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Did crowdfunding crowd out credit in the crisis? Evidence from a supply crunch

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Abstract

We use capital injections by the Financial Markets Stabilization Fund of Germany into some banks to identify banks that faced a supply constrained. These data we link to a sample of 136 ventures seeking funding on six German equity crowdfunding platforms and compare these to a counterfactual sample of 200 new ventures not using crowdfunding. We control for venture, manager, and bank characteristics. We show that ventures are more likely to successfully seek crowd financing when they are exposed to a supported commercial bank. Whereas still small in volume, especially new enterprises therefore seem to tap alternative funding sources in times of stress among conventional financiers.

Keywords: equity crowdfunding; credit crunch; bank bailouts
JEL classification: G01; G21; G30

1 Introduction

Were new ventures with ties to crisis-ridden banks more likely to turn to innovative financing, such as equity crowd finance? Targeted lending facilities by the Bank of England or the European Central Bank vividly illustrate continued concerns of policymakers about adverse repercussions of bank instability on lending, in particular to small and innovative entrepreneurs. Based on a unique and hand collected sample of new ventures and their relationships with banks, we identify the differential impact on obtaining crowd finance as an important form of alternative funding approaches in response to exposures to banks that had to be bailed out in the wake of the financial crisis of 2008/2009. Besides testing if new ventures tied to distressed banks are more

likely to use crowdfunding, we also investigate which type of ventures seek crowdfinance: those of poor quality that potential face credit constraints or those of high quality that succeed in convincing investors in competing for funds on crowd funding platforms. Put differently, we test, which kinds of new ventures seek and successfully obtain crowd finance – lemons or lollipops?

Young and small firms often require external resources to succeed and to survive. As revenues and earnings are largely non-existing to any noticeable extent in the first months or years, external financing and the methods of funding are often crucial problems for startups (Gorman and Sahlman, 1989; Kortum and Lerner, 2000; Gompers and Lerner, 2004). Cassar (2004) reports that most young firms have no access to equity, for instance, venture capital. The largest share of startup financing needs are covered by traditional forms of debt through commercial banks. But many firms remain unfunded (Cosh et al., 2009; Robb and Robinson, 2014; Cole and Sokolyk, 2013).

In particular, the post-2008 global financial crisis had serious consequences for the landscape of entrepreneurial financing. An even more serious funding gap for young and small firms resulted when the absolute number of equity financing rounds from venture capital firms and the respective volume decreased (Block et al., 2010).

Significant transaction costs rendered it unlikely that small amounts, those typically needed by startups, would be offered to the general public. But the Internet now provides these opportunities (Friedmann, 2005; Schwienbacher, 2013). As a consequence of the larger funding gap and the developments in communication, increasingly many funds are collected through a new source of fundraising called "crowdfunding". This method has become an alternative way of funding for firms seeking external financing, even if they are excluded

from traditional sources, such as venture capital, angel finance, government programs, or friends, fools, and family (Hornuf and Schwienbacher, 2014).

We collect data on 136 firms seeking crowdfunding on one of six German online platforms between November 2011 and June 2014. We construct a control sample of 200 firms with similar traits in terms of size and financial profiles from the membership database of the Federal Association of Startups that did not use crowdfunding. Since we observe the bank with which firms maintain a primary relationship, we then identify a credit supply shock as ties to banks that received a bailout by the German Special Fund for Financial Market Stabilization ("Soffin"), which came into effect as of 2008. Our results indicate that exposure to a bailed out bank increases the probability of using crowdfunding by 13%. We also find that weaker ratings correlate positively with the probability of crowdfunding. This result may indicate that it is more likely that lemons rather than lollipops seek this source of financing.

2 Literature and background

2.1 Bank funding and crowdfunding

Banks are vital to resolve information asymmetries that plague especially small and medium enterprises (see e.g., Petersen and Rajan, 1994, 2002; Berger and Udell, 1998). In particular the quality of opaque new ventures is difficult to evaluate for investors and information asymmetries always exist when it comes to external early stage financing (see Jensen and Meckling, 1976; Carpenter and Petersen, 2002; Stiglitz and Weiss, 1981; de Meza and Webb, 1987; de Meza and Southey, 1996). Information asymmetries between startups and

their possible investors result in the well-known pecking order or capital (Myers and Majluf, 1984). Firms prefer to finance new projects with retained earnings or other internal cash flows because external funds are more expensive. External debt finance is favored over external equity in the traditional pecking order theory because equity investor participation dilutes the share of the entrepreneur. Robb and Robinson (2014) use the Kauffman Firm Surveys to document the important role of debt at the beginning of a startups life. They suggest that the largest part of total capital comes from outside debt, followed by owners' equity, insider debt, outside equity, and owner debt. Brown et al. (2012) and Behr and Güttler (2007) use German data and analyze the role of certain characteristics, such as financial ratios or external credit ratings, on the availability of debt for startups. They find an important role for bank capital use. While the pecking order theory annotates which types of funds are preferred by firms and their owners, it does not explain why young firms in particular have problems raising external funds.

An important hurdle faced by young firms in raising external funds is the effect of the financial crisis on access to credit. Startups were confronted with a credit crunch during and after the time of the crash in 2008 (e.g., Popov and Udell, 2012; Puri et al., 2011; Jiménez et al., 2012). Following Berger and Udell (1994, p. 586), we define a credit crunch as a *"significant reduction in the supply of credit available to commercial borrowers."* Based on the ECB lending survey, Hempell and Kok (2010) identify beyond cyclical factors of credit growth a significant reduction in the availability of bank lending also in Germany. Blaes (2011) further shows that a bank's specific characteristics had a significant impact on outstanding loans during the peak of the crisis. Supply side constraints therefore appear to prevail in Germany, especially since 2008.

Given the important role of debt use in startup financing, the research on credit crunches is highly relevant and a supply side shock could be the trigger that forces young firms to find new sources of fundraising. Aside from credit supply restrictions, startups further face hurdles regarding equity financing. [1] Given a limited track record by definition, startups are presumably among the most opaque firms in the economy (Berger and Udell, 1998; Huyghebaert and de Gucht, 2007). Both potential outside investors and the entrepreneurs need to minimize agency costs and information asymmetries.

Mason and Stark (2004) compare different investment criteria of debt and equity providers and Cassar (2004) investigates the influence of certain characteristics such as size, organization type, asset structure, growth orientation, and owners' characteristics upon startup financing. He demonstrates that the provision of finance is linked to the maturity of assets on the one hand and to the capital structure of startups on the other hand, while characteristics of the management team alone have little effect.

Startup financing decisions may also be affected by the characteristics of the company and by the transaction costs incurring with the funding. This can be explained by the function of scale: smaller amounts of money include comparatively high transaction costs (Cassar, 2004; Titman and Wessels, 1988; Robb and Robinson, 2014; Berger and Udell, 1998; Wald, 1999). These high transaction costs can result in an exclusion of some sources of financing of the available range of possible funding choices for the company. In other words: if the amount requested is very small, some investors will not consider taking the opportunity into consideration (Cassar, 2004).

[1] See Denis (2004) and Gompers and Lerner (2001) for a detailed overview of the growing entrepreneurial finance literature.

An innovative way to reduce the transactions costs in startup financing is crowdfunding, which is becoming a viable method of financing for new ventures. As it is a relatively new phenomenon, related literature is nascent. Schwienbacher and Larralde (2010) provide an overview of equity crowdfunding. They put crowdfunding into perspective of entrepreneurial finance and thereby describe the factors affecting the choice of the founders for this alternative source of funding. Building on this, Hornuf and Schwienbacher (2014) and Mollick (2013) introduce equity crowdfunding into the framework of entrepreneurial finance and compare it to different entrepreneurial financing options. Hemer (2011) distinguishes between equity crowdfunding and traditional capital raising. The funding process itself is the decisive difference: *"Entrepreneurs make an open call for funding on a crowdfunding platform, and investors make their decisions based on the information provided therein. Moreover, the crowdfunding platform facilitates the transaction by providing a standardized investment contract and settling the payments."* Bradford (2012) describes equity crowdfunding as a concept in which supporters or investors receive a stake in the ventures they fund in the form profit participation or even real equity.

We define equity crowdfunding as a source of funds whereby an entrepreneur sells equity shares of a company to a group of (small) investors by means of an open call for funding on Internet-based platforms. To our knowledge, we are the first to identify the effect of bank credit shocks on new ventures' propensity to seek equity crowdfunding as a source of financing.

Equity crowdfunding implies the sale of stocks or similar securities. From a legislative perspective, equity crowdfunding is therefore subject to various regulatory issues and restricted in many countries (Bradford, 2012). Only few OECD countries permit currently the sale of equity shares to the public via crowdfunding platforms. [2]

German crowdfunding platforms facilitate the sale of subordinated loans (*Partiarische Nachrangdarlehen*) or silent partnerships (*Stille Beteiligungen*). Both are equity-like shares in a firm that give investors a share of profits and information rights, but no voting rights (Klöhn and Hornuf, 2012). Although the sale of voting rights to the general public is not permitted in Germany, the sale of equity-like instruments is legitimate. The respective offerings of a firm are limited to EUR 100,000 per year when there is no official sales brochure, which is accepted by the *Bundesanstalt fuer Finanzdienstleistungsaufsicht* (BaFin). Subordinated loans skirt this problem and allow offerings with higher volumes. A detailed discussion of the legal framework for crowdfunding in Germany can be found in Klöhn and Hornuf (2012).

Table 1 provides an overview of the German crowdfunding market. The first six projects were funded at the end of November 2011 on the platforms Innovestment and Seedmatch. As of June 2014, there were a total of 14 active crowdfunding platforms facilitating equity crowdfunding or revenue-sharing models in Germany. Nine more platforms started operations but were closed before the first offering started. [3]

[2] France, the UK, Ireland, Switzerland, the Netherlands, and Australia.
[3] See Hoelzner et al. (2014) for an overview of all market entries and exist of

The total funding volume of equity crowdfunding platforms in Germany in 2011 was approximately EUR 0.45 million and rose to EUR 15 million at the end of 2013. Until the end of June 2014, EUR 28.05 million were raised by all platforms. Seven of the 14 active platforms had only one or no offerings during this time period and 95% of the total volume was raised on only five platforms: Seedmatch (approximately EUR 16 million), Innovestment (EUR 2.25 million), Bergfuerst (EUR 3 million), Fundsters (EUR 0.5 million), and Companisto (EUR 5 million). In total, there were 164 offerings at the end of June 2014 by 155 different firms. Thirteen of these offerings were not successful, which means that the minimum amount requested by the company was not achieved during the time of the funding process. As of June 2014, eleven of the firms were already insolvent.

3 Sampling and identification

To assess the role of equity crowdfinancing as a way to mitigate credit constraints of young firms, we use the support of selected banks after the financial crisis to identify new ventures that are affected by changed credit supply conditions. Next, we compare them to a counterfactual sample of ventures regarding the effects of a credit crunch on successful crowdfunding.

platforms in Germany.

Table 1

German Crowdfunding Market Overview

Platform / Year	2011	2012	2013	2014 (First Half)	Total
Bankless24	0	0	2	2	4
	(0)	(0)	(0.15)	(0.15)	(0.3)
Bergfuerst	0	0	1	0	1
	(0)	(0)	(3)	(0)	(3)
Companisto	0	6	15	6	27
	(0)	(0.55)	(2.65)	(1.7)	(4.9)
Fundsters	0	0	4	3	7
	(0)	(0)	(0.3)	(0.2)	(0.5)
Innovestment	2	13*/8**	11*/4**	7	33*/12**
	(0.1)	(1)	(0.85)	(0.3)	(2.25)
Mashup Finance	0	1	1	0	2
	(0)	(0.1)	(0.11)	(0)	(2)
Seedmatch	4	24	21*/1**	9	58*/1**
	(0.35)	(2.65)	(7.4)	(5.5)	(15.9)
Others	0	1	11	7	19
	(0)	(0)	(0.55)	(0.45)	(1)
Total	6	45*/8**	66*/5**	34	151*/13**
	(0.45)	(4.3)	(15)	(8.3)	(28.05)

Notes: Volume raised in successful campaigns in million EUR in parentheses. * number of successful offerings, ** number of unsuccessful offerings. Source: Own elicitation.

3.1 Crowdfunding and counterfactual sample

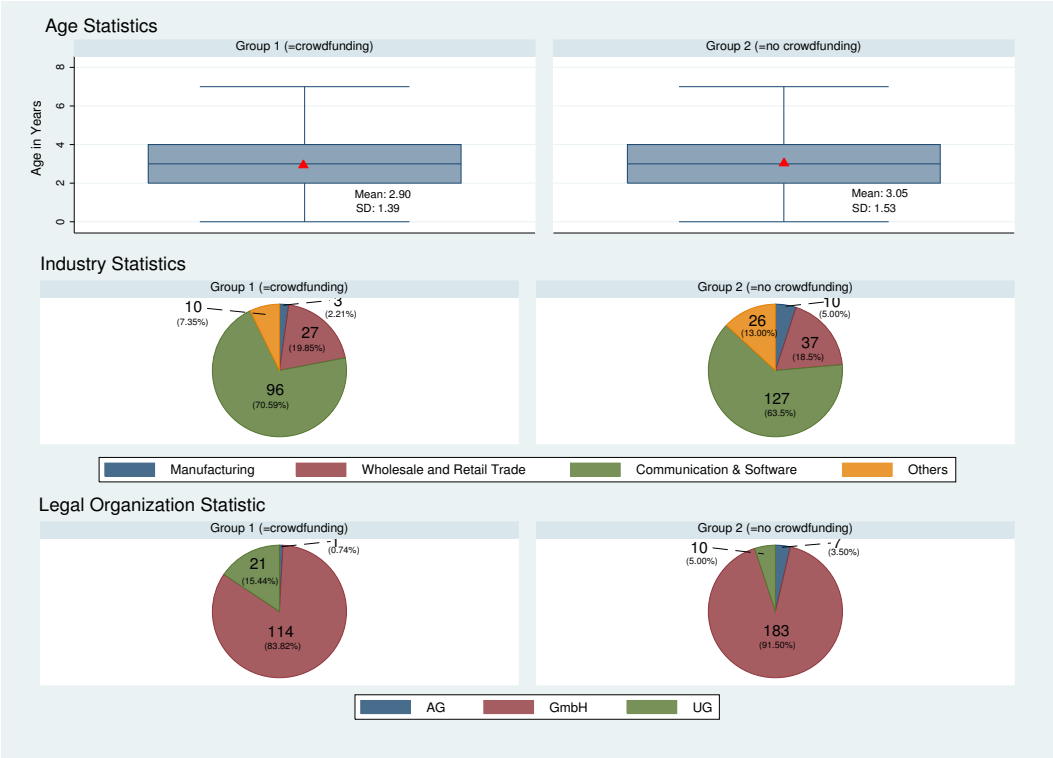
We construct a sample of new ventures that use and that do not use crowdfunding from various sources. We identify a total of 145 crowdfunding offerings by 136 different firms with available information that applied for funding through the German crowdfunding platforms Bankless24, Bergfuerst, Companisto, Fundsters, Innovestment, Mashup Finance, and Seedmatch between November 2011 and June 2014. We refer to these as Group 1. The data are obtained from continuously pulling information from the six platforms' publicly accessible webpages.

To identify the differential effect of a credit supply shock on the inclinedness of firms to seek crowdfunding, we construct a counterfactual sample of comparable firms in terms of structure, location of headquarter, legal status, business model, and industry sector. We refer to this sample as Group 2, and

it is constructed from the members of the Federal Association of startups in Germany (‘‘Bundesverband Deutsche Startups”). Formal prerequisites to be listed on a German crowdfunding platform are very similar to those required for an association membership. There were 258 members by the end of June 2014, of which 58 used crowdfunding. We exclude the latter, leaving a counterfactual sample of 200 no-crowdfunding firms.

The dependent variable in subsequent analyses is thus an indicator variable that equals “1” if the firm attempted to obtain external finance through crowdfunding and “0” otherwise. The counterfactual sample exhibits comparable traits regarding age, the sectoral, and the geographical distribution. Firm-specific traits are obtained from the firms’ websites. We gauge legal incorporation with an ordinal variable (*legal*) coded ”2” for the small UG, ”1” for a GmbH and GmbH & Co. KG and ”0” for a AG. Larger values thus indicate increasing private liability of entrepreneurs.

Fig. 1.
Sample Group Statistics



Notes: This figure shows the sample group statistics with n_{Total} =336. Group 1 includes the firms that used crowdfunding ($n_{Group\ 1}$=136), and Group 2 is the control group of firms that had not used crowdfunding ($n_{Group\ 2}$=200).

Figure 1 shows that 71% of the firms that used crowdfunding are active in the communication & software industry, followed by 20% in the wholesale & retail trade industry. The distribution for the control group is comparable with 64% of the firms being from the communication & software sector, and 19% from the wholesale & retail trade industry. Manufacturing and other sectors play subordinate roles in either sample. The median age of both groups is three years at the time of observation, virtually identical to the mean age. All firms of both groups are registered as limited liability companies in Germany; more than 80% are incorporated as limited liability company *"Gesellschaft mit beschraenkter Haftung"* ("GmbH" or a "GmbH & Co. KG") in both samples. Only less than 5 % are a joint-stock company " *"Aktiengesellschaft"* ("AG") and around 5% - 15% are registered as a *"Unternehmergesellschaft (haftungsbeschränkt)"* ("UG"). [4]

3.2 Identification through bank bailouts

In October 2008 the German Federal government founded the *Special Fund for Financial Market Stabilization* (SoFFin) in response to the turmoil in the aftermath of the Lehman collapse. The fund was designed to strengthen the capital base of German banks that were hit by by taking over problematic positions and other guarantees (Schmidt and Zwick, 2012), supporting a total of 10 German banks since its inception with a total volume of outstanding equity and guarantees of 166 billion Euros in 2009.

One consequence of the financial crisis was a contraction of credit both at a global (Popov and Udell, 2012; de Haas and van Horen, 2012) and at a national, retail-lending scale (Puri et al., 2011). In Germany, credit growth rates to non-financials fell from more than 10% by the end of 2008 to -3.4%

[4] The latter is a smaller version (minimum of share capital of EUR 1) of the GmbH (minimum of share capital of EUR 25.000).

in 2009 (Rottmann and Wollmershäuser, 2010), severely impeding the financing of German companies that continued to rely intensively on bank debt (Deutsche Bundesbank, 2009; Schmidt and Zwick, 2012). In particular banks that received support by the SoFFin become more restrictive with respect to the supply of loans according to Gern and Jannsen (2009).

Therefore, we identify the effect of a bank credit supply shock on the use of crowdfunding, if the new venture is connected to a bank that received support by the SoFFin. We observe bank-firm relationships for both groups of new ventures from the Creditreform database, which contains for each company a unique bank identification number of the finical institutions with which a major credit relationship is maintained. We combine these data with the database of the BaFin to control for consolidation and to obtain the complete bank names. In total, we identify 77 different banks (see Table A.1). These names are then matched with information about which banks were supported that is provided on the webpage of the SoFFin.

Table 2 shows descriptive statistics for our main testing variable, an indicator variable (*soffin*) that takes on the value "1" if the bank is supported and "0" otherwise. In total, 24% of all firms in the sample have a relationship to a bank that is supported through the SoFFin. However, the share of companies whose bank is supported through the SoFFin is 35% in the group of firms that used crowdfunding - almost twice the share of the group of firms that did not used crowdfunding (18%). We expect that a firm facing larger credit constraints is more likely to apply for crowdfunding, controlling for a number of firm traits, which we introduce and discuss in more detail below.

Table 2
Summary Statistics

	soffin	*size*	*struct.*	*credit*	*gender*	*heads*	*legal*	*city*	*rating*
Group 1									
Observations	72	72	72	72	72	72	72	72	72
Mean	.35	10.94	.16	1.97	1.25	1.56	1.11	.69	.46
Median	0	10.94	.06	2	1	1	1	1	.43
Min	0	6.90	0	1	1	1	0	0	0
Max	1	15.36	.71	3	3	4	2	1	1
SD	.48	1.52	.20	.63	.62	.75	.39	.36	.21
Group 2									
Observations	127	127	127	127	127	127	127	127	127
Mean	.18	12.40	.17	1.76	1.10	1.60	1.01	.77	.52
Median	0	12.53	0.01	2	1	1	1	1	.57
Min	0	6.86	0	1	1	1	0	0	0
Max	1	16.42	.95	3	3	4	2	1	1
SD	.39	1.82	.21	.53	.43	.72	.30	.42	.20
Total									
Observations	199	199	199	199	199	199	199	199	199
Mean	.24	11.87	.17	1.84	1.16	1.58	1.05	0.74	.495
Median	0	11.74	.08	2	1	1	1	1	.43
Min	0	6.86	0	1	1	1	0	0	0
Max	1	16.42	.95	3	3	4	2	1	1
SD	.43	1.85	.21	.57	.51	.73	.32	.44	.20

Notes: This table reports the descriptive statistics of the sample with no missing values. Group 1 includes the firms that used crowdfunding; Group 2 is the control group.

4 Model and results

4.1 Baseline results SoFFin effects

We predict the likelihood that a firm i applies successfully for crowdfunding $y_{it} = 1$ in year t conditional on firm traits x_{it} and the fact that it is tied to a bank that had to be bailed out by the $soffin_{it}$. We use a logit model as a baseline specification and estimate:

$$\Pr(y = 1 \mid x) = \frac{\exp\ (\alpha + \beta x)}{1 + \exp\ (\alpha + \beta x)} \tag{1}$$

Next to to the main variable to test of SoFFin support increased the likelihood of using crowdfunding, we add step-by-step additional covariates that are described in Table 2. Financial ratios are obtained from financial statements that we downloaded from the homepage of the Bundesanzeiger. The information used include the non-current assets and the total assets. Table 3 reports the results of the logit regressions.

A range of goodness of fit indicators, Pseudo R^2, Nagelkerke's R^2, and the Hosmer-Lemeshow (H-L) support a good discriminatory power of the model despite the relatively low sample size (Hosmer and Lemeshow, 2012). We also compare the predicted probabilities to a moving average of the proportion of cases using a "Locally Weighted Scatterplot Smoothing Graph" ("LOWESS") graph (Figure A.1), which also confirms the fit of the model. Likewise, the Area under the Receiver Operating Characteristic Curve (AURROC, Figure **??**), of 0.78 for model 5 strongly supports that the probability of using crowdfunding is explained quite well by the covariates.

The coefficient for the variable *soffin* suggests that the likelihood for the use of crowdfunding increases when a firm's bank is supported by the SoFFin. As

Table 3

Logit Regression Results for the Likelihood of Crowdfunding

	(1)	(2)	(3)	(4)	(5)
soffin	0.878***	0.838**	0.792**	0.789**	0.869**
	(0.338)	(0.345)	(0.370)	(0.371)	(0.388)
credit		0.622**	0.706**	0.709**	0.686**
		(0.274)	(0.293)	(0.295)	(0.310)
size			-0.504***	-0.502***	-0.490***
			(0.103)	(0.104)	(0.106)
structure				-0.0931	-0.142
				(0.789)	(0.811)
gender					0.161
					(0.343)
heads					0.113
					(0.248)
legal					0.743
					(0.530)
city					-0.662*
					(0.398)
rating					-1.406
					(0.872)
Constant	-0.794***	-1.942***	3.781***	3.780***	3.682**
	(0.176)	(0.545)	(1.263)	(1.263)	(1.608)
Observations	199	199	199	199	199
Pseudo R^2	0.026	0.047	0.161	0.161	0.191
Nagelkerke R^2	0.046	0.081	0.260	0.260	0.303
AUROCC	0.583	0.637	0.766	0.766	0.775
H-L Test		2.71	9.43	7.83	0.83
		(p=0.438)	(p=0.308)	(p=0.450)	(p=0.999)

Notes: This table reports the results of logit models for the likelihood of the use of crowdfunding. The dependent variable takes on the value "1" if the firm used crowdfunding. Explanatory variables are defined in the text and the appendix. Standard errors appear in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

expected, the coefficient is positive and statistically significant in all models.

4.1.1 Credit Scores

Credit scores are a common tool that banks use to evaluate firms applying for a loan, but it is unclear if these ratings affect the availability of debt for young firms. For example Robb and Robinson (2014) explore this question, using data from the Kauffman survey in the U.S., and observe that the information on the payment behavior of the firm in the past can have a negative effect on the access to finance for young firms. Brown et al. (2012) confirm this view and suggest that the information provided by an external credit agency can affect the availability of financing for startups; firms with a good rating have better chances to obtain a loan, while firms with bad ratings mostly face difficulties getting a loan. In line with the literature, I posit that firms with bad credit scores are more likely to use crowdfunding.

External credit ratings are provided by Buergel and given on a scale from A (good) to C (bad). The underlying variable (*credit*) is coded for the rating class A with "1" as a good rating, rating class B is coded with "2" as normal rating, and class C is coded with "3" as bad rating. Buergel was chosen, as it is one of the biggest databases on German companies with more than 3.9 million entries. With BoniCheck, a product of Euler Hermes, it offers an instrument for the assessment of the solvency of firms. From the Buergel database, I deduced whether an external credit rating in the form of the BoniCheck indicator was provided for each company, and if so, what the rating was like. Similar to the credit scores provided for example by Creditreform or Dun and Bradstreet, the BoniCheck provided by Buergel is based on past payment behavior regarding trade credit from utilities and suppliers. Additionally, the information is enhanced with a subjective assessment of the firms' future ability to fulfill credit obligations by Buergel. This is based on information regarding the firms' order situation or industry (Brown et al., 2012).

The distribution of good, normal, and bad credit scores is comparable

within both groups with a total mean of 1.84, indicating a normal score on average. The coefficient estimated for credit ratings has a significant influence upon the use of crowdfunding, with the variable being positive and statistically significant in all models. This is consistent with expectation that firms with a bad (higher) credit rating are more likely to use crowdfunding.

4.1.2 Size

The decision of an investor to finance a startup is based on many factors. Larger firms can use economies of scale to reduce information asymmetries, but they also have access to different sources of financing, as their risk exposure and the scale of transaction costs are different. Small firms are also more informationally opaque than large ones. Hence, size is an important factor when it comes to financing young firms (Berger and Udell, 1998). Small firms often face problems resolving informational asymmetries with investors and lenders at acceptable costs, and they are therefore exposed to higher charges for smaller amounts of capital. This situation is reflected in the pecking order theory, which discourages small firms from using outside financing (Scholtens, 1999). Transaction costs also influence the funding methods. Small amounts often incur relatively high transaction costs, why some of the available sources for certain kinds of firms are not relevant (Titman and Wessels, 1988; Wald, 1999). For instance, the public issue of equity shares, during an initial public offering requires a scale that most small companies do not reach in the early stages; therefore, it excludes small firms from this type of financing (Cassar, 2004).

In sum, smaller firms often face problems in obtaining traditional sources of outside financing, which could influence the use of crowdfunding. Empirical studies generally propose a positive link between firm size and outside financing, leverage, and bank financing (Cosh et al., 2009; Coleman, 2000; Osteryoung et al., 1992; Fluck et al., 2000; Scherr et al., 1993; Chittenden et al.,

1996; Michaelas et al., 1999). Therefore, we expect that smaller startups are more likely to use crowdfunding than large ones.

The mean size (log of total assets) of the sample firms is 11.87. Firms that made no use of crowdfunding are larger in terms of total assets with a log of 12.4 (≈ EUR 240.000) than firms that made use of crowdfunding with a logged size of 10.94 (≈ EUR 55.000). Non-current assets constitute around 17% of the total assets of the firms, while the difference for the both groups is marginal. We specify the log of assets as *size*.

The coefficient for the *size* is negative and statistically significant in all models. In line with the expected effect, the coefficient estimate indicates that smaller firms are more likely to use crowdfunding.

4.1.3 Asset structure

Another fact related to financing, particularly for young firms, is the structure of the assets (Cassar, 2004). The rationale behind this is that in case of bankruptcy, the financial loss for investors can be reduced when the assets are more tangible and generic (Harris and Raviv, 1991; Titman and Wessels, 1988). Moreover, costs for adverse selection and moral hazard can be reduced when firms pledge assets as collateral or when charges get fixed on the tangible assets. Tangible assets increase the liquidation value, which results in companies with a high share of tangible assets getting access to traditional sources of finance more easily. Due to the lower costs of financing, this frequently results in a higher degree of leverage in the capital structure of these firms. Empirical evidence suggests that banks will base their financing decision to a certain degree upon the hedging of a loan through tangible assets (Berger and Udell, 1998; Storey, 1994). Against the background of increased information asymmetries at the beginning of a firm's life cycle and the necessary information to forecast future development, there are, aside of the use of relationship bank-

ing, few ways for investors to reduce the risk to which they are exposed. The asset structure in terms of share of tangible assets often serves as a screening tool for banks, and it has significant effects on financing at the beginning of the startup (Cassar, 2004). Consistent with the theory, some authors suggest a positive relationship between the share of tangible assets and leverage for large firms, but the research concerning this topic for small firms is rare and only some evidence can be found that shows a relationship between the asset structure and the use of debt (Michaelas et al., 1999; Chittenden et al., 1996; Jordan et al., 1998; van der Wijst and Thurik, 1993). Nevertheless, we expect that the lower the share of tangible assets of a firm the higher the likelihood of using crowdfunding.

The asset structure of each firm for every year since its foundation is calculated by dividing the non-current assets by total assets, and the variable (*structure*) is given as the average of these values, ranging from "0" to "1".

Although the coefficients for the variable *structure* are also negative in all models, they are never significantly different from zero. Therefore, there is no evidence that firms with a higher share of tangible assets have a higher probability of using crowdfunding.

4.1.4 Characteristics of the Management Team and Firm

However, financial ratios and external ratings alone cannot help to explain the financing decisions of new firms. Regarding young firms in particular, many investors include the owner and the management team in their assessment, since their importance during the first years of operations is not to be underestimated (Cassar, 2004). For example, due to the credit discrimination or risk aversion of some financiers, the gender composition of the management team can influence the capital structure (Coleman, 2000). This is confirmed by Arenius and Autio (2006) who provide evidence that female-owned businesses

are often financed differently from male-owned businesses. Other authors suggest that female-owned firms have worse economic initial conditions with a lower capital base (Rosa et al., 1994; Verheul and Thurik, 2001) and face the problem of being less likely to obtain external funding (Cole and Gunther, 1995; Haynes and Thompson, 1999; Coleman, 2000). Furthermore, they usually use different sources for financing their business compared to male-owned firms (Neider, 1987; Lerner et al., 1997) and face difficulties especially when applying for and securing bank loans (Treichel and Scott, 2005; Riding and Swift, 1990; Haines et al., 2009; Coleman, 2000; Anna et al., 2000). Hence, I expect that firms with mixed or purely female teams are more likely to use crowdfunding than firms with a male management team.

The number of members in the management team can also affect the chances of obtaining external capital. Chandler and Hanks (1998) and Roberts (1991) show that ventures founded and led by a team are often more successful than those founded and led by single person. Beckman et al. (2007) find that the number of team members and the team composition have positive effects on the likelihood of startups attracting external financing. Therefore, I posit that firms with smaller management teams are more likely to use crowdfunding.

To control for management team characteristics, we add the number management team members, (*heads*), as well as the gender composition of the management team. The latter is specified as an ordinal variable (*gender*), with "1" for a male-only team, "2" for a mixed team, and "3" for a female-only team. Most of the management teams of the firms in the sample in both groups are purely male, as the mean for the gender composition with 1.16 shows. Firms that used crowdfunding have slightly more woman in the teams (1.25) than firms that did not use crowdfunding (1.1). With respect to the number of heads in the management team, both groups are comparable and total average 1.58 persons, but firms that did not use crowdfunding are a little

larger on average.

As shown in the last model in Table 3, the variables capturing the gender composition and the number of heads of the management are positive but not significant.

4.1.5 City

Most financiers invest only within a close geographic scope (Gupta and Sapienza, 1992), and rural areas are often characterized by worse access to finance for young and small firms (Strotmann, 2006). I expect that firms from rural areas have a higher likelihood of using crowdfunding than firms from urban areas.

The dichotomous variable (*city*) equals "1" if the headquarter is located in a city with more than 500,000 (urban) inhabitants and "0" otherwise (rural). Of all firms, 74% are located in cities with more than 500,000 inhabitants. Firms that did not use crowdfunding are a more often located in urban areas (77%) than the firms of Group 2 (69%).

The hypothesis for the variable city posits that firms in rural areas have a higher likelihood of using crowdfunding, as they have less access to finance. The coefficient for the city variable is negative and statistically significant. Firms in rural areas are more likely to use crowdfunding.

4.1.6 Incorporation

The legal status of a firm can also affect the availability of particular forms of funding, as it can be a signal for most investors (Storey, 1994). Banks may interpret a higher degree of incorporation as a positive signal showing credibility and future performance potential. Coleman and Cohn (2000) find a positive relationship between obtaining a credit and the incorporation of a

firm, while Freedman and Godwin (1994) and Storey (1994) find that incorporation influences the degree of leverage, which increases with the degree of incorporation (Cassar, 2004). A higher degree of incorporation can result in an improvement in the availability of traditional sources of capital, which is why I expect that firms with a lower degree of incorporation in terms of size of the minimum legal capital base are more likely to use crowdfunding.

By far the largest number of firms is incorporated as GmbH. The share of larger legal types like GmbHs and AGs is slightly higher for firms that did not use crowdfunding (a mean of 1.05) than for the group of firms that used crowdfunding (mean of 1.11).

The coefficient for the legal variable is positive in the model. This indicates that in line with the expected effect, firms with a lower degree of incorporation have a higher probability of using crowdfunding. However, the coefficient is not significant, and it cannot be concluded that the coefficient is different from zero.

4.1.7 Rating of Sophisticated Investors

A business plan is one of the most important steps to take when launching a startup. One of the reasons for a business plan, besides economic efficiency, is to raise funds to start or expand a project. Mason and Harrison (1996) and Kuratko and Hodgetts (2001), for instance, understand the business plan as the minimum requirement for any financing application, as more than three-quarters of business angels base their investment decision on this document. Different studies investigate the decision-making process of venture capital firms and suggest that the owner, the strategy of the business, and the financial issues are not the only determinants in investment decisions (Zacharakis and Meyer, 1998; Hall and Hofer, 1993). Moreover, many investors focus on the potential of the product as well as industry specific outlooks and growth

opportunities. Sweeting (1991) shows that equity investors typically spent less than 10 minutes on the first screening, and Hall and Hofer (1993) show they spent less than six minutes. Business angels typically devote up to nine minutes in the screening process (Mason and Rogers, 1997). Since crowdfunding is emerging and therefore a rather unusual tool for financing a startup due to possible legal uncertainties, I suspect that most firms that offer shares via crowdfunding have first tried obtaining funds through traditional sources of capital. Therefore, I expect that firms that are not taken into consideration for detailed investigation by sophisticated investors are more likely to use crowdfunding.

The funding decision is often modeled as a stepwise process (Haines et al., 2003; Feeney et al., 1999), which involves at least three different phases: the initial screening, the detailed investigation, and the negotiation and deal closing. With the information provided on the firms' websites, it is possible to imitate the screening process to get a rating from different sophisticated investors about the quality of the firms in the data sample and evaluate whether they would move on with the firms to the second step of the process, the detailed investigation, or whether they would decide not to pursue them after the first screening. Hence, all firms were presented to seven different equity investors from Germany who were asked if they would further investigate an investment for each firm. To avoid bias, the selected investors differed in characteristics, such as deal volume, industry focus, type, and location. The variable (*rating*) is the average of the single ratings, which are in the form of a dummy variable with the value "1" for interesting follow-up investment opportunities and "0" for firms that they would not take into consideration for an investment.

The average rating is almost identical for both groups. On average, about 50% of the investors would take a firm from the sample into consideration for further investigation, and the difference between the groups is small.

This last explanatory variable controls whether the firms use crowdfunding because they are not considered for detailed investigation by sophisticated investors. The coefficient of the rating variable is negative, which would indicate that firms that are classified as non-qualified for further investigation by the investors have a higher probability of using crowdfunding than companies that are considered by more investors. However, the coefficient is not significantly different from zero.

4.2 Alternative estimators

The comparison of the coefficients reported in Table 4 across the OLS, logit, and probit models tell a qualitatively similar story about the impact of a regressor on Pr(crowdfunding=1). Logit estimates are roughly five times the OLS estimates, and the probit estimates are roughly three times the OLS estimates, which is plausible. Robust estimation procedure shown in Table 4 are qualitatively similar, mitigating potential misspecification concerns.

Table 4

Regression Results for comparing Models

	(5) Logit	(6) Logit (robust)	(7) Probit	(8) Probit (robust)	(9) OLS	(10) OLS (robust)
soffin	0.869**	0.869**	0.536**	0.536**	0.165**	0.165**
	(0.388)	(0.351)	(0.236)	(0.213)	(0.0739)	(0.0724)
credit	0.686**	0.686**	0.392**	0.392**	0.119**	0.119**
	(0.310)	(0.323)	(0.182)	(0.189)	(0.0561)	(0.0580)
size	-0.490***	-0.490***	-0.295***	-0.295***	-0.0884***	-0.0884***
	(0.106)	(0.106)	(0.0606)	(0.0593)	(0.0171)	(0.0162)
structure	-0.142	-0.142	-0.109	-0.109	-0.0414	-0.0414
	(0.811)	(0.775)	(0.489)	(0.466)	(0.152)	(0.149)
gender	0.161	0.161	0.111	0.111	0.0366	0.0366
	(0.343)	(0.280)	(0.211)	(0.175)	(0.0631)	(0.0543)
heads	0.113	0.113	0.0460	0.0460	0.0187	0.0187
	(0.248)	(0.235)	(0.148)	(0.139)	(0.0443)	(0.0407)
legal	0.743	0.743	0.431	0.431	0.138	0.138
	(0.530)	(0.553)	(0.314)	(0.321)	(0.0985)	(0.103)
city	-0.662*	-0.662*	-0.422*	-0.422*	-0.121*	-0.121*
	(0.398)	(0.382)	(0.236)	(0.227)	(0.0722)	(0.0714)
rating	-1.406	-1.406	-0.806	-0.806	-0.233	-0.233
	(0.872)	(0.861)	(0.513)	(0.510)	(0.155)	(0.150)
Constant	3.682**	3.682**	2.288**	2.288**	1.148***	1.148***
	(1.608)	(1.558)	(0.956)	(0.913)	(0.291)	(0.290)
Observations	199	199	199	199	199	199
R^2					0.223	0.223
Pseudo R^2	0.191	0.191	0.192	0.192		

Notes: This table reports the results of different models for the likelihood of the use of crowdfunding. The dependent variable takes on the value "1" if the firm used crowdfunding. Explanatory variables are defined in the text and the appendix. Standard errors appear in parentheses and are based on both default and robust estimates of the VCE, which uses the robust estimator of variance. *** p<0.01, ** p<0.05, * p<0.1.

Overall, the robustness checks suggest that the logit regression used for Model 5 is the best fit and can withstand a comparison with other regression methods, as it delivers the same results. However, to understand the economic significance of specific variables, it might be wrong to only rely on the logit coefficient estimates. Following Hosmer and Lemeshow (2012), we therefore consult the marginal effects of the explanatory variables.

4.3 Economic Magnitudes

We calculate the average marginal effects of the variables based on Model 5. The results in Table 4.3 show strong and consistent evidence for the idea that the support of a firm's bank through the SoFFin affects the probability of using crowdfunding. The marginal effect indicates that the support of a firm's bank through the SoFFin increases statistically significant the probability of a firm using crowdfunding by about 12.9%. Second, the credit rating in terms of the score affects also the probability that a firm uses crowdfunding. While having a normal rating does not significantly affect the probability that a firm uses crowdfunding compared to firms with a good score, the marginal change for having a bad credit rating is significantly positive and increases the probability by 29.5% compared to firms with a normal rating.

Table 4.3 also shows that a greater level of size in terms of logged total assets decreases the probability per unit change by 8% that the firm will use crowdfunding, and it exhibits significantly negative marginal effects. However, the results do not confirm the hypothesis about the asset structure of a firm. Although the marginal effect is negative, it is not statistically significant and thereby not significantly influencing the probability of using crowdfunding.

Table 5
Marginal Effects

	(5b)	
	Marginal effects	Standard errors
soffin (d)	0.129*	(0.076)
credit (base=good=1)		
normal (=2)	0.035	(0.072)
bad (=3)	0.295**	(0.126)
size (co)	-0.089***	(0.015)
structure (co)	-0.070	(0.144)
gender (base=male=1)		
mixed (=2)	0.427**	(0.180)
female (=3)	-0.019	(0.120)
heads (co)	0.014	(0.044)
legal (base=AG=0)		
GmbH (=1)	0.162	(0.159)
UG (=2)	0.323*	(0.192)
city (d)	-0.147**	(0.071)
rating (co)	-0.223	(0.151)
Observations	199	

Notes: This table reports the marginal effects of the logit model for the likelihood of the use of crowdfunding. The dependent variable takes on the value of "1" if the firm used crowdfunding. Explanatory variables are defined in the text and the appendix. Reference categories for dichotomous variables are given in the table. The marginal effect describes the change in the probability of using crowdfunding associated with an incremental change in the respective explanatory variable, calculated as average marginal effect and all other variables equal. For continuous variables (co), it is the marginal change as means of the effects evaluated at each observations in probability due to a one unit change in the respective explanatory variable; for dichotomous variables (d), it represents the change in probability of using crowdfunding for a discrete change of the variable from 0 to 1 and for categorical variables, the marginal effects reflect the marginal change for a discrete change of the variable to the next category (e.g., base to 1, 1 to 2, etc.). Standard errors appear in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Support for the hypothesis that gender composition in terms of higher shares of female members in the management teams increases the probability that a firm uses crowdfunding is not universal. While the marginal effect for a mixed management team is significant positive, the effect for purely fe-

male teams is negative and not significant. The results further show that the marginal effect for the size of the management team is very small and not significant. Consequently, it is not necessarily the composition and size of the management team that matters for the use of crowdfunding. The marginal effect for legal organization proposes that the degree of incorporation has little effect on the use of crowdfunding. Examining the results for the different degrees of incorporation, they show that if a firm is incorporated as a GmbH, this increases the probability of using crowdfunding by 16.2% compared with firms that are incorporated as an AG. Notably, the observed marginal effect of incorporation upon the use of crowdfunding is only significant when a firm is registered as an UG. Compared to GmbH firms, for the smaller UG, the probability of using crowdfunding increases by 32.3%. This result partially confirms the effect of the variable *size* as incorporation is always an issue of firm size. Regarding the location of the headquarters, the marginal effect indicates that the probability decreases significantly for firms that are located in an urban area by 14.7%. For the used sample, there is no significant effect that an increase in the number of investors, who evaluate the business and consider investigations significantly affects the chances that the firm uses crowdfunding; nevertheless, the marginal effect is as expected negative.

In sum, there is little evidence that characteristics of the management team significantly affect the probability that the firm uses crowdfunding, but the results show that most measures of financial ratios negatively affect the probability of using crowdfunding. However, having a relationship with banks that are supported through the SoFFin increases the probability. The marginal effects of the variables *soffin*, *size*, and *credit* are statistically and economically substantial. Possible explanations for these strong effects are that banks that are supported through the SoFFin act more reservedly and restrictively on lending. Thereby, they force their customers to resort to alternative financing methods (Gern and Jannsen, 2009; Reize, 2010; Schmidt and Zwick, 2012). It

could also be that firms with bad credit scores or a small volume of assets are confronted with problems in obtaining funds from traditional sources, which is why they have to find new ways of financing (Cassar, 2004; Brown et al., 2012; Robb and Robinson, 2014).

5 Conclusion

Financing is a key component of entrepreneurial activities. By observing, which firms cooperated with banks that had to be bailed out by the German government, we identify the effect of an exogenous credit supply shock on the likelihood of using equity crowd funding. To this end, we manually collect a unique dataset that provides information about the financing decisions of startups in Germany. Specifically, we use data from more than 300 firms to test how certain characteristics in terms of bank relationship, size, asset structure, and other factors affect the probability that the firm will use crowdfunding.

Our results show that a relationship of a firm with a bailed out bank increases the probability that a firm uses crowdfunding by 13%. This effect is both economically and statistically significant. The analysis also shows that bad credit scores increase the probability of a firm to use crowdfunding by 30%. Supply side restrictions move banks to handle their lending more restrictively and firms showing no creditworthiness are not financed. This result suggest that among opaque new ventures, riskier projects tend to tap equity crowdfunding instead of bank financing.

We also find that smaller firms are more likely to use crowdfunding. The structure of the assets has no impact. Due to the small amounts obtained in a crowdfunding offering, this is plausible. Larger firms often need higher volumes and have access to other or cheaper sources of capital, such as initial public offerings. Management team characteristics have no statistically signifi-

cant effect. Likewise, neither the rating of the firms' quality by experts nor the legal organization exhibit a significant influence on a firm using crowdfunding. These results indicate that the use of crowdfunding is not a question of management or other organizational factors. This result supports the hypothesis that quality differences are not crucial. But the location of the headquarter has a significant effect and suggests that firms that are located in rural areas are more likely to use crowdfunding. Overall, equity crowdfunding exhibits very similar patters like other sources of entrepreneurial finance, and proximity is an important factor (Gupta and Sapienza, 1992; Strotmann, 2006).

The most important finding is, however, that firms are more likely to use crowdfunding when their bank is affected by a credit crunch. Equity crowdfunding thus seems to be of particular importance for entrepreneurial finance as a serious new source of capital in stressful times for banks.

Appendix

Fig. A.1.
Locally Weighted Scatterplot Smoothing Graph Graph

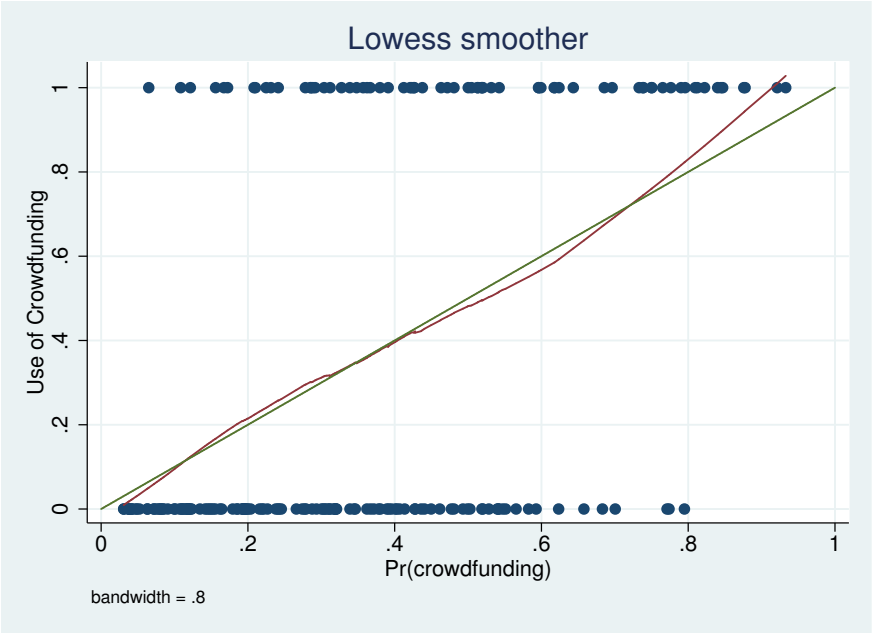


Table A.1
Banks Statistics

No.	Bank Name	Observations	Category
1	Bank fuer Sozialwirtschaft	2	Cooperative
2	Berliner Sparkasse	28	Savings
3	Commerzbank	82	Private
4	Deutsche Bank	77	Private
5	Donner & Reuschel	2	Private
6	Frankfurter Sparkasse	2	Savings
7	Frankfurter Volksbank	1	Cooperative
8	GLS Gemeinschaftsbank	2	Cooperative
9	Hamburger Sparkasse	9	Savings
10	Heidelberger Volksbank	1	Cooperative
11	HypoVereinsbank	12	Private
12	ING-DiBa	1	Private
13	Kasseler Sparkasse	1	Savings
14	Koelner Bank	1	Cooperative
15	Kreissparkasse Ahrweiler	1	Savings
16	Kreissparkasse Gro-Gerau	2	Savings
17	Kreissparkasse Kaiserslautern	1	Savings
18	Kreissparkasse Ludwigsburg	1	Savings
19	Kreissparkasse Waiblingen	1	Savings
20	LBBW	2	Landesbank
21	Nassauische Sparkasse	1	Savings
22	National Bank	1	Private
23	Nordthueringer Volksbank	1	Cooperative
24	Ostschsische Sparkasse Dresden	1	Savings
25	Postbank	17	Private
26	Raiffeisenbank Gundelfingen	2	Cooperative

27	Raiffeisenbank Heinsberg	1	Cooperative
28	Raiffeisenbank Parsberg-Velburg	1	Cooperative
29	Sofort Bank	1	Private
30	Sparkasse Aachen	1	Savings
31	Sparkasse Bamberg	1	Savings
32	Sparkasse Bochum	1	Savings
33	Sparkasse Bremen	1	Savings
34	Sparkasse Dachau	1	Savings
35	Sparkasse Dueren	1	Savings
36	Sparkasse Hannover	4	Savings
37	Sparkasse Harburg-Buxtehude	1	Savings
38	Sparkasse Herford	1	Savings
39	Sparkasse Hoexter	1	Savings
40	Sparkasse Karlsruhe	2	Savings
41	Sparkasse Koblenz	2	Savings
42	Sparkasse KoelnBonn	7	Savings
43	Sparkasse Landshut	1	Savings
44	Sparkasse Mainz	2	Savings
45	Sparkasse Markgrflerland	1	Savings
46	Sparkasse Maerkisch-Oderland	1	Savings
47	Sparkasse Muelheim an der Ruhr	1	Savings
48	Sparkasse Oder-Spree	1	Savings
49	Sparkasse Schaumburg	1	Savings
50	Sparkasse Westmuensterland	1	Savings
51	Sparkasse Zollernalb	1	Savings
52	Stadt- und Kreisspk. Darmstadt	1	Savings
53	Stadt- und Kreisspk. Erlangen	3	Savings
54	Stadtsparkasse Augsburg	1	Savings
55	Stadtsparkasse Duesseldorf	3	Savings
56	Stadtsparkasse Kaiserslautern	1	Savings
57	Stadtsparkasse Magdeburg	2	Savings
58	Stadtsparkasse Muenchen	5	Savings
59	Stadtsparkasse Schwerte	1	Savings
60	Verbundsparkasse Emsdetten	1	Savings
61	Vereinigte Volksbank Maingau	1	Cooperative
62	Volksbank Brilon-Bueren	1	Cooperative
63	Volksbank Erft	1	Cooperative
64	Volksbank Karlsruhe	1	Cooperative
65	Volksbank Mittelhessen	1	Cooperative
66	Volksbank Neckartal	1	Cooperative
67	Volksbank Paderborn	1	Cooperative
68	Volksbank Potsdam	11	Cooperative
69	Volksbank Rhein-Nahe	1	Cooperative
70	Volksbank Sauerland	1	Cooperative
71	Volksbank St. Blasien	1	Cooperative
72	Volksbank Stuttgart	2	Cooperative
73	Volksbank Welzheim	2	Cooperative
74	VR Bank Muenchen Land	1	Cooperative
75	VR-Bank Passau	1	Cooperative
76	VR-Bank Rhein-Sieg	1	Cooperative
77	VR-Bank Starnberg	1	Cooperative
	Total Number of Observations	336	
	Total Number of Banks	77	
	thereof Private Banks	8	
	thereof Savings Banks	42	
	thereof Cooperative Banks	26	
	thereof Landesbanks	1	

Notes: This table reports the names of the firm's main bank and the number of observations in the full sample.

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