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Working Paper No. 134

The Role of Demographics in Small Business Loan Pricing

by

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The Role of Demographics in Small Business Loan Pricing

Doris Neuberger^a and Solvig R athke-D oppner^b

Abstract

To sustain growth in an aging economy, it is important to ease the financing of small firms by bank loans. Using bank internal data of small business loans in Germany, we examine the determinants of loan rates in the period 1995-2010. Beyond characteristics of the firm, the loan contract, and the lending relationship, demographic aspects matter. However, collateral and relationship lending play a larger role in loan pricing than the entrepreneur's age. Banks do not seem to discriminate older borrowers by higher loan rates. We rather find statistical discrimination of younger borrowers because of their lower wealth. Single entrepreneurs obtain cheaper loans than married ones. Firms in peripheral regions with low population density are disadvantaged by higher loan rates compared to those in agglomerated regions.

JEL classification: D14, E43, G21, J14, L26

Keywords: small business finance, savings banks, relationship lending, aging, demographic change

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1. Introduction

The aging economies of Europe are characterized by a declining size and changing structure of their populations and work forces, resulting from declining fertility rates and increasing longevity. In Germany, the share of elderly above 60 has risen from 20% in 1990 to 26% in 2010, while the age group from 30 to 40 has declined from 17% in 1995 to 12% in 2010.¹ Since company founders usually pertain to this group, this demographic change will cause a gap in firm foundations. The firm foundation rate of individuals between 15 and 45 years tends to be about twice as high as that of individuals older than 45 years (Mittelstandsmonitor, 2008, pp. 54; Werner and Faulenbach, 2008, p. 1). Thus, the age structure of an economy is likely to have a large impact on its entrepreneurial activities (Harhoff, 2008; Werner and Faulenbach, 2008; Levesque and Minniti, 2006). However, with population aging, the age of company founders is rising. In the U.S., the share of new entrepreneurs in the age group 45-54 (55-64) has been rising from 23.9% (14.3%) in 1996 to 27.7% (20.9%) in 2011. Thus, almost every other self-employment was initiated by a person older than 45 years in 2011 (Fairlie, 2012). In Germany, it was one out of four (Franke, 2012, p. 12). The average age of company founders has risen from 36 years in 1990 to 41 years in 2012 with slight variations in different industries. For example, company founders in the software industry are 3 years younger than the average, and founders in the manufacturing industry are 2 to 3 years older than the average (ZEW, 2013).

While population is aging in all regions of Germany, migration of young people from poor, peripheral regions to rich, agglomerated regions has increased the disparities in the populations' wealth and age. Declining regions lose population and economic wealth and grow old relatively quickly, while growing regions gain population and economic wealth and get older more slowly. From 2002 to 2020, 227 out of the 439 districts and independent cities in Germany are expected to face a declining population with relatively high speed of aging (BBR, 2006). These regions will be most affected by the growing scarcity of entrepreneurially active people.

A further aspect of demographic change is the rising share of single households. In Germany, the share of single households has increased from 14% in 1991 to 20% in 2011 (Statistisches Bundesamt, 2012). Single persons may be more prone to take the risks of a firm foundation, since they do not need the income to finance their families.

¹ <http://www.zdwa.de/cgi-bin/demodata/index.plx> (31/12/2012)

Thus, increasing start-ups by elderly, single households or other demographic groups (females, immigrants) becomes important to maintain growth, especially in peripheral regions. Small and medium-sized enterprises (SMEs) are the engine of the European economy, accounting for 99.8% of firms and 66.9% of employment in the EU-27. One of their main problems is limited access to external finance, which constrains economic growth in Europe (European Commission, 2011). In Germany, bank loans are the second most important source of finance of small and medium-sized enterprises. Therefore, it is important to know whether demographic factors matter for access to bank loans and loan prices.

On the one hand, population aging may have a positive effect on bank lending by reducing credit risk, since older entrepreneurs are likely to have more experience and knowledge and often have more own funds or collateral (Werner and Faulenbach, 2008). On the other hand, credit risk may rise, because they have higher risk of illness or mortality. At the beginning of a long-term financial contract it is uncertain how long they will remain in business and whether sufficient time will remain to amortize the investment project. Moreover, the question of succession is often open. About 25% of the succession problems occur unexpectedly by death or illness (Kühner and Mosch, 2011). The elderly often become self-employed as consultants and demand consumer loans as small business loans (Kühner and Mosch, 2011). Some evidence shows that they face financial constraints on loan markets in Germany (Reifner, 2005; Engel et al., 2007).

With the decline of population size, the banks' customer base and revenues from retail loans decline, a problem that is particularly severe in declining regions. Therefore, banks face the challenge to broaden their customer base by serving demographic groups such as the elderly, women or immigrants that may have been neglected so far. While there is ample evidence about the effects of characteristics of the firm, the loan contract and lending relationship on loan prices, the role of demographics in loan pricing has been hardly investigated so far. The present paper aims to close this gap by analyzing for the first time the influence of demographic factors on the pricing of small business loans in Germany. Moreover, it examines the influence of credit risk variables commonly used in the literature on loan prices to test the hypotheses of statistical vs. prejudicial discrimination and compare the results with those of previous studies.

The present study differs from previous ones mainly by three factors: First, it is based on a larger data set with 13,142 observations. Secondly, the data set covers a longer time period from 1995 to 2010, including the period of the global financial crisis. Third, we include the age and family status of the entrepreneur and population density of the region where the firm

is located. We find that demographic factors influence loan prices. However, collateral and relationship lending play a larger role in loan pricing than the entrepreneur's age. Banks do not seem to discriminate older borrowers by higher loan rates. We rather find evidence for statistical discrimination of younger borrowers because of their lower wealth. Single entrepreneurs obtain cheaper loans than married ones. Firms in peripheral regions with low population density are disadvantaged by higher loan rates compared to those in agglomerated regions.

The paper is structured as follows. Section 2 provides an overview of the theoretical and empirical literature and derives hypotheses. Section 3 describes the data, measurement and descriptive statistics. The results of multivariate analyses are presented and discussed in Section 4, while Section 5 concludes.

2. Literature Review and Hypotheses

For the start-up success and growth of firms, both human capital and financial capital are necessary. Especially in the case of micro and small enterprises, a single person, usually the owner-manager, must have both technical and managerial skills (Neuberger and R athke, 2009), but he or she also needs the financial capital to finance start-up costs and investments, as for example in equipment. According to the pecking order theory of optimum capital structure (Myers, 1984; Myers and Majluf, 1984), asymmetric information associated with external financing causes a hierarchy of firms' financing strategies, with debt being the cheapest and therefore largest source of external financing. Thus, access to bank loans is of particular importance for entrepreneurs who cannot finance themselves through own funds.

Especially young and small enterprises may not have access to credit because of their lack of a track record and the associated problems of adverse selection and moral hazard (Stiglitz and Weiss, 1981). Credit rationing may be reduced by collateral, which acts as a signaling device through which a borrower reveals his or her default risk (Bester, 1985; Besanko and Thakor, 1987), or as an incentive device, motivating the borrower to exert effort and to reveal truthfully the state of his project (Bester, 1987; Bester, 1994). If credit risk cannot be reduced by collateral, banks may increase loan rates.

Credit risk may also be reduced by relationship lending through a close relationship between the borrower and his or her main bank or housebank (for surveys, see Boot, 2000; Ongena and Smith, 2000). It helps to reduce information asymmetry, since the housebank accumulates knowledge about the borrower's quality and behavior over time. For the borrower, the benefits of relationship banking are better loan terms and credit availability through a better

exchange of information through time. The housebank may recoup short-term losses later in the relationship, providing an intertemporal smoothing of contract terms (Boot, 2000). However, it may capture rents from its informational advantage vis-à-vis other potential lenders by charging monopolistic loan rates in later periods, when the borrower is locked-in (hold-up hypothesis; see Boot, 2000; Rajan, 1992; Sharpe, 1990).

The theoretical literature thus identifies three main determinants of small business credit risk: human capital or knowledge of the entrepreneur, financial capital or collateral, and relationship lending through a long-term or close banking relationship. Concerning the influence of demographic variables on credit risk and loan pricing, we derive the following hypotheses:

The age of the entrepreneur has a negative influence on loan rates, since older persons are likely to possess more human and financial capital and to have a longer relationship to a bank than younger ones (hypothesis H1).

Single borrowers have to pay higher loan rates than married ones, because they are less risk-averse and take higher risks than married ones (hypothesis H2).

Firms located in sparsely populated regions have to pay higher loan rates than those in agglomerated regions, because they face higher risks due to a smaller base of human capital and customers (hypothesis H3).

These hypotheses have not been tested so far. Many empirical studies examined the influence of characteristics of the firm (mostly size, age, legal form, leverage), the loan contract (collateral, loan volume, duration, credit use) and the lending relationship (duration, housebank status, number of lenders, mutual trust, distance between borrower and lender) on loan terms, while only few included socio-economic or regional variables. The main results are presented in Table 1.

Most of the studies find a negative influence of the size and age of the firm on loan rates, while firms with a bad credit rating or those in financial distress have to pay higher loan rates. The influence of collateral is ambiguous, while the loan volume has a negative influence on loan rates. Some studies found a negative influence of relationship lending, measured by the duration of the lending relationship (Berger and Udell, 1995), a small number of lenders or main bank relationship (Petersen and Rajan, 1994; Degryse and Ongena, 2005; Stein, 2011), stability (Harhoff and Körting, 1998), or mutual trust (Lehmann and Neuberger, 2001; Hernandez-Canovas und Martinez-Solano, 2010), on loan rates. Hernandez-Canovas und Martinez-Solano (2010) found that firms with a long-term lending relationship have better access to credit, but have to pay higher loan rates, consistent with the hold-up hypothesis.

Loan rates are lower in the case of two lending relationships than in the case of an exclusive lending relationship. Mutual trust seems to play a larger role in reducing loan rates than the duration of the relationship or the number of lenders. Stein (2011) shows that loan rates decrease with relationship strength, measured by the share of bank debt provided by the main lender, but increase with duration of the main bank relationship, in particular for small firms, consistent with hold-up. Degryse and Ongena (2005) find that loan rates rise with geographical distance between borrower and lender, inconsistent with informational advantages from relationship lending, but consistent with spatial price discrimination, where location rents are extracted from closer borrowers. However, spatial price discrimination decreases with a longer duration of the lending relationship.

In few cases, socio-economic or regional variables were included as control variables. Lehmann and Neuberger (2001) found a negative influence of human capital, measured by management skill on loan rates. Firms located in peripheral or poor regions such as East Germany (Harhoff and Körting, 1998; Lehmann and Neuberger, 2001) or Southern Italy (D'Auria et al., 1999) pay significantly higher loan rates than firms located in economically prosperous regions such as West Germany or Northern Italy. Harhoff and Körting (1998) found that firms in city counties pay higher interest rates than those in fringe or rural ones, which is consistent with the result of Petersen and Rajan (1995) that in more concentrated banking markets, availability of external finance increases.

To the best of our knowledge, the influence of the entrepreneur's age on the pricing of small business loans has not been investigated by multivariate analyses so far. For U.S. consumer loans, Chakravarty and Scott (1999) found a negative influence of the borrower's age on loan rates. For consumer loans in Thailand, Menkhoff et al. (2012) found no significant influence of the borrower's age on collateral. For Germany, Reifner (2005) observes that loans to older people are inflexible, expensive or unreachable, which applies above all to their mainly used mortgage loans, credit lines, installment loans and consumption loans. The elderly seem to be discriminated on loan markets, because people older than 55 years are no more credit-worthy. Banks even set internal credit granting directives that restrict lending to the elderly. For example, in the credit granting directives of the German savings banks, the age limit is 58 years (Kühner and Mosch, 2011). Engel et al. (2007) observe special difficulties of company founders older than 50 years to obtain loans. The elderly seem to be rated as bad borrowers because of higher illness or mortality risk. On the other hand, the younger may be discriminated because they have less wealth. Werner and Faulenbach (2008) found that younger company founders have more difficulties in obtaining start-up finance, probably

because they have less collateral than older ones. Reifner (2012) explains why demographical changes in Germany that got along with adjustments in the social and retirement systems have made it more difficult for younger people to accumulate wealth compared to the past. Because of lacking wealth and a lacking credit history, young people are likely to get bad credit scores, which makes them especially vulnerable to discrimination by banks. Since they also tend to take smaller and shorter loans, they are likely to pay higher loan rates than mid-aged borrowers. However, a correlation between age and risk does not mean that default rates depend on age. So far, we have no knowledge about age-specific default rates (Reifner, 2012). Because of the ageing of the German population, the average age of the overindebted has increased to 41 in 2012, also due to a significant rise within the age class 50+. However, the elderly of age 65+ have a below average probability of getting overindebted, because their liquidity is relatively stable (Knobloch and Reifner, 2013).

Studies for the U.S. have found substantial demographic differences related to the ethnicity of the entrepreneur in small firms' experiences in the credit market, even after controlling for a broad set of characteristics of the firm and owner (Blanchflower et al., 2003; Cavalluzzo et al., 2002; Cavalluzzo and Wolken, 2005), competition in the local banking market (Cavalluzzo and Cavalluzzo, 1998) and local geography (Bostic and Lampani, 1999). Black-owned firms pay significantly higher interest rates and are more likely to be denied credit than white-owned firms, even after taking into account differences in creditworthiness and other factors (Blanchflower et al., 2003). Cavalluzzo et al. (2002) included gender, but did not find a significant influence on loan rates. For small business loans in the U.K., Fraser (2009) found that ethnicity and gender did not influence financial rejection rates and loan rates. None of these studies included age of the entrepreneur as explanatory variable of loan rates or credit availability.

Most of these studies seek to explain demographic differentials in credit denials or loan rates paid by multivariate analyses. However, it is difficult to detect whether the observed demographic differentials in the credit granting behavior of banks are due to differential risk factors, thus being economically justified, or whether they arise from taste-based preferences of the lender. The first case is commonly referred to as statistical discrimination (Phelps 1972), the second one as noneconomic or prejudicial discrimination (Becker 1957). Statistical discrimination may arise from the fact that lenders lack economically relevant information that is correlated with demographic group. The use of demographic attributes as a proxy for missing information then leads to a differential treatment, which is based on economic grounds. Empirical studies of discrimination should control for all economic factors, which

are important for the credit granting decision. Otherwise, the estimated demographic coefficients will be biased by omitted variables (Cavalluzzo et al. 2002, p.642).

The following analysis is based on bank-internal data of small business loans in Germany. The data set includes information about the age and marital status of the entrepreneur, while information on gender and ethnicity is missing. With 13,142 observations for 1995-2010, it is larger and covers a longer time period than the data sets of previous studies.²

² For example, the number of observations was 1,127 in Harhoff and Körting (1998), 357 in Lehmann and Neuberger (2000), 1,389 in Petersen and Rajan (1994) and 863 in Berger and Udell (1995).

Table 1: Determinants of loan rates – results of previous studies

	<i>Harhoff and Körting (1998) Germany</i>	<i>Machauer and Weber (1998) Germany</i>	<i>Elsas and Krahen (1998) Germany</i>	<i>Lehmann and Neuberger (2001) Germany</i>	<i>Petersen and Rajan (1994) U.S.</i>	<i>Berger and Udell (1995) U.S..</i>	<i>Cressy and Toivanen (2001) U.K.</i>	<i>D'Auria et al. (1999) Italy</i>	<i>Hernandez-Canovas /Martinez-Solano (2010)</i>	<i>Stein (2011) Germany</i>
<i>Firm characteristics</i>										
- Firm size	negative***	-	negative***	negative*	negative***	n. sig.	-	negative***	negative***	negative***
- Firm age	negative*	-	-	n. sig.	negative**	n. sig.	-	-	negative*	-
- Legal form: incorporated firm	n. sig.	negative**	n. sig.	n. sig.	negative*	negative**	-	-	n.sig.	-
- Leverage ratio	positive**	-	-	-	-	-	positive***	-	-	-
- Credit rating/probability of default	-	positive***	positive**	positive***	-	-	-	-	-	positive***
<i>Loan characteristics</i>										
- collateral	n. sig.	positive***	positive*	n. sig.	-	n. sig.	negative***	-	-	-
- loan volume	-	negative***	negative***	-	-	-	negative***	negative***	-	-
- loan duration	-	-	-	-	-	-	-	-	-	-
- credit use: unspecified	-	-	-	positive***	-	-	tested	-	-	-
<i>Relationship characteristics</i>										
- duration of relationship	n. sig.	n. sig.	n. sig.	n. sig.	n. sig.	negative**	-	positive***	positive*	positive***
- housebank/main bank	-	n. sig.	n. sig.	n. sig.	-	-	-	-	negative**	negative***
- Number of lenders	n. sig.	n. sig.	-	-	positive***	-	-	negative***	-	-
- Stability/ mutual trust	negative*	-	-	negative**	-	-	-	-	negative*	-
<i>Control variables</i>										
- Industry	tested	-	-	n. sig.	n. sig.	n. sig.	tested	-	positive***	-
- Bank type	-	tested	tested	n. sig.	-	-	-	-	-	tested
- Local banking concentration	-	-	n. sig.	-	n. sig.	-	-	-	-	-
- City county	positive*	-	-	-	-	-	-	-	-	-
- Fringe county	n. sig.	-	-	-	-	-	-	-	-	-
- East Germany/South Italy	positive***	-	-	positive**	-	-	-	-	-	-
	-	-	-	negative**	-	-	-	positive**	-	-

*: significant at 10% level; **: significant at 5% level; ***: significant at 1% level; tested: several dummy variables have been tested, but not all were significant; n. sig.: tested, but not significant

Source: own compilation, based on Lehmann et al. (2004).

3. Data, Measurement and Descriptive Statistics

The data set was obtained from OSV, the Savings Bank Association of East Germany. It comprises micro data of about 6,000 borrowers and 14,000 loan contracts which were extended by 15 savings banks in the federal states Saxony, Saxony-Anhalt and Brandenburg in the period 1995-2010. The borrowers are small and medium-sized enterprises. The data set contains information about characteristics of the loan contract, the firm, the lending relationship and the managing director. Furthermore, we included data about the population density of each savings bank's business district, obtained from the East German Savings Bank Association (OSV) and own calculations. The variable definitions and descriptive statistics are presented in Table 2.

The contract-specific variables comprise the loan interest rate, the processing time of the loan decision in days, the loan volume, the volume of collateral and the volume of guarantees in percent. The average loan rate is 4.8%, and the loan granting decision takes 47 days on average. Longer processing times may indicate more search for information about the quality of the borrower or investment project, which reduces credit risk. Therefore, we expect a negative relationship between processing time and loan rate. The expected influence of the loan volume is ambiguous. On the one hand, larger loans may be more riskier than smaller loans, because they increase firm leverage and default probability (Steijvers and Voordeckers, 2009), on the other hand they may be cheaper, because the fixed costs per unit of capital decrease with loan size. Therefore, we expect a positive influence of the loan volume on the loan rate. If credit risk is reduced by collateral or guarantees, these variables should show a negative influence. In the present sample, the mean volume of collateral is 13% and the mean volume of guarantees is 3.5% of the loan volume. The firm-specific variables comprise firm age, size, industry and financial distress. Older firms tend to have lower default risk, because they had more time to signal their creditworthiness than younger ones. The mean age of the firm is 17 years. Credit risk is also likely to decline with firm size, measured by the volume of sales. Financial distress is measured by repayment arrears und reminder status that counts how often the bank has to remind to pay for the credit.

The lending relationship is not only measured by duration, as common in the literature, but also by the number of loans, the number of debit accounts, the number

of active accounts (all loans and debit accounts, including loans that have been repaid) and the total number of accounts held at the bank. The mean duration of the lending relationship is 12 years. A larger number of accounts is a proxy for repeated borrowing at the same bank, because each new loan requires a new account. The average number of accounts per firm is 8.5.

The demographic variables include the managing director's age (measured logarithmically in years) and marital status (married or single), the population density of the district where the firm is located and the distance to the lending bank. The age of the managing directors ranges from 19 to 75 and is on average 50 years. Only 26% of the entrepreneurs are married. The distance between borrower and lender is on average 40 kilometres and therefore plays only a minor role. This is due to the regional principle, which restricts the state-owned savings banks in Germany to extend loans only within a narrow district.

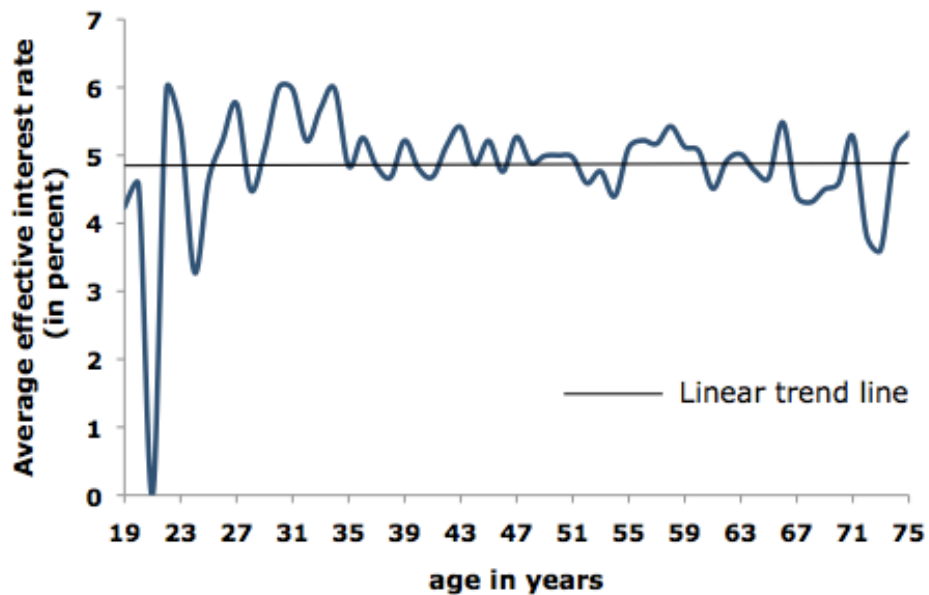
Table 2: Variable definitions and descriptive statistics

Variable	Definition	N	mean	min	max	median	standard-deviation
Contract Variables							
loan rate	Interest rate in percent	13142	4.839	0	17.47	5.33	2.617
time	Processing time of loan in days	12394	46.58	0	5197	12	196.9
amount	Loan volume granted in thousand Euro	13142	210.3	0	21488	80	531.8
collateral	Volume of collateral in percent of loan volume	13142	13.03	0	100	0	33.01
guarantee	Volume of guarantees in percent of loan volume	13142	3.47	0	100	0	15.88
Firm Variables							
firm age	Age of the firm in years	12957	17.22	1	132	15	17.583
industry	Dummy set I1-I7						
	I1: manufacturing industry	13142	0.168	0	1	0	0.374
	I2: construction	13142	0.115	0	1	0	0.319
	I3: trade and maintenance of motor vehicles	13142	0.163	0	1	0	0.369
	I4: real estate	13142	0.193	0	1	0	0.395
	I5: professionals	13142	0.094	0	1	0	0.292
	I6: education, arts, etc.	13142	0.110	0	1	0	0.313
	I7: others	13142	0.157	0	1	0	0.364
firm size	Sales in thousand Euro	13142	1520	0	9961	592	2107
financial distress	reminder status (count)	13142	0.402	0	9	0	1.818
	repayment arrears: dummy = 1, if the borrower is in repayment arrears, = 0 otherwise	13142	0.010	0	1	0	0.100
Lending Relationship Variables							
duration	Duration of the lending relationship in years	13142	11.745	1	21	12	5.765
debit	Number of the firm's debit accounts	13142	3.229	0	23	3	2.55
credit	Number of the firm's loans	13142	2.111	0	54	1	2.809
active	Number of all active accounts						
total	Total number of accounts	13142	8.506	0	91	7	6.588

Demographic Variables							
age	Age of the managing director in years	6867	49.62	19	75	49	10.76
marital	Marital status of the managing director: dummy = 1, if married, = 0 otherwise.	7217	0.264	0	1	0	0.441
Population density	Population density	13142	615.4	39	1715	182	610.4
distance	Distance between firm and bank in km	13139	40.24	0	70	23	77.69
Control Variables							
year	Year in which the loan was granted						
	1995 until 2000	12603	0.062	0	1	0	0.242
	2001	12603	0.036	0	1	0	0.188
	2002	12603	0.034	0	1	0	0.182
	2003	12603	0.051	0	1	0	0.221
	2004	12603	0.056	0	1	0	0.231
	2005	12603	0.069	0	1	0	0.254
	2006	12603	0.122	0	1	0	0.327
	2007	12603	0.149	0	1	0	0.356
	2008	12603	0.132	0	1	0	0.339
	2009	12603	0.159	0	1	0	0.365
	2010	12603	0.124	0	1	0	0.329
Savings bank	Dummy set for 15 regional savings banks						
	B1	13142	0.065	0	1	0	0.277
	B2	13142	0.042	0	1	0	0.201
	B3	13142	0.156	0	1	0	0.363
	B4	13142	0.072	0	1	0	0.258
	B5	13142	0.052	0	1	0	0.222
	B6	13142	0.034	0	1	0	0.182
	B7	13142	0.042	0	1	0	0.202
	B8	13142	0.021	0	1	0	0.144
	B9	13142	0.047	0	1	0	0.213
	B10	13142	0.042	0	1	0	0.215
	B11	13142	0.069	0	1	0	0.254
	B12	13142	0.061	0	1	0	0.240
	B13	13142	0.037	0	1	0	0.190
	B14	13142	0.074	0	1	0	0.262
	B15	13142	0.172	0	1	0	0.377

Figure 1 shows the average loan rate as a function of the age of the borrowing entrepreneur. Both variables do not seem to be related, as illustrated by the horizontal trend line, neglecting outliers (with very low or high age).

Figure 1: Average loan rate as a function of the age of the borrowing entrepreneur



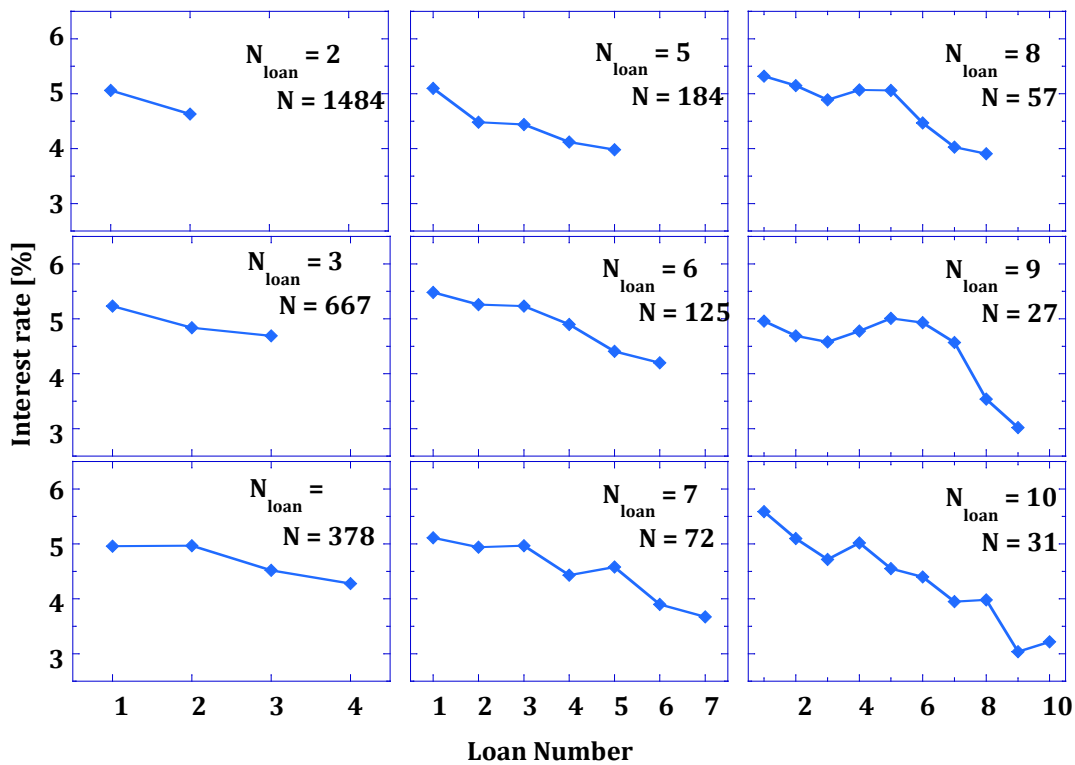
Source: own compilation

Moreover, we examined the development of loan rates with repeated lending by the borrower from the same bank. Figure 2 shows that repeated lending reduces interest rates. Bharath et al. (2011) found the same relationship, i.e. that repeated lending from the same lender reduces lending rates.

It seems to be important that the bank has gained knowledge about the borrower in the past, irrespective of the entrepreneur's age. This confirms previous evidence about the importance of relationship lending for loan pricing.

Figure 2: Loan rate as a function of repeated lending (N_{loan}) from the same bank.

The number of cases N is indicated.



Source: own compilation

The borrowers were classified according to the number of loans at the same bank, which ranged from 2 to 13 (for more than 13 loans the number of observations was too low). For each group, the average interest rates of repeated loans were calculated.

4. Results of Multivariate Analyses

To test the hypotheses described in section 2, we applied several OLS regressions with the loan interest rate as dependent variable. The independent variables describing the firm, the loan contract, the lending relationship and demographic aspects were included step by step. The different years were included in the regressions as fixed effects, and the savings banks as a set of dummies. We performed a multitude of regressions to test the robustness of results and exclude endogeneity problems.

The results are presented in Table 3. Regression I shows the influence of contract-specific variables. As expected, a longer loan processing time has a significant negative effect on loan rates. Large loans are cheaper than smaller ones, consistent with previous evidence (see Table 1). Collateral has a significant negative influence on the loan rate, which confirms the result of Cressy and Toivanen (2001).

Regression II shows the influence of firm-specific variables. The age of the firm has no significant influence, which confirms the results of Lehmann and Neuberger (2001) and Berger and Udell (1995). In contrast to most of the previous studies, larger firms pay higher loan rates. A possible explanation is that the savings banks in our sample cannot diversify risks across regions and therefore have higher cluster risk when lending to large firms within their district. Financial distress measured by repayment arrears and reminder status has a positive influence on loan rates as expected.

Regressions IV to VI show the influence of bank-specific variables. A longer duration of the lending relationship increases the loan rate, consistent with the hold-up hypothesis. The number of credits reduces the loan rate significantly when the lender has a larger number of both credit and debit accounts at the same bank. This indicates that not only information about the credit history, but also about the borrower's deposit behavior helps to reduce the bank's credit risk. This is consistent with the results of Stein (2011) that the lending costs decrease with relationship strength and increase with duration of the relationship. Banks also seem to learn from the total number of accounts. These results confirm previous evidence about the importance of relationship lending for SME loan pricing with a larger number of measures for the intensity of the bank-borrower relationship.

Regression VII shows the influence of demographic variables. Older entrepreneurs have to pay significantly lower interest rates than younger ones. This supports hypothesis H1. However, the significance of the age variable vanishes, if collateral is included at the same time which is evidence that prejudicial discrimination against age is not present. Banks seem to charge lower loan rates from older borrowers mainly because of their larger wealth. Human capital, larger experience and higher mortality risk of the elderly do not seem to matter. Our study points towards statistical discrimination of younger borrowers. Since they cannot pledge as much collateral they are forced to pay higher loan rates than older lenders (consistent with Reifner, 2012).

Married entrepreneurs have to pay higher loan rates than single ones, inconsistent with hypothesis H2. The reason could be that they have less wealth than single persons like divorced or widowers (Frick et. al. 2010). This result holds even if we control for collateral, which may be provided more easily by singles. Most of the

firms in our sample have unlimited liability, where the owner-manager is liable with his or her personal assets, which are likely to be higher if he or she does not have to finance a spouse or family.

Hypothesis H3 cannot be rejected. Firms located in densely populated regions get cheaper loans than those in peripheral ones. This is consistent with previous evidence about loan price differentials between East and West Germany (Harhoff and Körting, 1998; Lehmann and Neuberger, 2001) as well as South and North Italy (D'Auria et al., 1999). Loan rates decline with the distance between borrower and lender, which supports the finding of Degryse and Ongena (2005) about spatial price discrimination. However, distance plays only a minor role in the present data set of savings banks that are subject to the regional principle.

5. Conclusion

In the aging economies of Europe, the financing of small enterprises and entrepreneurially active people is important to sustain growth. An open question is whether special demographic groups such as the elderly, singles, females or immigrants are disadvantaged on loan markets because they present higher risks for the banks. Credit risk may be particularly high in declining regions with low wealth and population density. Previous studies on small business loan terms focus on the influence of characteristics of the firm, the loan contract and the lending relationship on interest rates or collateral, neglecting socio-economic and demographic variables. The present paper closes this gap by examining for the first time the influence of the entrepreneur's age and marital status as well as population density of the region where the firm is located on loan rates of small enterprises in Germany. It is based on a larger data set than previous studies, covering 13,142 observations for the period 1995-2010.

We find no support for the hypothesis that older entrepreneurs obtain cheaper loans because they have more experience or knowledge. Relationship lending by repeated loans from the same bank plays a larger role for loan prices than the borrower's age. Older borrowers may only obtain cheaper loans than younger ones if they can provide more collateral because they are wealthier. Even if banks include age limits into their credit granting directives, because they fear higher illness or mortality risks, they do

not seem to discriminate older people by higher loan rates. Rather, we find evidence for statistical discrimination of younger borrowers.

Married entrepreneurs have to pay higher loan rates than single ones, even if the latter are likely to take higher risks. This seems to be due to unlimited liability of small enterprises, where singles can provide more personal assets in the event of default than married owner-managers. With the rising share of singles in Germany, this might ease the financing of small enterprises.

Firms in declining regions with low population density are disadvantaged by higher loan rates, because they have higher default risk than those in agglomerated and growing regions. Because of the growing disparities between agglomerated and peripheral regions due to demographic change, this implies that small firms in declining regions will find it even more difficult to get loans at the same prices as similar firms in growing regions. This will aggravate the rising regional disparities.

The statistical discrimination of younger borrowers and other demographic groups is a result of the creditworthiness assessment which has to be based on a scoring system according to the minimum requirements for risk management (MaRisk) that apply to all banks within the framework of Basel III. These rules even prescribe that loan prices have to be related to the credit score.³ German banks use both internal scorings and external scorings from credit bureaus (mainly Schufa), which assess the creditworthiness of a borrower on the basis of past experience with this borrower (Reifner, 2012, p. 6). Since creditworthiness depends on credit history young people have little chances to get good scores and therefore have to pay higher loan rates, even if this is not economically justified because they have more productive projects. Banking regulations thus favor credit history over credit future.

This study is based on bank-internal data of savings banks in East Germany and therefore is not representative for the whole country. Because of data protection reasons, it does not include information on gender, nationality or migration background of the entrepreneur. Whether female entrepreneurs or immigrants are disadvantaged on the loan market in Germany is still an open question, which has to be tackled in the future.

³For the latest revisions see:

http://www.bundesbank.de/Redaktion/DE/Downloads/Kerngeschaeftsfelder/Bankenaufsicht/Marisk/2010_12_15_anlage_2_alle_aenderungen.pdf?__blob=publicationFile

Table 3: Results of OLS regressions with the loan rate (in percent) as the dependent

Model	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
Contract-Specific Variables											
time	-0.001*** (-5.78)		-0.001*** (-6.02)							-0.001*** (-3.60)	-0.001*** (-3.78)
amount	-0.000*** (-7.69)		-0.000*** (-6.75)							-0.001*** (-4.93)	-0.001*** (-5.73)
coll	-0.010*** (-13.77)		-0.010*** (-13.75)							-0.011*** (-11.07)	-0.010*** (-10.67)
garant	0.002 (1.65)		0.002 (1.22)							0.006** (2.71)	0.006** (2.68)
Firm-Specific Variables											
ln_age_firm		-0.004 (-0.15)	0.003 (0.11)							-0.001 (-0.01)	-0.015 (-0.30)
industry											
I1		-0.287*** (-4.38)	-0.322*** (-4.81)							-0.265** (-2.74)	-0.269** (-2.78)
I2		-0.092 (-1.24)	-0.174* (-2.32)							-0.299** (-2.87)	-0.323** (-3.10)
reference group											
I4		-0.429*** (-6.79)	-0.430*** (-6.52)							-0.208* (-2.11)	-0.144 (-1.45)
I5		0.046 (0.57)	0.022 (0.28)							0.111 (0.99)	0.093 (0.83)
I6		0.253*** (3.38)	0.173* (2.26)							-0.097 (-0.78)	-0.088 (-0.71)
ln_sale		0.039*** (3.55)	0.049*** (4.29)							0.081*** (4.45)	0.103*** (5.47)
dunning status		0.047*** (3.76)	0.029* (2.24)							0.053** (3.10)	0.053** (3.14)
late payments		0.817*** (3.72)	0.893*** (3.92)							0.843** (2.71)	0.809** (2.60)
Bank-Specific Variables											
ln_duration				0.063 (1.91)	0.104** (3.10)	0.060 (1.83)		0.080 (1.71)	0.125** (2.62)	0.073 (1.22)	0.034 (0.57)
credit				-0.048*** (-10.19)				-0.055*** (-7.60)	-0.059*** (-7.54)		
debit				0.081*** (6.32)	0.042*** (3.95)	-0.014 (-1.82)		0.053* (2.40)	0.025 (1.29)	0.017 (0.81)	0.041 (1.82)
active				-0.093*** (-11.11)				-0.099*** (-7.74)			-0.106*** (-7.74)
total							-0.095*** (-11.03)				
Control Variables											
age							-0.008** (-2.81)	-0.009** (-2.99)	-0.009** (-2.90)	-0.004 (-1.15)	-0.004 (-1.18)
marital							0.240** (2.94)	0.262** (3.23)	0.277*** (3.41)	0.264** (3.16)	0.246** (2.95)
population density							-0.000 (-0.04)	0.001 (0.09)	-0.000 (-0.05)	-0.002 (-0.27)	-0.001 (-0.16)
distance							-0.001** (-3.05)	-0.001** (-3.11)	-0.001** (-3.06)	-0.001 (-1.20)	-0.001 (-1.21)
year											
1995-2000		reference group									
2001	0.065 (0.44)	0.212 (1.50)	0.149 (1.00)	0.153 (1.10)	0.097 (0.70)	0.156 (1.12)	0.278 (1.34)	0.311 (1.51)	0.231 (1.12)	0.247 (1.13)	0.353 (1.61)
2002	0.395** (2.67)	0.420** (2.93)	0.386** (2.60)	0.469*** (3.31)	0.440** (3.10)	0.470*** (3.32)	0.360 (1.76)	0.356 (1.75)	0.320 (1.57)	0.306 (1.45)	0.351 (1.66)
2003	0.353*** (2.67)	0.352** (2.74)	0.281* (2.09)	0.464*** (3.68)	0.419*** (3.33)	0.460*** (3.65)	0.384* (2.09)	0.378* (2.07)	0.334 (1.83)	0.125 (0.64)	0.176 (0.91)
2004	-0.021 (-0.17)	0.152 (1.22)	-0.012 (-0.09)	0.193 (1.57)	0.170 (1.38)	0.194 (1.58)	-0.138 (-0.76)	-0.145 (-0.81)	-0.132 (-0.74)	-0.387* (-2.02)	-0.356 (-1.87)
2005	-0.063 (-0.51)	0.082 (0.69)	-0.122 (-0.97)	0.165 (1.41)	0.128 (1.09)	0.162 (1.39)	0.092 (0.55)	0.095 (0.57)	0.072 (0.43)	-0.262 (-1.48)	-0.236 (-1.33)
2006	0.225* (2.03)	0.411*** (3.86)	0.164 (1.47)	0.540*** (5.14)	0.500*** (4.76)	0.540*** (5.14)	0.496*** (3.33)	0.534*** (3.60)	0.496*** (3.34)	0.086 (0.54)	0.136 (0.86)
2007	0.195 (1.82)	0.425*** (4.12)	0.141 (1.29)	0.548*** (5.37)	0.485*** (4.76)	0.546*** (5.35)	0.423** (2.94)	0.455** (3.16)	0.394** (2.74)	-0.059 (-0.38)	0.008 (0.05)
2008	-0.138 (-1.26)	0.032 (0.30)	-0.227* (-2.05)	0.197 (1.89)	0.121 (1.16)	0.199 (1.91)	0.085 (0.58)	0.154 (1.04)	0.069 (0.47)	-0.362* (-2.30)	-0.270 (-1.71)
2010	-1.183*** (-11.05)	-0.983*** (-9.52)	-1.267*** (-11.61)	-0.831*** (-8.10)	-0.904*** (-8.81)	-0.832*** (-8.11)	-0.862*** (-5.98)	-0.810*** (-5.58)	-0.897*** (-6.17)	-1.349*** (-8.69)	-1.264*** (-8.15)
2011	-1.636*** (-14.77)	-1.461*** (-13.59)	-1.747*** (-15.45)	-1.279*** (-11.93)	-1.358*** (-12.67)	-1.279*** (-11.93)	-1.181*** (-7.77)	-1.119*** (-7.26)	-1.211*** (-7.85)	-1.715*** (-10.43)	-1.619*** (-9.87)

variable. The t-statistics are reported in parentheses.

Control Variables (continued)

savings bank											
B1	0.272*	0.265*	0.332*	0.212	0.143	0.208	0.158	1.417	0.015	-1.916	-0.895
	(2.13)	(2.08)	(2.55)	(1.70)	(1.14)	(1.67)	(0.02)	(0.15)	(0.00)	(-0.20)	(-0.09)
B2	-0.288	-0.604***	-0.375*	-0.479***	-0.509***	-0.475***	-0.915	0.476	-0.966	-2.870	-1.828
	(-1.96)	(-4.19)	(-2.51)	(-3.39)	(-3.60)	(-3.36)	(-0.09)	(0.05)	(-0.10)	(-0.29)	(-0.19)
B3	0.288**	0.196	0.235*	0.308**	0.246*	0.310**	0.460	0.847	0.399	-0.322	0.014
	(2.60)	(1.78)	(2.09)	(2.84)	(2.27)	(2.86)	(0.16)	(0.29)	(0.14)	(-0.11)	(0.00)
B4	-0.178	-0.129	-0.200	-0.131	-0.145	-0.136	-0.283	0.907	-0.332	-2.277	-1.383
	(-1.40)	(-1.01)	(-1.54)	(-1.05)	(-1.16)	(-1.10)	(-0.03)	(0.10)	(-0.04)	(-0.26)	(-0.16)
B5	-0.191	-0.034	-0.064	-0.145	-0.189	-0.147	-0.131	1.077	-0.258	-2.156	-1.170
	(-1.42)	(-0.25)	(-0.46)	(-1.10)	(-1.42)	(-1.11)	(-0.01)	(0.12)	(-0.03)	(-0.24)	(-0.13)
B6	0.617***	0.669***	0.650***	0.684***	0.629***	0.679***	0.616	1.641	0.582	-0.907	-0.126
	(4.11)	(4.47)	(4.27)	(4.65)	(4.28)	(4.62)	(0.09)	(0.23)	(0.08)	(-0.13)	(-0.02)
B7	-0.070	-0.049	-0.063	-0.026	-0.027	-0.028	-0.361	0.902	-0.377	-2.415	-1.503
	(-0.50)	(-0.35)	(-0.44)	(-0.19)	(-0.20)	(-0.21)	(-0.04)	(0.10)	(-0.04)	(-0.26)	(-0.16)
B8	-1.126***	-1.047***	-1.122***	-1.086***	-1.172***	-1.088***	-1.457	-0.245	-1.671	-3.771	-2.719
	(-6.49)	(-6.10)	(-6.42)	(-6.39)	(-6.87)	(-6.40)	(-0.15)	(-0.03)	(-0.17)	(-0.40)	(-0.29)
reference group											
B10	-0.243	-0.265	-0.373*	-0.051	-0.049	-0.044	-0.328	1.202	-0.189	-2.474	-1.495
	(-1.56)	(-1.67)	(-2.28)	(-0.34)	(-0.32)	(-0.29)	(-0.03)	(0.12)	(-0.02)	(-0.25)	(-0.15)
B11	-1.238***	-1.188***	-1.237***	-1.167***	-1.219***	-1.176***	-1.087	0.250	-1.154	-3.246	-2.230
	(-9.82)	(-9.37)	(-9.62)	(-9.41)	(-9.84)	(-9.49)	(-0.11)	(0.03)	(-0.12)	(-0.34)	(-0.23)
B12	0.475***	0.423**	0.490***	0.461***	0.377**	0.446***	0.045	1.222	-0.074	-1.903	-0.956
	(3.61)	(3.21)	(3.65)	(3.57)	(2.92)	(3.46)	(0.01)	(0.14)	(-0.01)	(-0.22)	(-0.11)
B13	-0.204	-0.010	-0.154	-0.021	-0.030	-0.031	-0.672	0.543	-0.678	-2.521	-1.679
	(-1.39)	(-0.07)	(-0.99)	(-0.15)	(-0.21)	(-0.22)	(-0.07)	(0.06)	(-0.07)	(-0.28)	(-0.19)
B14	-1.862***	-1.677***	-1.795***	-1.771***	-1.733***	-1.779***	-1.626	-1.451	-1.656	-2.009	-1.886
	(-14.90)	(-13.38)	(-14.03)	(-14.46)	(-14.13)	(-14.53)	(-0.79)	(-0.71)	(-0.81)	(-1.00)	(-0.94)
B15	-0.891***	-0.924***	-0.910***	-0.909***	-0.932***	-0.907***	-0.495	-1.196	-0.456	0.669	0.121
	(-8.12)	(-8.32)	(-8.06)	(-8.44)	(-8.64)	(-8.42)	(-0.09)	(-0.23)	(-0.09)	(0.13)	(0.02)
constant	5.831***	5.032***	5.360***	5.501***	5.476***	5.511***	6.062	4.880	6.288	8.027	6.765
	(43.94)	(23.91)	(24.66)	(36.84)	(36.67)	(36.89)	(0.58)	(0.47)	(0.60)	(0.79)	(0.66)
R-sqr	0.155	0.142	0.166	0.140	0.138	0.139	0.126	0.138	0.137	0.179	0.179
adj. R-sqr	0.153	0.139	0.163	0.138	0.136	0.138	0.122	0.133	0.133	0.172	0.172
F	77.7***	61.4***	62.3***	75.5***	74.7***	75.4***	30.3***	30.4***	30.3***	27.0***	27.1***
N	11874	12321	11613	12603	12603	12603	5937	5937	5937	5511	5511

* p<0.05 ** p<0.01 *** p<0.001

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