between states.

³ These surveys include Baele et al. (2004), Barros et al. (2005), Dermine (2006), ECB (2007), and Kleimeier and Sander (2007).

access to finance (Sapienza, 2002; Bonaccorsi di Patti and Gobbi, 2007).⁴ However, the effect vanishes over time and 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 and derives the testable hypotheses. 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 determinants of cross-border lending are tested empirically in section 6. Section 7 presents a threshold analysis between distance and credit perception of the enterprises. We conclude in section 8.

2. Banking Sector in Germany

Before we derive the testable hypotheses, we want to describe some particular characteristics of the German banking system. It is a three 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; Krahen 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 banks are not allowed to lend outside their community.

⁴ 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.

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 (see 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 (see 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 in 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).⁵ 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. The adjustment of the threshold value in Germany is in line with the Lamfalussy approach which intends to reduce the difference in the financial

⁵ This requirement could be avoided if the debtor pledges a sufficient amount of collateral.

regulation and supervision. Although this different threshold values exemplify the difference in regulation very well, the more fundamental difference in the implementation of regulation still prevails.

Moreover, Austria has also actively promoted SMEs financing in various area. In 2005, for example, the 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 the SMEs also in other countries where BACA operates (that is, including South Germany). Finally, Austrian banks offer financing packages that differ from those of German banks and not infrequently include foreign currency loans.⁶

3. Model of Cross-Border Lending

We capture the situation described above in the following model. Firms want to undertake an investment project that costs I . 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 does not have funds to finance the project itself and therefore needs to finance the investment with credit. Firms are distributed uniformly on a Hotelling line of length 1.

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. 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 0. We will focus on firms that demand loans of a size for which regulation differs between Germany and Austria.

⁶ Recently, the Austrian banks have specialized on the loans 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 the Austrian banks up to now.

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 , $s \leq 1$.⁷ 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 Austrian bank, i.e. $\frac{\partial s(d)}{\partial d} < 0$.

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.⁸

The timing of events is as follows. First, banks decide whether or not to offer contracts (and this offer is binding) and announce repayments they require. Next, firms decide which bank they apply to for a loan. Then banks receive signals about the firm's creditworthiness and decide which firm they offer a loan to. Finally, payoffs are realized.

Given this set-up, bad firms always have an incentive to apply at the Austrian bank because they know that they will never get a loan from the German bank. Good firms have to take into account that they do not get a loan with certainty from the Austrian bank. Therefore, a firm will be indifferent between applying for a loan at a German or at an Austrian bank when

$$p(X - R^D) = s(d)p(X - R^A) \quad (1)$$

⁷ Note that, for $0.5 \leq s$, the signal is uninformative and will not be used by the bank.

⁸ Small and regional banks have not implemented risk-based pricing and seem somewhat reluctant to do so (Jäger and Redak, 2007).

Both banks need certain minimum repayments to break even. These repayments are denoted by \underline{R}^G and \underline{R}^A , respectively. We characterize the equilibrium in proposition 1:

Proposition 1: The German bank screens its applicants and always makes an offer to good firms but does not offer loans to bad firms. The Austrian bank offers loans to all firms with a good signal.

(1) If the Austrian bank has a cost advantage, 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 $\bar{\Pi}^A = -apX(1-s) + I((1-2\alpha)(1-s) + \alpha s) + ac$.

(2) If the German bank has a cost advantage, 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 $1 - F^G(X) = \frac{(1-\alpha)(1-s)I}{\alpha s(pX-I)}$. It makes

$\bar{\Pi}^G = ap(1-s)X + I((1-\alpha)(1-s) + \alpha s) - ac$. The Austrian bank offers repayments in the interval $[\underline{R}^A, X)$ according to the cumulative density function

$F^A(R) = 1 - \frac{ap(1-s)X - (2\alpha-1)(1-s)I - ac}{\alpha(pR-I-c)}$ and does not offer loans with

probability $1 - F^A(R) = \frac{ap(1-s)X - (2\alpha-1)(1-s)I - ac}{\alpha(pR-I-c)}$. It makes $\Pi^A=0$.

Proof: See the Appendix A.

Due to regulatory requirements, the German bank must always screen its applicants. Since financing bad firms yields an expected loss, the bank does not make an offer to bad firms. The signal on the firm's quality is perfect and thus the bank always offers loans to good firms. The firms know how banks will behave and therefore bad firms always apply at the Austrian bank, which does not screen.

If the Austrian bank's minimum repayment is the lowest (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. 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's minimum repayment is lower, there is no equilibrium in pure strategies because one bank (the German bank) has superior information. Suppose the German bank undercuts the offer of the Austrian bank. 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 .

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. Note that 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 for implementing the credit evaluation technique that uses hard information on German firms.

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

Proposition 2: The closer a good firm is located to the Austrian border, the higher is the probability that it can get an offer from both banks.

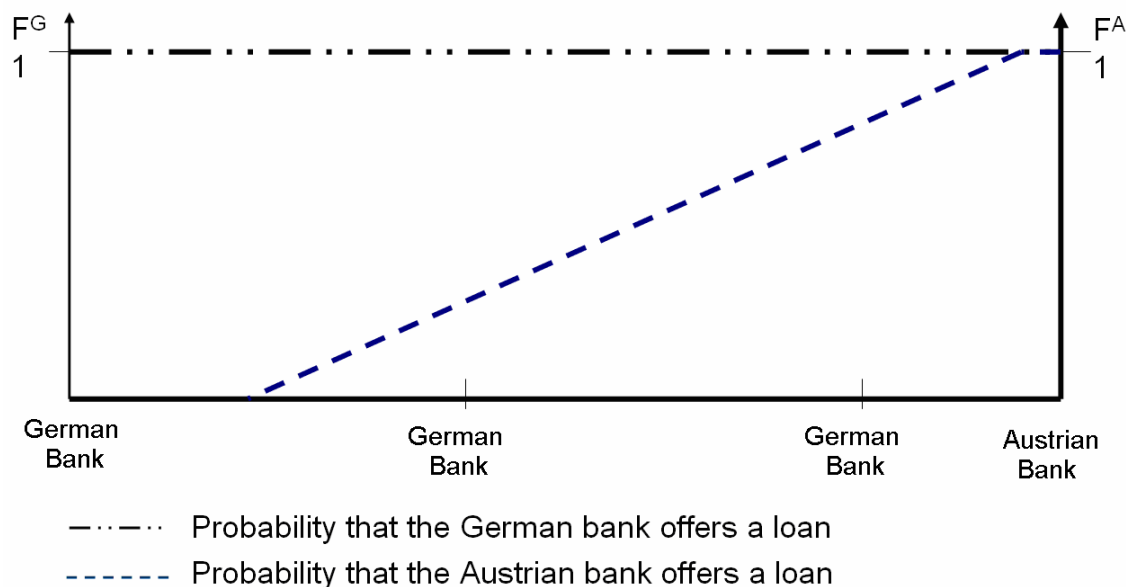
Proof: See the Appendix A.

Good (bad) firms always (never) receive loan offers from a German bank. The Austrian bank finances both good firms and also some bad firms. 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 firms are located from the border, 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.

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 2 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 this firm gets a loan offer from the Austrian bank.

Figure 1: Distance and Probability of Loan Offers to Good Firms



The probability that the German and the Austrian banks offer loans 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 2, the probability that the Austrian bank makes an offer 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

Based on our model that captures the particular situations in Germany and Austria and the availability of data, we can derive the following testable hypothesis. Since loans cannot be observed directly, we measure the cross-border lending by Austrian banks indirectly by measuring how German firms perceive the banks' lending behavior.

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

In principle, we would expect that access to loans is more difficult for firms in the border region. As long as foreign banks do not lend to them, they have fewer banks in their vicinity that potentially grant them loans. Once Austrian banks start to lend cross border, our propositions imply that otherwise identical firms will perceive the bank's lending behavior with a higher probability as normal or accommodating if they are located closer to the Austrian border. Similarly, the probability that the firms perceive the lending behavior as accommodating is negatively related to distance to the Austrian border.

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

In addition, the perception of an enterprise of the banks' general lending behavior depends on the macroeconomic, industry-specific, and economy-wide factors. However, the state of business of the individual firms should play the overwhelmingly import 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 credit behavior perception and the enterprise's state of business is expected to be positive.

5. Data Description

We use data of the ifo Business Climate Survey, which provides a unique source of information on perception of the bank's lending behavior by German firms. Nevertheless, the ifo survey data have hardly been used in the literature. Firms are asked:

“How do you assess the readiness of the banks to provide loans to enterprises?”

The possible answers include cautious (to which we attribute 1), normal (2) and accommodating (3). The surveys are available on a semiannual base (March and August) from August 2003 to August 2006.⁹ The response rate to this question is generally very high. Furthermore, we use information on the business development of companies 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 ifo survey also includes a number of further questions which specify the firm's economic situation in more detail. These include, for example, the stock of orders, and the assessment of the previous developments as well as expected ones. The data show a high correlation for the assessment of the current state of business and the previous expectations. Therefore, we only included the current state of business, which performed also best in the regression analysis. This result is similar to findings by Westermann (2007).

In our further analysis, we use data for manufacturing firms. We focus on the states of Bavaria and Baden-Wuerttemberg because they have a common border with

⁹ In August 2003 this question was asked for the first time.

Austria.¹⁰ This provides us with about 7000 observations if all companies are considered, and 3,700 observations about small and medium enterprises (SMEs). Figures 1 and 2 show the development of financial conditions and state of business for our whole regional sample and for the SMEs.¹¹

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 companies are located in municipalities with two or more financial institutions. The number of banks should not influence on the perception of the financial conditions. Moreover, according to our model, the credit policy of German banks does not depend on the distance to the Austrian border.

To proxy for the firm's opportunity for getting a loan from an Austrian bank, we include the shortest distance to selected communities in Austria.¹² To measure distance, we use the great circle distance, which is defined as

$$d^{ia} = \rho \arccos \left[\sin \left(\pi \frac{B_i}{180} \right) \sin \left(\pi \frac{B_a}{180} \right) + \cos \left(\pi \frac{B_i}{180} \right) \cos \left(\pi \frac{B_a}{180} \right) \cos \left(\pi \frac{L_i - L_a}{180} \right) \right], \quad (1)$$

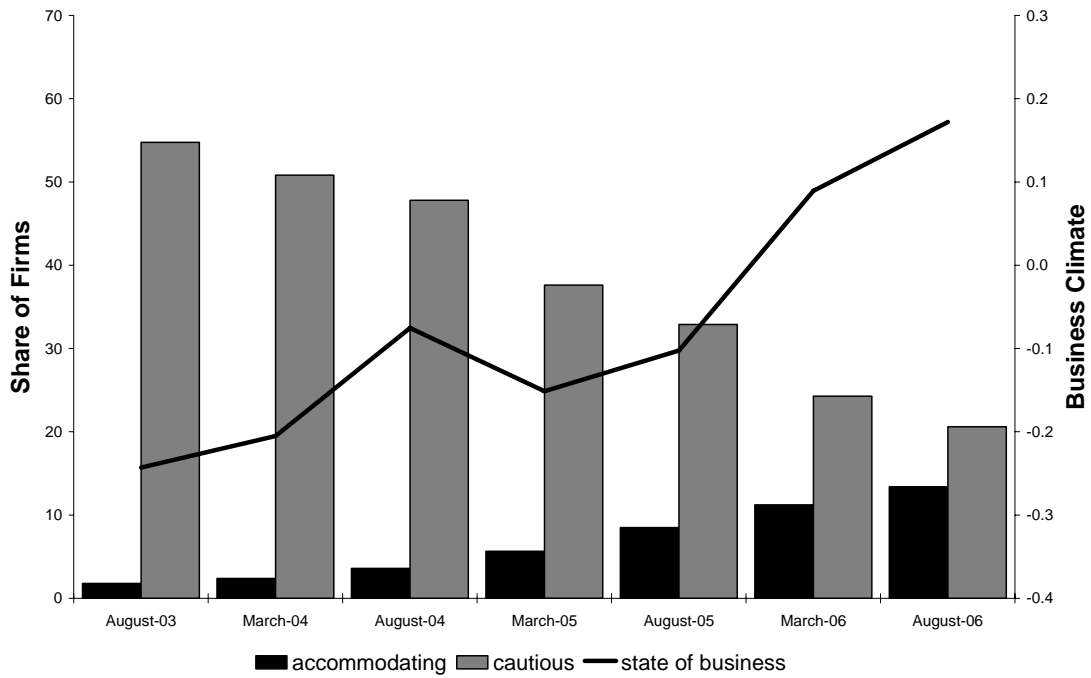
where ρ is the equator radius (6378.137 km), B and L are the geographic degrees of latitude and longitude of both analyzed firms (denoted by i) and selected financial institutions in Austria (denoted by a). We use the shortest distance to a financial institution in Austria for each firm. This measure of distance ranges between 14 km and about 300 km in the states of Bavaria and Baden-Wuerttemberg.

¹⁰ 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.

¹¹ Business climate is defined in Figures 1 and 2 in relation to the number of all firms surveyed as the number of firms assessing their state of business as good less those assessing it as bad.

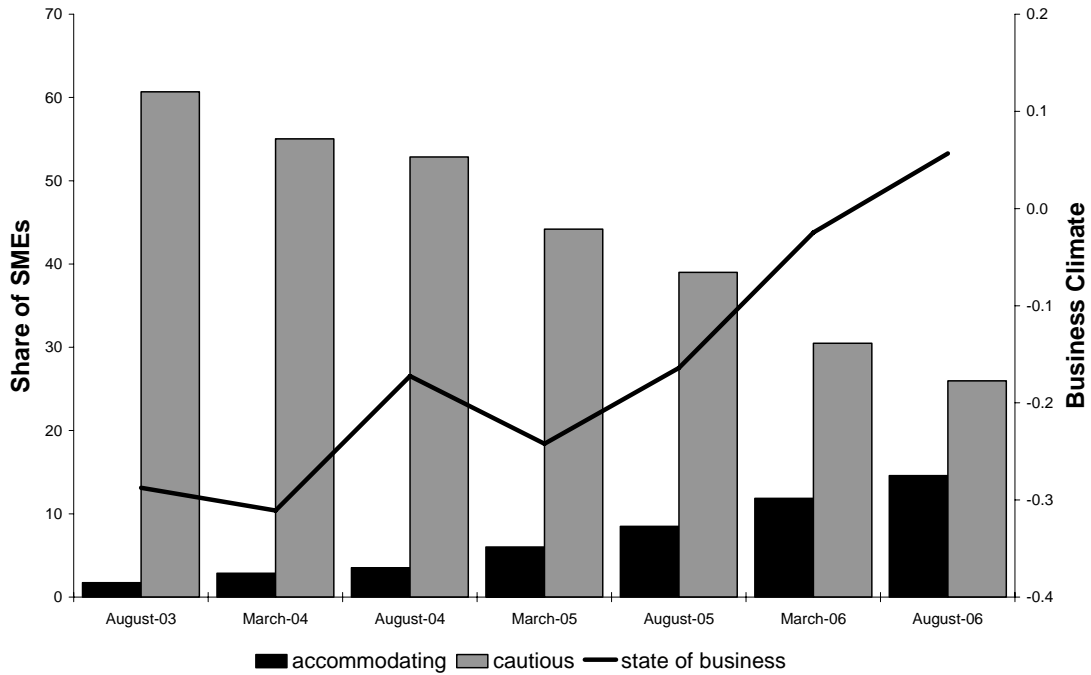
¹² Taking into account possible traffic routes, we selected the following targets: Salzburg, Kufstein, Jenbach, Braunau am Inn, Musau, Schattwald, Bregenz, Langen bei Bregenz, Scharnitz, Schärding, Seefeld in Tirol, Reutte, and Kleinwalsertal. Alternatively, we used the exact travel distance computed by the Yahoo route planner. See Figure A.1 in the appendix with a map of the region analyzed.

Figure 2: Financial Access and Business Climate in Bavaria and Baden-Wuerttemberg, All Firms



Source: ifo Institute, own calculations.

Figure 3: Financial Access and Business Climate in Bavaria and Baden-Wuerttemberg, SMEs (less than 200 Employees)



Source: ifo Institute, own calculations.

6. Determinants of the Cross-Border Lending

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 (that is, for five partially overlapping periods). Our dependent variable is the conditional probability that a firm assesses the banks' lending behavior positively. For logit and probit regression, we analyze the probability that c equals one for firm i at time t , which means that the firm views the lending behavior of banks as accommodating, and zero otherwise. On the right-hand side, we use firms' assessment of their state of business, b_i , distance, d_i , and a vector of additional control variables, \mathbf{Z}_{it} , including dummies for the size of companies and time effects (that is, the period of the biennial surveys) with the corresponding coefficient vector γ . Thus, we can specify the model as

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

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

Table 1 reports OLS, logit, and probit estimation of (1).¹³ 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.¹⁴

Distance has negative effects on the perception of the banks' lending behavior, although the estimated effects are relatively small. However, the differences in the distance between the firms are also large. Linear probability and 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

¹³ We consistently report marginal probability effects below for probit estimations in our paper.

¹⁴ However, there is a possible endogeneity problem as firms with access to loans may also face better economic developments. The results remain mainly unchanged if we use alternative variables (e.g. orders with fewer endogeneity problems).

accommodating by 1.3 percentage point. The effects are possibly slightly smaller for the logit regression (the odds ratio equal to 0.9).

Furthermore, the regression largely confirms the stylized facts of the loan supply in the period analyzed. First, the coefficients of time dummies show that the assessment of the banks' lending behavior has been continuously improving during this time. Although the financial supervision in Germany was set to be more similar to that in Austria in May 2005, we cannot see a structural break in this period. This is also confirmed by further sensitivity analysis in Appendix B.

Somewhat surprisingly, the smallest enterprises (below 50 employees) seem to assess the credit supply as more accommodating than the larger enterprises do according to the logit and probit specification. However, the coefficients for the SMEs are not significantly different from zero.

We applied several sensitivity tests to our results. Table 2 reports the results for the sample of the SMEs (with less than 200 employees). The stability of results on state of business is fully confirmed. The effects of distance keep the sign for logit and probit estimations and are significant for the probit estimation.

Furthermore, we estimate an alternative definition of the dependent variable. In particular, we use the probability, r , that the firms view the credit policy as cautious, where r equals one if the bank's lending behavior is viewed as cautious and zero otherwise. In comparison to the previous results, this regression should yield the opposite signs for both the state of business and the distance,

$$P(r_{it} = 1) = \beta_1 + \beta_2 b_{it} + \beta_3 d_i + \mathbf{Z}_{it} \gamma + \varepsilon_{it}. \quad (3)$$

The first hypothesis is again confirmed for all specifications (see Tables 3 and 4). However, the distance has a positive sign, as expected, but the coefficients are negligible and insignificant. Furthermore, the order of size effects is reversed (and all coefficients are significant), which corresponds better with our expectations.¹⁵

Further sensitivity analyses¹⁶ use time-specific coefficients for the distance to Austria, which might reflect the changes in the regulatory requirements during the

¹⁵ Similarly, the ordered probit estimations (not reported here) yield expected, but low, coefficients, which are only marginally significant in the whole sample.

¹⁶ The results of sensitivity analyses described below are available upon request from authors.

period analyzed. The results (see Appendix B) confirm the stability of the distance parameters for the assessment of credit policy as accommodating, while the time-specific distance terms remains jointly insignificant for cautious assessments.

Next, we include dummies for Munich and the major cities in Bavaria and Baden-Wuerttemberg. Surprisingly, the effects of the cities are less important and less robust than we expected. Furthermore, we replace state of business with expectations on commercial operations, although this variable is less appropriate for our model as expectations are not observable by the banks. Moreover, the responses to question on the access to credits and expected commercial development may be endogenous, while, as a realized variable, state of business can be considered as exogenous. The results prove the overall stability of our findings, which may reflect correlation between state of business and expectations (0.24 for all firms). If both variables are included in estimations, only state of business remains significant.

Table 1: Financial Access and Distance in Bavaria and Baden-Wuerttemberg, August 2003 – August 2006, Answer “Accommodating”

| Variable | OLS | Logit | Probit ^A |
|--------------------------|-----------|-----------|---------------------|
| State of business | 0.041*** | 0.704*** | 0.034*** |
| Distance (in 100 km) | -0.013*** | -0.252*** | -0.013*** |
| Year 2003:08 | -0.097*** | -1.832*** | -0.054*** |
| Year 2004:03 | -0.093*** | -1.577*** | -0.051*** |
| Year 2004:08 | -0.086*** | -1.244*** | -0.044*** |
| Year 2005:03 | -0.064*** | -0.742*** | -0.031*** |
| Year 2005:08 | -0.036** | -0.304* | -0.015* |
| Year 2006:03 | -0.020 | -0.165 | -0.008 |
| Size (1-49 employees) | 0.006 | 0.091 | 0.002 |
| Size (50-199 employees) | 0.018* | 0.303* | 0.013 |
| Size (200-499 employees) | -0.005 | -0.119 | -0.007 |
| Size (500-999 employees) | -0.005 | -0.111 | -0.006 |
| Constant | 0.062*** | -3.163*** | |
| Number of observations | 6054 | 6054 | 6054 |

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.

Table 2: Financial Access and Distance in Bavaria and Baden-Wuerttemberg, SMEs (less than 200 Employees), August 2003 – August 2006, Answer “Accommodating”

| Variable | OLS | Logit | Probit ^A |
|------------------------|-----------|-----------|---------------------|
| State of business | 0.065*** | 1.039*** | 0.052*** |
| Distance (in 100 km) | -0.008* | -0.147* | -0.008** |
| Year 2003:08 | -0.105*** | -1.942*** | -0.056*** |
| Year 2004:03 | -0.093*** | -1.384*** | -0.048*** |
| Year 2004:08 | -0.095*** | -1.326*** | -0.047*** |
| Year 2005:03 | -0.065*** | -0.704*** | -0.030*** |
| Year 2005:08 | -0.046** | -0.381* | -0.019* |
| Year 2006:03 | -0.020 | -0.125 | -0.006 |
| Constant | 0.025 | -3.837*** | |
| Number of observations | 3312 | 3312 | 3312 |

Note: See Table 1.

Table 3: Financial Access and Distance in Bavaria and Baden-Wuerttemberg, August 2003 – August 2006, Answer “Cautious”

| Variable | OLS | Logit | Probit ^A |
|--------------------------|-----------|-----------|---------------------|
| State of business | -0.135*** | -0.644*** | -0.147*** |
| Distance (in 100 km) | 0.001 | 0.005 | 0.001 |
| Year 2003:08 | 0.283*** | 1.372*** | 0.320*** |
| Year 2004:03 | 0.252*** | 1.242*** | 0.290*** |
| Year 2004:08 | 0.234*** | 1.173*** | 0.274*** |
| Year 2005:03 | 0.129*** | 0.705*** | 0.162*** |
| Year 2005:08 | 0.090*** | 0.529*** | 0.119*** |
| Year 2006:03 | 0.028 | 0.184 | 0.039 |
| Size (1-49 employees) | 0.186*** | 0.886*** | 0.208*** |
| Size (50-199 employees) | 0.100*** | 0.505*** | 0.116*** |
| Size (200-499 employees) | 0.081*** | 0.411*** | 0.094*** |
| Size (500-999 employees) | -0.048** | -0.256** | -0.054* |
| Constant | 0.410*** | -0.488*** | |
| Number of observations | 6054 | 6054 | 6054 |

Note: See Table 1.

Table 4: Financial Access and Distance in Bavaria and Baden-Wuerttemberg, SMEs (less than 200 Employees), August 2003 – August 2006, Answer “Cautious”

| Variable | OLS | Logit | Probit ^A |
|------------------------|-----------|-----------|---------------------|
| State of business | -0.151*** | -0.673*** | -0.163*** |
| Distance (in 100 km) | 0.000 | 0.002 | 0.001 |
| Year 2003:08 | 0.291*** | 1.298*** | 0.307*** |
| Year 2004:03 | 0.236*** | 1.061*** | 0.255*** |
| Year 2004:08 | 0.234*** | 1.059*** | 0.255*** |
| Year 2005:03 | 0.141*** | 0.666*** | 0.161*** |
| Year 2005:08 | 0.102*** | 0.503*** | 0.121*** |
| Year 2006:03 | 0.034 | 0.188 | 0.045 |
| Constant | 0.569*** | 0.282 | |
| Number of observations | 3312 | 3312 | 3312 |

Note: See Table 1.

7. Threshold Effects

The results in the previous section show mixed evidence about the relationship between the access to credits and distance to banks located in Austria. A possible reason for this is that the effects are significant only for a relatively short distance. The effects may diminish after a threshold is reached. We restrict our analysis only to Bavaria and Baden-Wuerttemberg, which means that the distance is less than approximately 300 km. However, this restriction presents an exogenous assessment. Most likely, the distance effects are important only for German companies located much closer to the Austrian border.

However, any other 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

$$c_{it} = \beta_1 + \beta_2 b_{it} + \theta_1 d_i + \mathbf{Z}_{it} \gamma + \varepsilon_{it} \quad \text{if } d_i \leq \delta, \quad (4.a)$$

$$c_{it} = \beta_1 + \beta_2 b_{it} + \theta_2 d_i + \mathbf{Z}_{it} \gamma + \varepsilon_{it} \quad \text{if } d_i > \delta, \quad (4.b)$$

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

$$c_{it} = \beta_1 + \beta_2 b_{it} + \beta_3 d_i + \beta_4 D(\delta) d_i + \mathbf{Z}_{it} \gamma + \varepsilon_{it}, \quad (5)$$

where $\theta_1 = \beta_3 + \beta_4$ and $\theta_2 = \beta_3$. 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 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 4. 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 Tables VI

to VIII also present the estimations for logit and probit (using the identified thresholds).¹⁷

Figure 4: Identification of Thresholds

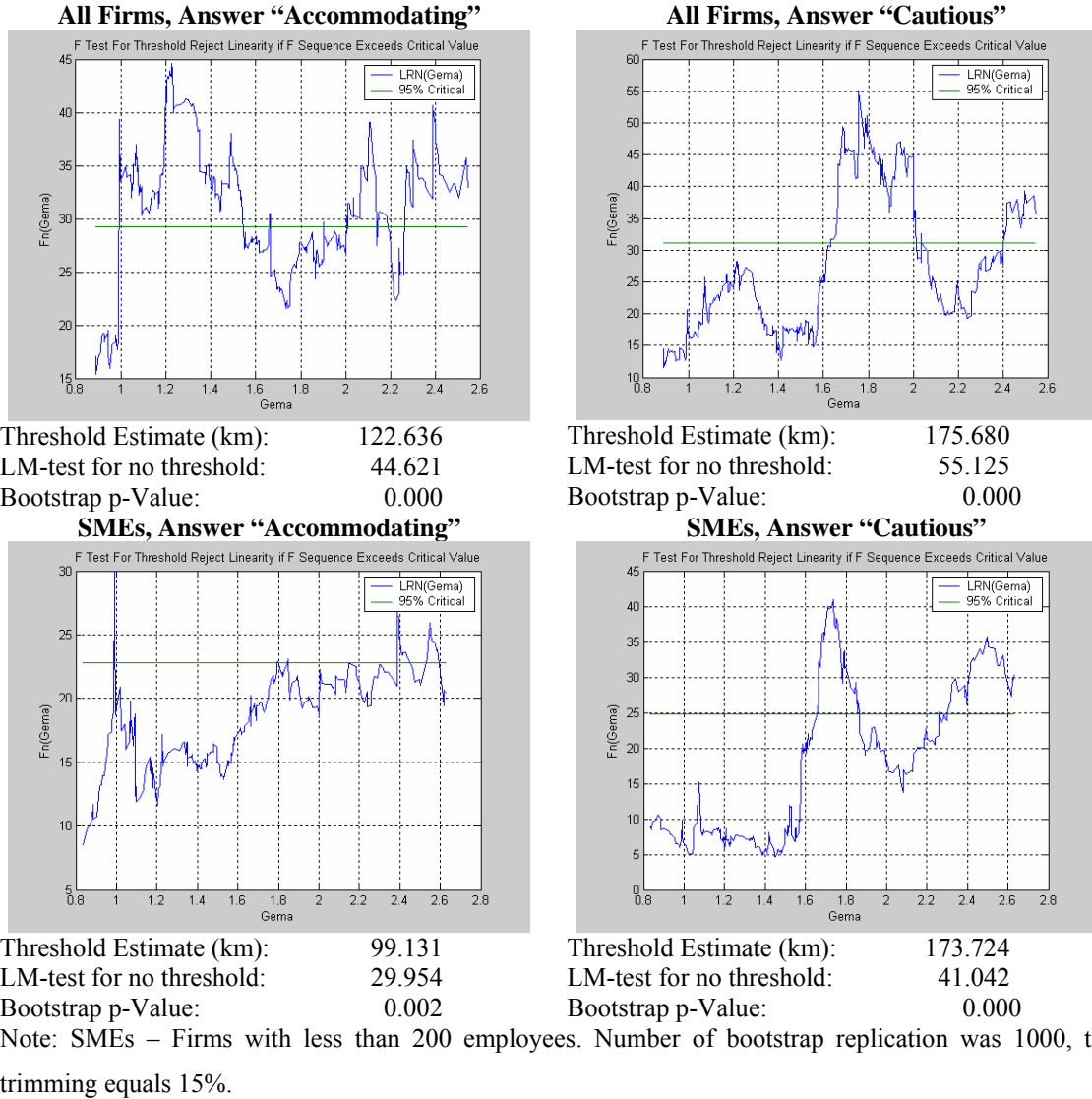


Figure 4 shows the results of both tests applied sequentially for the linear probabilistic models. For the SMEs, the Hanson’s LM test identifies clearly a threshold level of distance at 99 km, which is significant at 1% level. Table VI reports the results

¹⁷ 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.

for SMEs. We can see that the marginal effects of distance on the probability that a firm views the credit supply as accommodating is relatively high (0.067 for probit model), in addition to the distance effects found for the whole sample (0.019). 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.

For all firms, we find ambiguous evidence for the threshold level. The LM test delivers nearly the same test statistics for 95 km and 122 km, while the sequential likelihood ratio test (not reported here) favors the latter threshold. Both threshold levels are significant at the 5% level. The lower level also corresponds to the results found for SMEs. Hence, given the results for SMEs, we analyze both threshold levels. Table 5 reports the results for the lower threshold (95 km), which also yields comparably high marginal probability effects for distance below the threshold level (0.035) in addition to the whole-sample effects (0.018).¹⁸

In an additional robustness test, we define our dependent variable, r , as 1 if the companies surveyed view the credit policy as cautious. Thus, the effects of all explanatory variables should be simply reversed in this analysis,

$$r_{it} = \beta_1 + \beta_2 b_{it} + \beta_3 d_i + \beta_4 D(\delta) d_i + \mathbf{Z}_{it} \gamma + \varepsilon_{it}, \quad (6)$$

The results are presented in Tables 7 and 8 and Figure 4. For this variable, we can find a threshold at 176 km for the whole sample and at 174 km for the SMEs. The size of the coefficients is slightly smaller than for the accommodating answers (reflecting the opposite signs of the variables). The effect of distance alone is much smaller than the effect of distance to the Austrian border below the particular threshold. An increase in distance by ten kilometers increases the probability that a firm perceives the credit policy as cautious by about 0.7 percentage points (reflecting both distance coefficients in the whole sample and below the threshold) in the whole data sample, while the effects are slightly higher for the SMEs (about 1.0 percentage points).

¹⁸ By contrast, the alternative higher threshold level yields a positive coefficient. Given the evidence for the SMEs, we also use the lower threshold for these firms.

Table 5: Distance Threshold Effects in Bavaria and Baden-Wuerttemberg, August 2003 – August 2006, Answer “Accommodating”

| Variable | OLS | Logit | Probit ^A |
|--------------------------------------|-----------|-----------|---------------------|
| State of business | 0.041*** | 0.714*** | 0.034*** |
| Distance (in 100 km) | -0.019*** | -0.382*** | -0.018*** |
| Distance less than Threshold (95 km) | -0.040*** | -0.730*** | -0.035*** |
| Year 2003:08 | -0.097*** | -1.832*** | -0.054*** |
| Year 2004:03 | -0.093*** | -1.576*** | -0.051*** |
| Year 2004:08 | -0.086*** | -1.243*** | -0.044*** |
| Year 2005:03 | -0.064*** | -0.741*** | -0.031*** |
| Year 2005:08 | -0.036** | -0.304* | -0.015* |
| Year 2006:03 | -0.020 | -0.169 | -0.008 |
| Size (1-49 employees) | 0.006 | 0.097 | 0.002 |
| Size (50-199 employees) | 0.018* | 0.314* | 0.013 |
| Size (200-499 employees) | -0.004 | -0.094 | -0.006 |
| Size (500-999 employees) | -0.005 | -0.095 | -0.005 |
| Constant | 0.074*** | -2.912*** | |
| Number of observations | 6054 | 6054 | 6054 |

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.

Table 6: Distance Threshold Effects in Bavaria and Baden-Wuerttemberg, SMEs (less than 200 Employees), August 2003 – August 2006

| Variable | OLS | Logit | Probit ^A |
|--------------------------------------|-----------|-----------|---------------------|
| State of business | 0.066*** | 1.048*** | 0.051*** |
| Distance (in 100 km) | -0.022*** | -0.385*** | -0.019*** |
| Distance less than threshold (99 km) | -0.082*** | -1.448*** | -0.067*** |
| Year 2003:08 | -0.104*** | -1.940*** | -0.054*** |
| Year 2004:03 | -0.092*** | -1.374*** | -0.047*** |
| Year 2004:08 | -0.095*** | -1.340*** | -0.046*** |
| Year 2005:03 | -0.065*** | -0.719*** | -0.030*** |
| Year 2005:08 | -0.046** | -0.380* | -0.019* |
| Year 2006:03 | -0.019 | -0.130 | -0.006 |
| Constant | 0.056** | -3.310*** | |
| Number of observations | 3312 | 3312 | 3312 |

Note: See Table 3.

Table 7: Distance Threshold Effects in Bavaria and Baden-Wuerttemberg, August 2003 – August 2006, Answer Cautious

| Variable | OLS | Logit | Probit ^A |
|---------------------------------------|-----------|-----------|---------------------|
| State of business | -0.136*** | -0.655*** | -0.149*** |
| Distance (in 100 km) | 0.017** | 0.084** | 0.019** |
| Distance less than Threshold (176 km) | 0.042*** | 0.203*** | 0.046*** |
| Year 2003:08 | 0.282*** | 1.374*** | 0.320*** |
| Year 2004:03 | 0.251*** | 1.240*** | 0.289*** |
| Year 2004:08 | 0.234*** | 1.173*** | 0.274*** |
| Year 2005:03 | 0.129*** | 0.706*** | 0.161*** |
| Year 2005:08 | 0.090*** | 0.529*** | 0.118*** |
| Year 2006:03 | 0.028 | 0.183 | 0.039 |
| Size (1-49 employees) | 0.183*** | 0.876*** | 0.206*** |
| Size (50-199 employees) | 0.102*** | 0.518*** | 0.119*** |
| Size (200-499 employees) | 0.081*** | 0.411*** | 0.094*** |
| Size (500-999 employees) | -0.053** | -0.276** | -0.059** |
| Constant | 0.359*** | -0.736*** | |
| Number of observations | 6054 | 6054 | 6054 |

Note: See Table 3.

Table 8: Distance Threshold Effects in Bavaria and Baden-Wuerttemberg, SMEs (less than 200 Employees), August 2003 – August 2006, Answer Cautious

| Variable | OLS | Logit | Probit ^A |
|---------------------------------------|-----------|-----------|---------------------|
| State of business | -0.153*** | -0.684*** | -0.166*** |
| Distance (in 100 km) | 0.026** | 0.116** | 0.028** |
| Distance less than threshold (174 km) | 0.067*** | 0.302*** | 0.073*** |
| Year 2003:08 | 0.291*** | 1.305*** | 0.308*** |
| Year 2004:03 | 0.234*** | 1.061*** | 0.254*** |
| Year 2004:08 | 0.232*** | 1.059*** | 0.253*** |
| Year 2005:03 | 0.140*** | 0.667*** | 0.160*** |
| Year 2005:08 | 0.101*** | 0.503*** | 0.121*** |
| Year 2006:03 | 0.032 | 0.183 | 0.042 |
| Constant | 0.488*** | -0.081 | |
| Number of observations | 3312 | 3312 | 3312 |

Note: See Table 3.

Combined with the previous results, we can see that three areas are involved. Up to a distance of 95 km (99 km for the SMEs), the proximity to the Austrian border both increases the probability that the credit policy is perceived as accommodating and decreases the probability that the credit policy is perceived as cautious. Within a next interval until 176 km (174 km for the SMEs), the policy is viewed less cautious if a surveyed firm is located closer to the Austrian border. Above both thresholds, the distance has still significant, but smaller, effects on both types of answers.

8. Conclusions

We started this paper with the observation that financial integration in Europe is low with respect to 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 show that distance matters for cross-border lending as well. We can thus 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. Thereby, cross-border lending as a mode of integration 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 “regulations in the books” in both countries. Since we do not see a significant change in our results after this point in time, we interpret the difference in “regulations in the books” as a proxy that can be used to measure differences in the general construction of the supervision in Austria and Germany. But these differences are more multifaceted than this one particular regulatory provision.

Cross-border lending has been observed not only at the German-Austrian border. There is 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

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

The German bank will grant loans only to good firms. Thus, the German bank's profit is $\Pi^G = \alpha(pR^G - I - c)$. The minimum repayment necessary to break even is $\underline{R}^G = \frac{I + c}{p}$. The Austrian bank grants loans to those firms with a good signal. Thus, the

Austrian bank's profit is $\Pi^A = \alpha s(pR^A - I) - (1 - \alpha)(1 - s)I$. The minimum repayment necessary to break even is $\underline{R}^A = \frac{I((1 - \alpha)(1 - s) + \alpha s)}{\alpha s p}$.

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

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 $\bar{\Pi}^A = -\alpha p X(1 - s) + I((1 - 2\alpha)(1 - s) + \alpha s) + \alpha c$. The Austrian bank does not have an incentive to demand a lower repayment because it would renounce 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 $p(X - \underline{R}^G) > sp(X - \underline{R}^A)$

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 $[R^A, X)$ and not making an offer at all, that is

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

As a result, $F^G(R) = 1 - \frac{(1-\alpha)(1-s)I}{\alpha s(pR-I)}$. With probability $1 - F^G(X) = \frac{(1-\alpha)(1-s)I}{\alpha s(pX-I)}$

the German bank will demand X .

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

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

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

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

Q.E.D.

Proof of Proposition 2:

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 $1 -$

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

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

Figure A.1: Map of Selected Austrian Communities with Financial Institutions



Appendix B: Stability Tests

The cross-border lending as a new phenomenon of 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) and (3) by a set of time-specific coefficients of distance,

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

$$P(r_{it} = 1) = \beta_1 + \beta_2 b_{it} + \sum_{k=1}^6 \tau_k d_i \theta_k + \mathbf{Z}_{it} \gamma + \varepsilon_{it}. \quad (\text{B.2})$$

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.

Table B.1 presents the estimations of probit models for firms responding that credit policy of banks is accommodating (column 2 and 3) or cautious (column 4 and 5), while we again use the whole sample and a sample with SMEs only. Although we can see some differences between the surveys, they are not very large. Therefore, we test the stability of the coefficients by a joint test that all coefficients are constant during the analyzed period,

$$\tau_1 = \tau_2 = \tau_3 = \tau_4 = \tau_5 = \tau_6. \quad (\text{B.3})$$

The null of equal coefficients between the surveys cannot be rejected at the standard significance level (5 percent) for all specifications. Furthermore, the distance terms are jointly significantly different from zero for the assessment that credit policy is accommodating, although distance is insignificant for the perception that the credit policy is cautious. Thus, this sensitivity analysis confirms the results in Tables 1 to 4. 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, Probit Specifications

| | Accommodating | | Cautious | |
|---|---------------|-----------|-----------|-----------|
| | All Firms | SMEs | All Firms | SMEs |
| State of business | 0.034*** | 0.050*** | -0.147*** | -0.164*** |
| Distance (2003:08) | -0.013 | -0.041** | -0.021 | -0.031 |
| Distance (2004:03) | -0.031** | -0.022 | -0.011 | -0.017 |
| Distance (2004:08) | -0.026** | -0.029* | -0.016 | -0.009 |
| Distance (2005:03) | 0.004 | 0.013 | 0.008 | 0.000 |
| Distance (2005:08) | -0.020** | -0.006 | 0.040* | 0.034 |
| Distance (2006:03) | -0.002 | 0.000 | 0.010 | 0.035 |
| Year 2003:08 | -0.019** | -0.011 | 0.011 | 0.001 |
| Year 2004:03 | -0.056*** | -0.036 | 0.372*** | 0.354*** |
| Year 2004:08 | -0.042** | -0.037* | 0.326*** | 0.284*** |
| Year 2005:03 | -0.038** | -0.031 | 0.320*** | 0.271*** |
| Year 2005:08 | -0.050*** | -0.050*** | 0.167*** | 0.163** |
| Year 2006:03 | -0.013 | -0.025 | 0.066 | 0.065 |
| Size (1-49 employees) | -0.029* | -0.022 | 0.042 | -0.012 |
| Size (50-199 employees) | 0.001 | | 0.209*** | |
| Size (200-499 employees) | 0.012 | | 0.116*** | |
| Size (500-999 employees) | -0.008 | | 0.094*** | |
| Constant | -0.006 | | -0.053* | |
| Number of observations | 6054 | 3312 | 6054 | 3312 |
| Joint test that distance terms are constant | 11.71* | 12.76* | 6.21 | 4.66 |
| Joint test that distance terms are zero | 24.18*** | 16.19** | 6.30 | 4.67 |

Note: The 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. Joint tests report the *F*-Statistic of the null that all distance coefficients are constant and equal to zero, respectively.

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