Lending to Small and Medium-Sized Firms: Is There an East-West Gap in Germany?

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ABSTRACT. The financing of small and medium-sized firms is important for the catching-up of the East German to the West German economy since reunification. We explore whether it is restricted by unfavorable bank loan terms, using bank-survey data on lending decisions to small and medium-sized firms. A comparison of the terms of lending between the former East German and West German states yields a lending gap given by higher loan prices and collateral requirements in East Germany. This gap can be explained by differences in credit risks and lending strategies of banks.

1. Introduction

With German reunification in 1990, the East German economy has been challenged to be transformed from a centrally planned economy to a competitive market economy with the same standard of living as in West Germany. The general intention has been to close the huge economic gap between East German and West German states as soon as possible with support from federal state authorities, the corporate sector and the banking sector. The banks have been asked to finance the transformation of formerly state-owned East German firms and the foundation and growth of new firms.

Since many firms closed down, the financing of new, small and medium-sized enterprises (SMEs) plays a key role for the catching-up of the East German economy.[1] Small companies are said to have become the most important creators of new jobs and the seedbeds for cutting edge technological innovation (Acs and Audretsch, 1990). It is a stylized fact that in a market economy, a large number of jobs arises from SMEs, while simultaneously many jobs are destroyed by close-downs of SMEs (Davis et al., 1996). In East Germany, the difference between firm foundations and firm exits was high shortly after reunification, but converges towards zero at the end of the 1990s (Ostdeutscher Bankenverband, 2000b, p. 10).

Credit restrictions have been one of the highest impediments to firm foundations in East Germany (Steil, 1998, p. 131). Many SMEs in East Germany complained of severe financing restrictions because of lacking equity capital and a low willingness of banks to grant loans (Hummel and Ludwig, 1994). The equity gap between East and West Germany could not be closed, despite large public equity aid programs. The scarcity of equity capital is most severe for SMEs which have no access to the capital market and are not owned by West German or foreign firms.[2] These firms, which are highly dependent on bank loans, criticize banks for excessive collateral requirements and loan prices (Carlin and Richthofen, 1995, p. 20).

In the general public, too, German banks are often claimed to be too risk averse, while on the other hand, the banks allege that they help to build up the small and medium-sized sector of the East German economy. Because of high loan losses in

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East Germany, some banks have been downgraded by rating agencies. Banks reported that they faced special problems when lending to East German firms: lacking information and borrower history made rating difficult and the value of collateral was low or uncertain because of unclear property rights. To compensate for the higher market and firm-specific risks, some banks demand higher risk premiums from firms in East Germany, while others cross-subsidize borrowers between both regions (Hummel and Ludwig, 1994, p. 7). The scope of banks to demand higher loan rates or collateral from East German firms might have been enlarged by high bank loyalty and low bargaining of the latter (IWH, 1996, p. 109).

Our paper seeks to find out whether there is really an East-West lending gap in the sense that banks demand excessive loan prices and collateral from East German SMEs. If a gap can be explained by a risk differential, the reproaches to banks for excessive risk-aversion are unjustified. On the contrary, if it cannot be explained by (objective) risk variables, the banks may be rightly accused of (subjectively) discriminating against East German firms.[3] The paper is based on the theories of financial intermediation and regional economics. The theory of financial intermediation backed by empirical studies explains how bank lending depends on credit risk variables as firm characteristics, loan characteristics and features of the lending relationship.[4] These variables affect idiosyncratic credit risks, but not market risks. Market risks arise from the affiliation of a firm to an industry (industry risk) or to its location in a regional market (regional risk). The determinants of regional risks are explained by regional theories, which analyze how birth, growth, and death of firms depend on regional variables and why some regions have higher economic growth rates than others.[5] These findings are used to discuss an East-West gap in regional credit risk.

Using data of a survey which was conducted among German banks in 1997, we test differences in credit risk variables and their influence on the terms of lending (interest rate, collateral) in East and West Germany. While the impact of firm location on interest rates and collateral has already been addressed by Harhoff and Körting (1998) and ourselves in a previous paper (Lehmann and Neuberger, 2001), the present paper differs from these studies in several regards. First, the main difference to the Harhoff and Körting study is that our data set is based on a survey of banks and not of firms. Thus, we have information on the banks' internal credit ratings as assessments of borrower risk, which are important for their lending decisions, but are not available from firm interviews.[6] Secondly, unlike the previous studies we test a lending gap not only by using a dummy to control for West versus East Germany, but also by splitting the sample according to the two regions. Thirdly, we include dummies to control for the bank type, considering that private banks, savings banks and cooperative banks differ in their lending policies.

Our results support the assumed "gap" between East and West Germany. East German firms have to provide more collateral and have to pay higher interest rates than West German firms. The differences can be partly explained by the higher risk that banks face in East German firms, and partly by differences in bank types. We expect that this gap will increase in the next years due to the new capital rules of Basel II, which adjust the capital required by the regulators to the banks' risks they run. If, as the results show, East German firms have a higher credit risk, lending to them will impose higher costs on banks after the implementation of the Basel II rules. The banks may then either ration East German borrowers or demand higher loan rates.

The paper is organized as follows. In Section 2, we review the theory of financial intermediation which yields hypotheses about the determinants of bank lending terms and summarize the prior empirical evidence. Section 3 deals with the explanation of regional credit risk by theories of regional economics and reviews the available evidence on a credit risk gap between East and West Germany. In Section 4, we report the results of the empirical analysis of the East-West gap in lending terms. Finally, we summarize our results in the context of the New Basel II regime in Section 5.

2. Financial intermediation and terms of lending

2.1. *Theoretical issues*

The theory of financial intermediation[7] suggests that banks specialize in information production and loan contract design to resolve credit rationing problems of SMEs, where problems of asymmetric information are most prominent. The banks gather information about borrowers and measure their default risk by internal risk classes or borrower ratings. These ratings depend on characteristics of the borrower and the loan, the relationship between bank and borrower, and the market in which the borrower acts. So far, the applied rating criteria and number of risk classes differ across banks (Basel Committee on Banking Supervision, 2000). Theoretical studies that provide generally accepted rating principles that ought to be met by "good rating practice" are still in their infancy (Krahnen and Weber, 2001).

Loan pricing according to the borrower ratings serves to compensate the banks for the risk that the borrowers do not repay. However, it may not be rational for a bank to demand higher loan rates because this provokes an increasing risk by adverse selection and adverse incentives. Likewise, the relationship between collateral and borrower risk is theoretically ambiguous. On the one hand, conventional wisdom in banking suggests that banks demand more collateral from riskier borrowers to reduce their risk exposure. On the other hand, good borrowers may provide more collateral to signal their lower default risk. Hence, the predicted relationship between borrower risk and collateralization should be positive for observable risks ("sorting by observed risk"), but negative for unobservable risks ("sorting by private information"). If collateral and loan pricing are substitutive devices to lower credit risk, we expect a negative relationship between collateral and loan rates.

The literature on relationship banking[8] explains why terms of lending should not be risk adjusted. By building up an intense relationship with a borrower, a bank may be able to bind that customer. The borrower may profit from a binding, because it enables the bank to smooth interest rates over time in response to changes of borrower risk or market interest rates. It may be achieved by an information advantage, which is often related to the status of a housebank. A housebank may raise interest rates or collateral requirements to be compensated for its special services such as provision of liquidity or renegotiation of debt contracts.

2.2. *Previous empirical results*

In empirical studies on the influence of credit risk on loan prices and collateralization, credit risk has been measured by characteristics of the firm, the loan, and the bank-borrower- relationship. Studies based on bank survey data also include the variable "credit rating", i.e. the bank's internal assessment of borrower risk. The influence of variables outside the theory of financial intermediation is controlled by industry dummies, bank type dummies or regional dummies. Tables I and II report the significant results for different countries and periods.

As shown in Table I, most studies confirm that a higher (i.e. worse) bank internal rating implies a higher loan rate and that small and young firms have to pay higher loan rates than larger or older firms. Incorporated firms tend to pay lower loan rates than unincorporated firms. Banks demand a higher risk premium from firms which have been in financial distress or have a higher default probability, but a lower loan price from firms which they perceive to have high management skills. As theoretically predicted, the relationship between collateral and loan rates is ambiguous. Large loans are cheaper than smaller loans and lines of credit and commitment loans are more expensive because of unspecified credit use or the right of the borrower to recall the loan. Concerning the features of the lending relationship, a longer duration, a rising number of lenders and a housebank relationship do not result in the expected loan rate reduction in most cases. However, stability of the lending relationship and mutual trust between borrower and lender reduce loan rates. Table II shows that the effect of the bank internal rating on collateralization (measured by incidence or degree) is ambiguous.[9] The same holds for most of the variables related to firm and loan characteristics, except the age of the firm which shows a negative influence on collateral in all studies. Unanimously, it is found that housebanks are

TABLE I
Significant effects of credit risk variables on loan prices: previous evidence

Paper / Credit Risk Variables	*Lehmann/ Neuberger* (2001) Germany	*Harhoff/ Körting* (1998) Germany	*Machauer/ Weber* (1998) Germany	*Elsas/ Krahnen* (1998) Germany	*Ewert/ Schenk* (1998) Germany	*Degryse/ Van Cayseele* (2000) Belgium	*D'Auria/Foglia/Reedtz* (1999) Italy	*Cressy/ Toivanen* (2001) U.K.	*Berger/ Udell* (1995) U.S.	*Petersen/ Rajan* (1994) U.S.
Credit rating (higher rating = higher risk class)	positive***	-	positive***	positive**	no	-	-	-	-	-
Firm characteristics										
- firm size	negative*	negative***	-	negative***	negative***	no	positive***	-	no	negative***
- firm age	no	negative*	-	-	-	negative*	-	-	no/neg.**	negative**
- legal form: incorporated firm	no	no	negative**	no	-	negative***	-	-	negative**	negative*
- leverage (debt/equity or assets)	-	no	-	-	positive*	-	positive***	-	no	no
- financial distress/default probability	-	positive**	-	-	-	-	-	positive***	-	-
- management skill	negative**	-	-	-	-	-	-	-	-	-
Loan characteristics										
- collateral	no	no	positive***	positive	positive**	negative***	-	negative***	no	-
- loan size	-	-	negative***	negative***	-	-	negative**	no	-	-
- loan maturity	-	-	-	-	-	negative***	-	negative	-	-
- line of credit/commitment loan	positive***	-	-	-	-	pos./neg.	-	-	-	-
Relationship characteristics										
- duration of relationship	no	no	no	no	-	positive***	pos./neg.	-	negative**	no
- housebank/main bank	no	-	no	no	no	negative***	negative**	-	-	-
- number of lenders	-	no	no	-	no	-	negative**	-	-	positive***
- stability/mutual trust	negative**	negative*	-	-	-	-	-	-	-	-
Control/firm location variables										
- industry	no	yes***	-	-	yes**	yes	no	yes	no	no
- bank type	no	-	yes***	yes**	yes**	-	yes**	-	-	-
- local banking concentration	-	-	-	no	yes***	-	-	-	-	no
- city county	-	positive*	-	-	-	-	-	-	-	-
- fringe county	-	no/pos.*	-	-	-	-	-	-	-	-
- East Germany/South Italy	positive**	positive***	-	-	-	-	positive**	-	-	-

* Significance at 10% level

** Significance at 5% level

*** Significance at 1% level

TABLE II
Significant effects of credit risk variables on collateral: previous evidence

Credit Risk Variables \ Paper	*Lehmann/ Neuberger* (2001) Germany	*Harhoff/ Körting* (1998) Germany	*Elsas/ Krahnen* (1999) Germany	*Machauer/ Weber* (1998) Germany	*Degryse/ Van Cayseele* (2000) Belgium	*Cressy/ Toivanen* (2001) U.K.	*Berger/ Udell* (1995) U.S.	*Boot/Thakor/ Udell* (1991) U.S.	*Leeth/ Scott* (1989) U.S.
Credit rating (higher rating = higher risk class)	negative**	-	no	no/neg.***	-	-	-	-	-
Firm characteristics									
- firm size	negative***	negative***	no	-	negative***	-	positive**	-	no
- firm age	negative**	negative*	-	-	negative*	-	negative*	-	negative***
- legal form: incorporated firm	negative*	no	no	negative**	no	-	-	-	-
- leverage (debt/equity or assets)	-	no	-	-	-	-	positive**	-	-
- financial distress/default probability	-	positive***	-	-	-	no	-	-	-
- management skill	no	-	-	-	-	-	-	-	-
Loan characteristics									
- loan rate	-	-	-	positive***	-	-	-	-	-
- loan size	-	positive***	-	negative**	positive***	-	-	negative***	positive***
- loan maturity	-	-	-	-	positive***	positive***	-	negative***	positive***
- line of credit/commitment loan	negative***	-	-	-	positive***		-	positive***	-
Relationship characteristics									
- duration of relationship	no/neg.**	negative*	no	no	no	-	negative**	-	-
- housebank/main bank	positive***	-	positive***	positive***	positive***	-	-	-	-
- number of lenders	-	positive*	-	negative**	-	-	-	-	-
- stability/mutual trust	positive**	negative**	-	-	-	-	-	-	-
Control/firm location variables									
- industry	no	yes*	yes***	-	-	yes	no	-	yes**
- bank type	no	-	yes***	yes***	-	-	-	yes***	-
- local banking concentration	-	-	no/positive*	-	-	-	-	-	-
- city county	-	no	-	-	-	-	-	-	-
- fringe county	-	no	-	-	-	-	-	-	-
- East Germany	positive*	positive*	-	-	-	-	-	-	-

* Significance at 10% level

** Significance at 5% level

*** Significance at 1% level

significantly more likely to ask for collateral and demand more collateral than "normal" banks, indicating that this helps them to perform their special functions.[10] Other relationship variables have ambiguous or no effects on collateralization.

Since these studies test hypotheses derived from financial intermediation theory, they are less concerned about the effects of variables that control for industry, firm location or bank type. Some find significant industry effects,[11] and most find that the type of the bank plays a significant role in the determination of the lending terms. Only few studies control also for regional variables as local banking concentration or firm location in a city county, fringe county or a less developed region (East Germany, South Italy). Local banking concentration and location in a city or fringe county as proxies for banking competition do not seem to be important. However, firms located in East Germany pay significantly higher loan rates and provide significantly more collateral than firms located in West Germany (Harhoff and Körting, 1998; Lehmann and Neuberger, 2001). A comparable loan price gap has been found for firms located in South versus North Italy (D'Auria et al., 1999).

Summing up, these findings suggest that East German firms are disadvantaged on the loan market, but that the interest rate and collateral gap cannot be explained by the theory of financial intermediation alone. The open question is whether the unexplained gap is due to differences in regional credit risks or other omitted credit risk variables.

3. Regional economics and credit risk

3.1. *Theoretical issues*

Credit risk arises from the uncertainty of a firm's survival. The higher the probability of insolvency, the higher the risk to the bank that the loan cannot be repaid. Regional theories explain how growth and death rates of firms which affect their insolvency risk depend on the region in which they are located and why some regions have higher economic growth rates than others. Regional economics is a wide field which comprises theories of regional development, growth, location, interregional trade, industrial organization and new economic geography. In the following, only the main aspects which might explain a gap between East and West German SMEs will be summarized.[12]

A disadvantage of East German firms after reunification may have been caused, firstly, by their location in a "resource deficient" region which is poorly endowed with so-called potential factors of development, such as a qualified labor force, modern transport infrastructure, an easy access to research facilities and an attractive standard of living. A second possible handicap was the break-down or absence of industrial districts, where agglomeration advantages are reaped from regional concentration of an industry (localization effects) or of economic activities in general (urbanization effects).[13] Being embedded into local networks has been found to be especially important for the innovative activities of small firms with low investments in R&D. Location and proximity are crucial for the use of knowledge spillovers, and the innovation output depends positively on the availability of a qualified labor force and spatial concentration of R&D (Feldman, 1994; Audretsch and Feldman, 1996).

Third, from a dynamic point of view, East German firms may be permanently disadavantaged by a lower growth rate of their regional economy. The new growth theory postulates that differences in growth rates of regions are caused by different rates of knowledge accumulation, which goes along with positive externalities due to technological spillovers (Grossman and Helpman, 1991). Since the latter depend on the region's stock of knowledge, regional disparities should be permanent or growing over time.[14] This theory rests on the assumption that spillovers occur within the region of knowledge production, neglecting the transfer of knowledge between regions. If we consider the transfer of knowledge, as it occurs from West to East Germany since 1990, we might explain a catching up or even leapfrogging of the East German relative to the West German region.

An East-West lending gap may also arise from different structures of the banking industry in both regions, which implies different lending strategies or different capabilities to assume credit risks. The German banking sector is dominated by three banking groups, the big private banks, the state-owned savings banks and the cooperative banks.

They differ not only in their governance structure but also in their ability to internalize credit risks. The big private banks are listed on the stock exchange and are thus able to allocate their credit risk to dispersed shareholders. On the contrary, the cooperative banks have few members to bear the risk, and savings banks are state-owned banks, where the risk is borne by the public.[15] Hence, the latter may assume greater risks without having to pay higher risk premiums in their refinancing rates (Sinn, 1999). However, the banking groups differ not only in risk sharing, but also in their ability to diversify their credit portfolio across regions. Unlike the big private banks, which are active nationwide, the cooperative banks and the state-owned savings banks have only a small number of branches concentrated around their locations. Thus, we assume that cooperative banks, where risk sharing and risk diversification are the most constrained, will be more restrictive in their lending activities than the other two bank types.

Comparing East und West, the big private banks have gained a significantly higher credit market share in East Germany. This kind of market segmentation can be explained by the higher reputation of the private banks when they entered the East German market after the reunification, whereas the already established state-owned banks and cooperative banks had to take a lot of efforts to transform into today's structures. Moreover, the "Staatsbank" of the former German Democratic Republic, which had a large branch network, was taken over by two big private banks.

3.2. *Previous empirical results*

There is no direct evidence about the determinants of regional credit risk, but a large literature shows indirectly the impact of the above stated regional factors on birth, growth, and death rates of SMEs.[16] In the following, only the findings concerning a possible gap between East and West Germany are reported.

The determinants of firm foundation do not differ significantly between East and West Germany (Steil, 1997). Firm foundation rates are highest in the surroundings of cities, are negatively affected by the regional unemployment rate and are fostered by public infrastructure. Economically prospering regions are characterized by a high turbulence of firms, with simultaneously high birth and death rates (Fritsch, 1992). This might be explained by a higher intensity of competition in these regions. However, firm foundations in East Germany seem to have higher survival rates compared to West Germany, which may also be the result of higher subsidies (Steil, 1998, p. 257).[17]

An East-West gap in growth rates of SMEs has been found for the period 1992–1996 (IWH, 1996; Steil and Wolf, 1999). East German firms were restricted by the following location disadvantages: excessive unit labor cost,[18] insufficient capital (obsolete production facilities, ecological restructuring costs), high energy and water prices, insufficient innovative activity, marketing difficulties (e.g. because of concentration on local and regional sales markets, lacking networks, insufficient firm size). In the manufacturing sector, the regional unemployment rate showed a negative influence on employment growth of East German firms, which indicates a lack of demand due to unemployment. The population density also had a negative effect, showing an agglomeration disadvantage by scarce land for commercial purposes. There is evidence for localization advantages, the growth dynamics of a region being positively affected by the regional concentration of manufacturing industries (Steil and Wolf, 1999). The growth rates of East German firms which are large enough to be active also on national or international markets are positively affected by the participation of a West German or foreign firm. This points to a transfer of know-how which counters the disadvantage of late development postulated by the new growth theory (Steil and Wolf, 1999). On the contrary, the majority of small firms in East Germany are embedded in local or regional networks with low innovation intensity, so that they cannot profit from a knowledge transfer (IWH, 1996, p. 72). In East Germany, the rate of firm foundations in knowledge-intensive industries is lower than in West Germany, being concentrated in the core regions of agglomerations (ZEW 2001, p. 2). Although the efficiency or productivity gap between East and West German firms has been reduced, it is still significant at the end of the 1990s (Barrell and te Velde, 2000; Funke and Rahn, 2000; Sinn, 2000).

4. Analysis of an East-West lending gap

4.1. *Hypotheses*

Based on the theoretical arguments and previous empirical evidence, we summarize here our central hypotheses.

H1: There is an East-West lending gap in the sense that East German firms have to pay significantly higher interest rates or provide more collateral than West German firms.

H2: The lending gap can be explained by a risk differential. Credit risk is significantly higher in East German firms, because they are smaller and younger, have shorter or less intense banking relationships, and receive higher (worse) bank-internal credit ratings than West German firms.

Hypothesis H2 is, primarily, derived from the theory of financial intermediation. Regional theories further explain why bank-internal credit ratings should be higher in East Germany, given that these ratings are also based on observations of market risks.

4.2. *Data measurement and descriptive statistics*

Data have been obtained from a survey of German banks in 1997. Approximately 1200 questionnaires were mailed to banks in towns with a location of a state-owned savings bank. It was addressed to the wholesale managers of three different bank types: big private banks,[19] state-owned savings banks and cooperative banks. The respondents were asked to refer to loan applications of SMEs with a loan volume ranging between DM 100000 and 10 millions.

In addition to firm characteristics (firm size, firm age, legal form, management skill, technological skill) and contract terms (interest rate, collateral), the questionnaire inquired about bank-internal credit ratings. Moreover, a variety of questions related to information gathering and the nature of the bank-borrower relationship were included.

Specific aspects of the bank-borrower relationship and the borrower's management or technological skill as perceived by the bank were measured using a set of multi-item scales. The loan officers were asked to indicate their perceptions about these aspects on a range of statements scored on a 5-point Likert scale, which takes the value 1 (5), if the respondent chooses the judgement "very low" ("very high"). These responses were transformed into dummy variables: for each 5-point-scaled ordinal variable, all values below the median are proxied by the value zero and all values at or above the median by the value one. This reduces the number of dummy variables on the right hand sight but also leads to a loss in information. The same procedure was applied to measure the housebank status. The bank managers had to evaluate on a 5-point scale whether they perceived their bank as the customer's housebank (1 = does not apply; 5 = applies completely). An industry bias in the measurement of firm size[20] has been precluded by computing the median of sales volume for each industry and transforming the size variable into a dummy variable.

The grouping of firms into age categories follows the usual classification by banks: young firms of age less than 2 years, middle-aged firms of age between 2 and 6 years, old firms of age between 7 and 10 years, and more than 10 years. This provides a signal concerning credit risk. As shown by the time-series study of Brüderl and Preisendörfer (1998), firms in the age class 2–6 years carry the highest bankruptcy risk, whereas a long-term success cannot be expected before 7 years after birth. For the youngest firms with less than 2 years of age bankruptcy risk tends to be low, because they can often resort to government aid or to own reserves built up in the start-up phase. Similarly, we grouped the duration of the lending relationship in the following way: new customer (first contract), young relationship with a duration less than 2 years, duration according to the "problem age class" of 2–6 years and old relationship with a duration of at least 7 years.

Furthermore, we included a dummy variable for each bank type (private banks, savings banks and cooperative banks), dummies for the kind of credit use, as well as industry dummies. All variables are listed in Table III.

The statistics are based on 360 responses to our questionnaire which refer to approved loans.[21] Among the responding banks, 80% were located in West Germany and 20% in East Germany.

TABLE III
Definition and measurement of variables

	Variable	Explanation and measurement
	West German firm	Dummy variable indicating whether the firm is located in West Germany (former West German states)
	Collateral	Collateral measured as percentage of loan volume
	Interest rate	Measured as percentage points above the refinancing interest rate
Bank internal rating	Credit rating	Qualitative variable, indicating the credit rating, ranging from 1 (= best rating) to 5 (= worst rating).
Firm characteristics	Firm age	Set of dummy variables indicating whether the firm is: less than 2 years, 2 to 6 years, 7 to 10 years, more than 10 years old
	Firm size	Turnover-size categories in million DM: less than 1, less than 2, less than 5, less than 10, less than 50, less than 100, more than 100; transformed into a dummy variable indicating whether the firm size is above the median size in that industry.
	Incorporated firm	Dummy variable indicating whether the firm is incorporated (dummy = 1) (limited liability company GmbH or stock corporation AG) or not (KG, OHG, BGR)
	Management skill[a]	"The management competence is below average (1), . . . average (3), . . . above average (5)."
	Technological skill[a]	"The technological competence is below average (1), . . . average (3), . . . above average (5)."
Relationship characteristics	Duration of the relationship	Set of dummy variables indicating whether the relationship is: the first contract, less than 2 years, 2 to 6 years, more than 7 years old
	Housebank	Dummy variable indicating: "We are the customer's housebank"
Control variables	Bank type	Set of dummy variables indicating whether the bank belongs to the big private banks (base line), cooperative banks or savings banks
	Credit use	Dummy variable indicating whether the credit is used for a replacement investment or has no special use.
	Industry	Set of dummy variables indicating the industry (manufacturing and production; trade, service, building and construction; others)

[a] Qualitative variable, measured by a Likert scale, based on answers ranging from 1 (= not at all) to 5 (= to a very large extent). The qualitative variable was transformed into a dummy variable, indicating whether its value is below the median (0) or not (1).

According to demographic data as the number of inhabitants, we have no selection bias towards East or West German banks. Table IV provides the means of the lending variables for firms in East and West Germany either by *t*-tests or cross-tabulations. It turns out that on average loan prices and collateral requirements are significantly higher for East German firms than for their West German counterparts. While in West Germany, firms pay on average a loan price which lies 1.55% above the bank's refinancing rate, in East Germany they pay 2.15% and, hence, a premium of 0.6% which is more than a third of the price paid in the West. Collateral amounts to more than 60% of the loan volume to firms in East Germany, compared to 53% in West Germany. These may be the results of riskier loan portfolios in East Germany: the mean borrowing firm gets a worse credit rating, is younger, and has a shorter relationship to its bank. 85% of the firms in East Germany are less than 7 years old, compared to 33% of the firms in West Germany, where most of the firms are older than 10 years. Likewise, the duration of the lending relationship is significantly shorter in East Germany. Clearly, these differences can be explained by the date of the German reunification.

TABLE IV
Terms of lending and credit risk variables in East and West Germany

Variables	Means of variables		
	East Germany	West Germany	*t*-test (Pearsons χ-square)[a]
Collateral	60.861	53.313	**
Interest rate	2.152	1.555	***
Credit rate	2.791	2.540	**
Firm age			
Less than 2 years	0.26	0.13	**
2 to 6 years	0.59	0.20	***
7 to 10 years	0.09	0.13	
Older than 10 years	0.06	0.54	***
Firm size	0.69	0.67	
Management skill	0.40	0.43	
Technological skill	0.77	0.87	
Duration of relationship			
First contract	0.36	0.18	***
Less than 2 years	0.26	0.12	***
2 to 6 years	0.35	0.24	***
More than 7 years	0.03	0.46	***
Housebank	0.55	0.55	
Bank type			
Big private bank	0.58	0.39	
Cooperative bank	0.21	0.33	
Savings bank	0.21	0.27	

[a] Calculated using crossing tabulations.
*, **, *** Significance at the 10%, 5% and 1% level.

There are no significant differences in firm size, management skill, technological skill, the role of a housebank and bank type.

Summarizing, we have found evidence for a lending gap according to H1. To explain the gap and test hypothesis H2, we ran regressions with loan prices and collateral as endogenous variables.

4.3. *Estimations*

The descriptive statistics provide evidence for a gap in interest rates and collateralization between East and West German firms. This gap can be either explained by different "qualities" of the borrowers or by discrimination. If the first assumption holds, differences in the variance of interest rates or collateralization should be explained by variables indicating those differences. As in the previous empirical studies (see Tables I and II), we estimate two reduced-form equations with the interest rate and the collateral as endogenous regressors.[22]

4.3.1. *Determinants of loan prices*

First, we conduct a simple OLS regression in the kind of a hedonic price function to analyze differences in the interest rates. We use five different specifications. The first specification (All (I)) includes all observations and a dummy variable for West German firms. If there are no quality differences between East and West German firms and there is no discrimination, this dummy variable should not be significantly different from zero. This could not be affirmed by the data: West German firms pay significantly lower loan rates of about 0.48 basis points.[23] Also, credit rating and collateral have a significant impact on loan prices. A worse rating (i.e. higher rating class) implies an interest rate premium of about the same magnitude as the location of the firm in East Germany.

More collateral reduces the loan price, because it lowers the risk to the bank, but its effect is marginal. Furthermore, a higher management skill reduces the financing costs. This may be due to both more bargaining power and higher human capital of the manager, indicating a higher probability of successful investments. It turns out that neither firm-specific nor relationship-specific variables explain significantly the variation of the interest rate. This, however, contrasts the hypothesis H2 derived from the theory of financial intermediation. East German firms are much younger and have shorter banking relationships, hence banks have less information about their quality, which should lead to significantly higher risk premiums.

The next specification (All (II)) excludes the dummy for West Germany. The results exhibit no (significant) differences, neither in the sign of the coefficients nor in their size.

In the next step, we separate the data set in "EAST" and "WEST". The first estimations (I) include the relationship variables (housebank status, duration of the relationship). The results differ in some respect from the whole sample estimations. First, credit rating now shows a higher impact on loan prices in East Germany, which indicates that the location in East Germany either affects the rating decision or the size of the risk premium for a given rating. Secondly, we could find the assumed significant negative relationship between collateral and loan rates only for East German firms. Thus, collateral and loan pricing may be closer substitutes for East German than for West German firms. This reflects the fact that higher collateralization improves the credit rating which has a higher impact on loan prices in East Germany. Thirdly, management skill lowers the loan rate significantly of about 0.63 basis points only in East Germany. Thus, it appears that higher skills of the management lower the credit risk faced by banks in East Germany. Finally, there are no significant differences concerning the impact of the firm's age, the duration of the lending relationship, the housebank status and the bank's type. Thus, it seems that differences in the lending gap cannot be explained by these variables.

If we exclude the relationship variables, which are supposed to be related to the type of the bank, the results differ in one respect, the significance of the bank type variable. For both parts of Germany, the influence of collateral on the loan price is no longer significant, while the bank's type becomes significant. In East Germany, the loan rates set by cooperative banks are about 75 basis points higher than those of the big private banks. This is in line with our hypothesis that cooperative banks will be more restrictive in their lending because of their low capabilities to share and diversify risks. Savings banks demand significantly lower loan rates than the big private banks in West Germany, but not in East Germany. The results show that bank type and relationship variables are not independent.[24] If the relationship variables are excluded (specification II), the Wald test shows a significant joint influence of the bank dummies for East Germany, in contrast to the first specification. The opposite holds for the West German sample. This may reflect that because of the transformation of the East German banking market, lending relationships of East German firms differ mainly due to different bank histories, but not to different durations.

Summing up, loan rates are higher in East Germany, but this cannot be explained by the differences in firm specific variables and the variables of the lending relationship. This result offers two possible conclusions: On the one hand, relatively higher regional risks could put East German firms at a disadvantage. Or, on the other hand, East German firms might face some discrimination by banks with regard to loan pricing. However, the adjusted R squares are quite low for all specifications.[25]

4.3.2. *Determinants of collateral*

To explain the variations in collateral requirements, we apply two-limit Tobit estimations. The endogenous variable is truncated at both high and low values, since the minimum (maximum) of collateralization is 0% (100%). The results are reported in Table VI.

The first specification (All (I)) includes the whole data set. It turns out that there is a significant collateral gap in the sense that West German firms obtain loans with less collateral than East German firms. This holds although firm specific and relationship specific variables contribute significantly to the explanation of variations in the degree of collateral. In contrast to the OLS esti-

TABLE V
Determinants of loan pricing

Dependent variable: Interest rate
OLS Regression Coefficients (White Heteroskedasticity-consistent *t*-value)

	All (I) (N = 334)	All (II) (N = 334)	West (I) (N = 267)	East (I) (N = 67)	West (II) (N = 267)	East (II) (N = 67)
Constant	1.2498 (2.777)***	0.6792 (1.696)*	0.5833 (1.302)	1.552 (1.194)	0.6396 (1.543)	1.1315 (1.083)
West German firm	–0.4812 (2.682)***					
Collateral	–0.0062 (2.463)**	–0.0051 (2.052)***	–0.0031 (1.100)	–0.0115 (1.672)*	–0.0037 (1.386)	–0.009 (1.407)
Credit rating	0.4284 (5.5135)***	0.4393 (5.605)***	0.4086 (4.671)***	0.5807 (2.851)***	0.4021 (4.755)***	0.5920 (3.152)***
Firm age						
< 2 years	0.0725 (0.333)	0.1556 (0.715)	–0.0127 (0.051)	0.2901 (0.476)	–0.0154 (0.073)	0.2107 (0.364)
2–6 years	0.1507 (0.796)	0.2872 (1.563)	0.0698 (0.318)	0.3791 (0.692)	0.1810 (1.066)	0.4381 (0.898)
Firm size	–0.1490 (1.044)	–0.1158 (0.806)	–0.1661 (1.029)	–0.3273 (0.752)	–0.1842 (1.195)	–0.1361 (0.339)
Incorporated firm	0.0768 (0.596)	0.1044 (0.802)	0.1917 (1.347)	–0.1464 (0.376)	0.1794 (1.294)	–0.0372 (0.101)
Management skill	0.2519 (1.929)**	–0.2249 (1.711)*	–0.1670 (1.123)	–0.6344 (2.025)***	–0.1902 (1.331)	–0.5141 (1.703)*
Technological skill	–0.1498 (0.820)	–0.1730 (0.939)	–0.0591 (0.299)	–0.514 (0.855)	0.0770 (0.398)	–0.4503 (0.431)
Duration						
First contract	–0.1847 (0.866)	–0.1010 (0.474)	–0.1285 (0.5467)	0.0406 (0.033)		
< 2 years	0.1054 (0.478)	0.1638 (0.740)	0.3654 (1.457)	–0.0876 (0.076)		
2–6 years	0.1316 (0.684)	0.1667 (0.860)	0.1343 (0.636)	0.1622 (0.148)		
Housebank	–0.0003 (0.0026)	–0.0048 (0.034)	–0.0250 (0.158)	0.2035 (0.576)		
Cooperative bank	0.2232 (1.396)	0.1557 (0.988)	0.0800 (0.441)	0.7642 (0.123)	0.0598 (0.348)	0.7520 (1.712)*
Savings bank	–0.2007 (1.248)	–0.2564 (1.593)	–0.2833 (1.571)	–0.1261 (0.283)	–0.2821 (1.630)*	–0.0184 (0.043)
Replacement	–0.2711 (1.413)	–0.234 (1.213)	–0.1806 (0.833)	–0.6482 (1.300)	–0.1532 (0.718)	–0.5495 (1.139)
No special use	0.8425 (4.369)***	0.8118 (4.202)***	0.8104 (3.952)***	1.4263 (2.028)**	0.7977 (3.971)***	1.304 (1.949)*
Industry dummies[a]	Not sig.	Not sig.	Not sig.	Not sig.	Not sig.	Not sig.
Wald χ (Relationship)[b]	3.092	2.533	3.952	0.869	–	–
Wald χ (Bank type)	6.762**	6.432**	4.69*	0.782	0.291	3.64***
Adj. R^2	0.248	0.233	0.204	0.263	0.206	0.261

[a] Includes 5 industry-dummies; [b] Housebank, duration of relationship.
*, **, *** significance at the 10%, 5 % and 1% level.

TABLE VI
Determinants of collateral

Dependent variable: Collateralization
Censored (0%, 100%) Normal Tobit (*z*-statistics in parantheses)

	All (I) (N = 334)	All (II) (N = 334)	West (I) (N = 267)	East (I) (N = 67)	West (II) (N = 267)	East (II) (N = 67)
Constant	86.621 (8.803)***	78.376 (8.765)***	76.8334 (7.751)***	41.3891 (1.7027)*	84.7632 (8.868)***	86.0308 (5.133)***
West German firm	–8.4434 (1.963)**					
Credit rating	–6.5035 (3.348)***	–6.4309 (3.287)***	–6.03595 (2.795)***	–5.0090 (1.240)	–7.4124 (3.379)***	–7.11630 (1.925)*
Firm age						
< 2 years	12.073 (2.268)**	13.5263 (2.549)**	14.4359 (2.425)**	–12.5572 (1.109)	8.7569 (1.619)	–7.85684 (0.720)
2–6 years	12.204 (2.619)***	14.4249 (3.170)***	15.0174 (2.858)**	–19.4448 (1.873)**	7.4802 (1.714)*	–10.3016 (1.097)
Firm size	–5.6199 (1.602)	–5.401 (1.531)	–7.8106 (2.003)**	17.3691 (2.086)**	–9.1082 (2.288)**	18.6958 (2.381)**
Incorporated firm	–8.7840 (2.759)***	–8.4573 (2.644)***	–10.0769 (2.957)***	–1.5163 (0.1906)	–12.1913 (3.464)***	–1.6823 (0.217)
Management skill	–5.9881 (1.819)*	–5.8238 (1.759)*	–4.9943 (1.360)	–7.6502 (1.173)	–7.448 (1.989)**	–9.79864 (1.556)
Technological skill	–5.8456 (1.268)	–6.4958 (1.404)	–7.1162 (1.475)	–7.9846 (0.623)	–6.0193 (1.194)	–2.20363 (0.179)
Duration						
First contract	–7.6888 (1.437)	–5.8685 (1.107)	–13.4283 (2.323)***	41.8680 (2.077)**		
< 2 years	–7.9608 (1.449)	–6.9360 (1.260)	–12.1271 (1.997)**	39.6773 (1.978)**		
2–6 years	–13.124 (2.747)***	–12.5160 (2.611)***	–15.4258 (3.045)***	40.6046 (2.172)**		
Housebank	16.041 (4.745)***	16.4529 (4.845)***	15.4979 (4.171)***	12.9401 (1.808)**		
Cooperative bank	5.5290 (1.373)	4.4287 (1.106)	8.9088 (2.005)**	–4.4326 (0.464)	15.314 (3.466)***	–8.8441 (1.023)
Savings bank	0.8148 (0.201)	–0.2429 (0.060)	4.8163 (1.079)	–8.79334 (1.038)	10.2161 (2.273)***	–8.5261 (1.042)
Replacement	1.9913 (0.413)	2.5734 (0.531)	2.1821 (0.408)	–5.7453 (0.569)	3.1580 (0.565)	–8.5095 (0.847)
No special use	–26.848 (5.707)***	–27.571 (5.838)***	–20.6251 (4.062)***	–55.6740 (4.821)***	–25.2350 (4.810)***	–58.2290 (5.419)***
Industry dummies[a]	Not sig.	Sig.[c]	Not sig.	Not sig.	Sig.[c]	Not sig.
Wald χ (Relationship)[b]	33.103***	32.455***	33.641***	7.180	–	–
Wald χ (Bank type)	2.229	1.72	4.021	1.121	13.936***	1.049
Adj. R^2	0.297	0.289	0.337	0.215	0.274	0.231

[a] Includes 5 industry dummies; [b] Housebank, duration of relationship; [c] Significant negative for service industry
*, **, *** significance at the 10%, 5% and 1% level.

mation of interest rates, the Tobit estimations reflect large differences between East and West German firms.

Younger firms provide more collateral in West Germany, but not in East Germany, compared to older firms. This may be due to the lack of collateral or to public equity or collateral aid to firm foundations in East Germany. Also, the duration of the lending relationship exhibits differences between both regions. In East Germany, the banks demand more collateral from firms which they finance for the first time or for less than 6 years (see also Table II). It appears that a longer relationship is a substitute for collateral only in East Germany. However, the Wald-test shows a joint significance of the relationship variables only in West Germany. This may again be explained by the absence of long-lasting or housebank relationships in the East German banking sector a few years after reunification. Housebanks demand more collateral from all firms, as previously found, but to a larger degree in West Germany.

Moreover, the legal form of the firm matters significantly for collateralization only in West Germany. While a larger firm size reduces the demand for collateral in West Germany, the opposite is found for East German firms. Here, firm size may be positively correlated either with higher risk or with the capability to supply collateral. Loans with unspecific use are less collateralized than specific investment loans, with a larger differential in East Germany. Finally, the management skill as a proxy for borrower quality reduces collateral requirements significantly only for West German firms.

If we exclude the relationship-specific variables, the results keep very robust with the exception of those for the bank dummies. As in the previous OLS estimations, it can be assumed that relationship-specific variables also depend on the bank type. While there are no differences in the collateralization of loans in East Germany, savings banks and cooperative banks request more collateral than big private banks in West Germany.

5. Conclusions and policy implications

The answer to the question: is there an East-West gap in lending towards small and medium-sized firms in Germany? is yes, since East German firms pay significantly higher loan rates and provide significantly more collateral than West German firms. The results are similar to those of Harhoff and Körting (1998) who examined firm-interview data of small firm loans in the same year. To explain this gap, we analyzed credit risk variables which have been found relevant for the determination of loan terms in previous studies. Some of these variables differ significantly between both regions, indicating higher firm-specific and lending-specific credit risk in East Germany. These inter-regional differences contribute to the explanation of variations in loan rates and collateral requirements, but they do not explain the whole gap. The location of a firm in East Germany still has large explanatory power, pointing to the relevance of regional credit risk factors as explained by regional economics. It is, however, unclear to what extent these differences in market risk affect the bank-internal credit rating. Firms located in East Germany are rated as worse borrowers by the banks and therefore pay a higher risk premium. Additionally, banks demand a risk premium and higher collateral for the location in East Germany. If the differences in market risks were completely considered in the bank-internal rating, they should not have further explanatory power. However, the study also showed that banks differ in their lending decisions. Especially cooperative banks seem to have a restrictive lending policy.

Since the end of the 1990s, the catching-up of the East German economy appears to have stopped and there exists no "self-sustaining upswing" (Funke and Rahn 2000; Sinn, 2000). Financial market policies in the form of equity aid and loan market policies in the form of guarantees[26] have been employed effectively to ease the financing constraints of SMEs (Almus and Prantl, 2001). Since higher collateral was shown to reduce interest rates significantly, state guarantees as a form of collateral should be able to make loans to East German firms cheaper without going along with high transfers.

However, the East-West lending gap in Germany is likely to increase, when the new capital rules of banking supervision according to Basel II will become effective. They will require more capital for loans to high-risk borrowers and less capital for less risky loans. As a consequence, loans to low-risk customers will become less

expensive, whereas loans to high-risk customers will become more expensive for the banks. This has different implications for the banks and their customers in East and West Germany. First, the profit maximizing big private banks will be tempted to replace high risk customers with low risk customers and thus reduce East German firms in their credit portfolio. Secondly, local banks like cooperative banks and savings banks, which are located in East Germany, will be forced to reduce their loans, since the Basel II rules will require a higher capital ratio for the high-risk customers in their regions. This is likely to enhance credit rationing of East German firms. Finally, the settled abolishment of the public sector's maintenance obligation ("Anstaltslast") and unlimited liability ("Gewährträgerhaftung") for the state-owned savings banks should lead to higher refinancing costs and loan prices of this banking group. In the end, the East-West gap in lending as discussed in this study is likely to increase due to the coming changes in the regulatory environment.

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Notes

[1] The formerly state-owned GDR (German Democratic Republic) firms play only a minor role relative to the newly founded firms in East Germany (Steil, 1997, p. 30).

[2] In 1996, the average equity ratio of an East German SME grew by 0.5% to reach 21.4%, compared to the constant level of 23.5% for West German firms (KfW, 1999). In 1995, the volume of the private equity capital market in East Germany reached only a tenth of the West German volume (IWH, 1996, p. 90), but it grew to 17% until 1998 (Ostdeutscher Bankenverband, 2000a, p. 3). During the last years, the equity of SMEs in Germany even declined. In 2000, the share of firms with an equity ratio below 10% reached 38.8% (Creditreform, 2000).

[3] For the measurement of discrimination in financial services, see Benston (1997), Townsend (1997), Wachter (1997).

[4] See e.g. Elsas and Krahnen (1998), Harhoff and Körting (1998), Lehmann and Neuberger (2001), Machauer and Weber (1998).

[5] For surveys see e.g. Brülhart (1998) and Vaessen (1993).

[6] Moreover, the data set of Harhoff and Körting (1998) differs from ours by refering only to the smallest firms with less than 500 employees and which are not subsidiaries. Thus, it does not contain data on lending conditions of East German firms which had been founded before German reunification and belong to the "Treuhandanstalt".

[7] For surveys see Freixas and Rochet (1998), Greenbaum and Thakor (1995), Dewatripont and Tirole (1993).

[8] For surveys see Ongena and Smith (2000), Ongena (1999).

[9] The significant negative relationship found by Lehmann and Neuberger (2001) has been observed by Machauer and Weber (1998) only for the best three rating classes. It is consistent with the "sorting by private information"-hypothesis, but may also be explained by rating categories incorporating the net default risk, i.e. borrowers who provide more collateral receive a better rating.

[10] Indeed, housebanks do more frequently engage in workout activities for distressed borrowers, and collateralization increases workout probability (Elsas and Krahnen, 1999).

[11] Relative to manufacturing firms, firms in construction, transportation, and services pay relatively high interest rates and are more likely to pledge collateral (Harhoff and Körting, 1998; Ewert and Schenk, 1998). For companies in the manufacturing and trade industries, the probability to post collateral is lower (Elsas and Krahnen, 1999). This may be explained by differentials in insolvency rates or opportunities for pledging collateral.

[12] For surveys see Brülhart (1998), Vaessen (1993, p. 18), Neuberger (2000). We do not discuss location theories, because they are less relevant for SMEs. Small firms are less mobile than large firms and mostly locate near the residence of their founders. Hence, their foundations are not the result of an interregional location decision but rather present an endogenous potential of a region's development (Fritsch, 1995, p. 24).

[13] See e.g. Harrison (1992) and (Krugman 1991).

[14] Catching up or leapfrogging of regions can only be explained if we assume that knowledge does not grow continuously but in discrete steps (see Brezis et al., 1993).

[15] State owned savings banks are characterized by the so called "Anstaltslast" and "Gewährträgerhaftung". "Anstaltslast" or maintenance obligation is the obligation of the public sector as the owner to keep those banks in a position to perform their functions and to enable them to perform their obligations when due. "Gewährträgerhaftung" is the unlimited liability of the guaranty authority (i.e. city or municipality) for all obligations of the savings banks operating within its jurisdiction. Both guarantees are still in place, but will be abolished (as required by the EU commission) after a transition period from July 2001 to July 2005. The 'Anstaltslast' will then be replaced by a normal owner relationship.

[16] See Reynolds et al. (1994), Audretsch and Fritsch (1994), and Fritsch (1995).

[17] On the other hand, foundation subsidies have a higher effect on the probability of survival and on employment growth in West Germany than in East Germany (Almus and Prantl, 2001).

[18] In 1995, the labor's share in total income amounted to 73% in the former East German states, compared to 54% in the former West German states (IWH, 1996, p. 36).

[19] Including Deutsche Bank, Dresdner Bank, Commerzbank, and the now merged Bayerische Vereinsbank and Bayerische Hypotheken und Wechsel-Bank.

[20] E.g. the minimum efficient size related to the sales volume is higher in the trade sector than in the services sector.

[21] Since only 34 responses referred to refused loans, we do not consider these credit rationing cases, but focus on the loan terms of approved loans. For firms in East Germany, the percentage of refused loans was twice as high as that for West German firms, but the data set is too small to allow representative results.

[22] The estimations rely on ad hoc assumptions regarding the set and exogeneity of regressors, since they are not based on formal models. As obvious from Tables I and II, collateral is mostly included as exogenous variable in the interest rate equation, while the interest rate is not included as exogenous variable in the collateral equation. For comparability, we follow this approach. The first attempt to derive the relationship between interest rate and collateralization from a microeconomic banking model yielded that the collateral decision depended on exogenous variables only, while the interest rate depended on the endogenous collateral variable (Cressy and Toivanen, 2001).

[23] We also tested a North-South gap of lending rates within West Germany, but did not find a significant impact of the respective dummy variable to the explanation of the loan rate.

[24] We are grateful to an anynomous referee for this point.

[25] Furthermore, we applied Ramsey's RESET test of misspecification and tested a linear specification against a nonlinear specification. In two specifications – those for West Germany in the OLS estimations – we could not reject the Null hypothesis on a 10% level. This indicates that lending decisions as assumed by our estimations, may differ between West and East Germany.

[26] Mostly granted by the Deutsche Ausgleichsbank, the Kreditanstalt für Wiederaufbau (Reconstruction Loan Corporation) and public guaranty banks.

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