

## Friend or Foe? Crowdfunding versus Credit when Banks are Stressed

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## Friend or Foe? Crowdfunding versus Credit when Banks are Stressed\*

### Abstract

Does bank instability push borrowers to use crowdfunding as a source of external finance? We identify stressed banks and link them to a unique, manually constructed sample of 157 new ventures seeking equity crowdfunding. The sample comprises projects from all German equity crowdfunding platforms since 2011, which we compare with 200 ventures that do not use crowdfunding. Crowdfunding is significantly more likely for new ventures that interact with stressed banks. Innovative funding is thus particularly relevant when conventional financiers are facing crises. But crowdfunded ventures are generally also more opaque and risky than new ventures that do not use crowdfunding.

Keywords: equity crowdfunding, credit crunch, bank stress

JEL Classification: G01, G21, G30

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## 1 Introduction

Akerlof’s (1970) seminal lemons problem epitomizes the key challenge faced by any investor: how to select projects from a pool of opaque applicants. Traditionally, banks help resolve the information asymmetry between savers and investors by developing screening competences and acting as delegated monitors (Diamond, 1984). But dramatically reduced transaction and information acquisition costs, together with historically low interest rates, impede banks’ incentives to engage in costly information generation, which can lead to the contraction of credit (Puri et al., 2011; Jiménez et al., 2012) or misallocated funding to too risky projects (Dell’Ariccia and Marquez, 2004; Jiménez et al., 2014). Against this backdrop, recent studies by Belleflamme et al. (2013) and Mollick (2014) hypothesize that crowdfunding may rival bank finance and connect even small savers with risky new ventures that face traditionally tighter financing constraints (e.g., Cassar, 2004; Robb and Robinson, 2014).

We test whether the wisdom-of-the-(investor)crowd can substitute for bank credit as a major source of funding for new ventures, by exploiting exogenous shocks to young ventures’ banks. We construct a novel, hand-collected data set of ventures’ uses of equity crowdfunding in Germany, their relationships with banks, and various venture traits since 2011. By observing venture-bank relationships, we can identify if ventures connected to shocked banks are more likely to use crowdfunding in an attempt to substitute for contracting bank credit supply. In so doing, we move beyond the admittedly important descriptive evidence in this nascent strand of literature, which does not permit inferences about the causal effects of the determinants of crowdfunding.<sup>1</sup>

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<sup>1</sup> Recent policy (e.g., De Buysere et al., 2014), and academic (e.g., Mollick, 2014;

We also control for observable management and venture traits to determine if more opaque ventures with greater information asymmetries are more likely to use crowdfunding as an alternative source of financing. Greater information asymmetries increase capital costs, which implies a well-known pecking order of capital structure: Internal funds are preferred over debt, and equity is a last resort of funding (Jensen and Meckling, 1976; Myers and Majluf, 1984). To mitigate information asymmetries and facilitate the efficient allocation of financial resources, from savers to productive investors, financial intermediaries can generate private information by establishing close and long-term relationships (Rajan, 1992; Uchida et al., 2012). But relationship lending is costly, so banks may turn down funding requests by promising, yet hard-to-assess projects such as new ventures if they cannot confidently cover the costs associated with producing necessary private information (Rajan, 1992; Petersen and Rajan, 1994, 2002). In this setting, we investigate if ventures tied to banks that struggle to cover the costs of private information generation are more likely to tap a potentially less-than-wise crowd as a funding source.

The financial crisis of 2008 amplified the generally prevalent challenges that young and small ventures confront when trying to raise external finance. In the aftermath of the great financial crisis, the number and volume of equity financing rounds from venture capital sources declined significantly (Block et al., 2010), credit supply tightened in the Eurozone (Hempell and Kok, 2010), and in Germany, even local lenders reduced their loans (Puri et al., 2011). Gorman and Sahlman (1989) and Cassar (2004) caution that credit supply

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Schwienbacher, 2013; Hornuf and Schwienbacher, 2014) light on the potential role of crowdfunding and vividly illustrate the broadening interest in this new form of financing ventures. We instead seek to provide empirical evidence about the causal effects of bank credit crunches.

shocks are especially important for new ventures. However, most existing empirical evidence is geared toward venture capitalist funding (for an overview, see Gompers and Lerner, 2001). The ability of crowdfunding to substitute for bank credit or other sources of external finance, due to its significantly lower transaction costs in the Internet age, in particular remains unclear.

This research gap exists primarily because of the absence of data. We hand-collected a sample of all the ventures that applied for funds on major German equity crowdfunding platforms since 2011. That is, among 357 new ventures for which we have data, 157 applied for equity crowdfunding at one of the six major German online platforms between November 2011 and June 2014, which cover 95% of the total market in terms of offerings and 99% in terms of volume. Figure 1 illustrates the structure of the sample and the main specifications that explain the odds that a venture apply for external funding on a crowdfunding platform conditional on its bank relationship and venture and management traits.

– Figure 1 –

We manually gathered the data for the crowdfunding ventures from each platform webpage and database. For the 200 ventures that did not use crowdfunding, we obtained the venture and management variables from the membership database of the Federal Association of Startups. Thus, in contrast with previous research into crowdfunding (e.g., Belleflamme et al., 2013; Mollick, 2014), we can estimate the probability of tapping the “wisdom of the crowd”, conditional on venture and managerial traits, relative to a relevant comparison group of comparable young ventures that face similar financing constraints.

Another challenge that plagues empirical literature pertaining to the role of

crowdfunding is the notorious unobservability of the arguably most important competing source of external finance: bank credit. Because we collect information about each ventures' bank relationship, we can exploit the heterogeneity in bank distress in the aftermath of the financial crisis and identify credit supply shocks to ventures, according to the health of their main external financier. To our knowledge, this article is the first to seek to identify the effect of bank stress on alternative forms of external finance directly.

In total, we identify 82 banks connected to the new ventures in our sample and specify five alternative indicators of stressed relationship lenders. The main indicator is whether a bank received capital support from the German Special Fund for Financial Market Stabilization ("SoFFin"), which came into effect as of 2008. With an alternative approach, we also classify banks as stressed if they report an existing restructuring plan, according to the comprehensive assessment conducted by the European Banking Authority (EBA) in November 2014, how stable the bank is according to the EBA, how stable the parent of a bank is according to the EBA, and whether a regional savings bank belongs to a Landesbank that was stressed in 2008 (see Puri et al., 2011).

The main results show that ties to a bank bailed out by the SoFFin increase the probability that the venture taps a crowdfunding platforms by 18%. The probability of successfully completing a crowdfunding request increases by 22% though, so the successful completion of a crowdfunding request (the left branch in Figure 1) does not appear to depend on the indicators of bank distress. That is, credit supply shocks determine the choice to seek alternative funding forms, but they do not necessarily discriminate between projects that can or cannot convince the crowd. The positive effect of relationships with crunched banks on the use of crowdfunding remains statistically and economically significant,

even when we control directly for bank financial profiles. Alternative indicators of bank distress, and especially the existence of restructuring plans shared with the EBA, yield qualitatively similar results, though with weaker statistical significance. Regarding other venture and management traits, we find that the likelihood of using crowdfunding is significantly larger for ventures that exhibit lower ratings, are smaller, and have fewer tangible assets. This result may indicate that ventures with greater information asymmetry suffer the most from a credit supply shock, and therefore seek crowdfunding as an alternative. Whether these projects are more likely to be lemons or gems that have been neglected by banks is an important question for further research.

The remainder of this article is organized as follows: Section 2 relates our study to prior literature and provides an institutional background of equity crowdfunding in Germany. In Section 3, we present and discuss crowdfunding data, as well as our identification strategy for bank-venture relationships. We discuss the empirical findings in Section 4 and conclude in Section 5.

## **2 Literature and background**

### *2.1 Bank funding and crowdfunding*

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



and possible investors result in the well-known pecking order of capital (Myers and Majluf, 1984), such that ventures prefer to finance new projects with retained earnings or other internal cash flows, because external funds are more expensive. External debt financing is favored over equity, because the latter dilutes the ownership of the entrepreneur. Robb and Robinson (2014) use the Kauffman Firm Surveys to document the important role of debt at the beginning of a venture's life and suggest that the largest part of total capital comes from outside debt, followed by owners' equity, then insider debt, outside equity, and finally owner debt. Brown et al. (2012) also note the important role for bank debt as a source of funding for new ventures in Germany.

The financial crisis aggravated the financing challenges faced by young ventures during and after 2008 (e.g., Popov and Udell, 2012; Jiménez et al., 2012). Puri et al. (2011) document a credit supply crunch among German local lenders and Hempell and Kok (2010) identify a significant bank lending contraction in Germany from the ECB lending survey. Considering the important role of debt use in entrepreneurial financing, we conjecture that banks transmitting a credit shock may cause the young ventures connected to them to grow more inclined to find new sources of funding, especially if small financing volumes imply high relative transaction costs that are unattractive to large-scale investors (Titman and Wessels, 1988; Robb and Robinson, 2014).

A novel way to reduce transaction costs in entrepreneurial financing is crowdfunding. Schwienbacher and Larralde (2010) provide an overview of nascent equity crowdfunding literature in relation to entrepreneurial finance, in which they discuss why founders choose this source of funding. Hornuf and Schwienbacher (2014) and Mollick (2013) compare crowdfunding to different entrepreneurial financing options. Hemer (2011) emphasizes that the funding

process itself is the decisive difference, because "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) defines equity crowdfunding as a scenario in which supporters or investors receive a stake in the ventures they fund, in the form of profit participation or straight equity.

We similarly define equity crowdfunding as a source of funds, obtained when an entrepreneur sells equity shares of a company to a group of (small) investors through an open call for funding on Internet-based platforms.

## *2.2 Institutional background*

Equity crowdfunding platforms are non-bank financial institutions that provide intermediation services for the offering and sale of stocks and similar securities to the general public. These services include the provision of standardized contracts, technology infrastructure for the transactions, and investor relations. To reduce investors' transaction costs, they also provide standardized information, such as pitch decks, financials, and valuations sourced from the venture, without guaranteeing their correctness though. Most equity crowdfunding platforms do not act as open marketplaces but instead serve as network orchestrators, curating the offerings placed on the platform after a cross-check of formal criteria, such as limited liability and available documentation.

Whereas some platforms allow the direct acquisition of securities in the venture, others act as nominated agents and pool funds. Because they facil-

itate the sale of equity-like instruments without voting rights, the platforms fall outside legal brokerage framework, though rapidly growing crowdfunding markets worldwide have prompted some countries (e.g., Italy, the United Kingdom, France, Germany, Spain) to develop specific crowdfunding regulations, with the goal of protecting unprofessional investors and increasing the transparency of offers in the shadow banking market.

German crowdfunding platforms use financial instruments and equity-like mezzanine capital, such as silent partnerships (*Stille Beteiligungen*) and participation rights (*Genussrechte*). More common debt-like mezzanine instruments take the form of subordinated loans (*Partiarische Nachrangdarlehen*), which are less regulated. The offerings of a venture based on equity-like securities in Germany are limited to EUR 100,000 per year without an official prospectus, which is accepted by the *Bundesanstalt fuer Finanzdienstleistungsaufsicht* (BaFin) as long as there are more than 20 investors or the offering is aimed at unprofessional investors with a share price of less than EUR 50,000. Subordinated loans skirt this problem and allow offerings with higher volumes.

As an intermediary between investors and the ventures looking for funding, the platforms are not directly involved in the financial activity and take on very limited responsibility. Revenue is mostly generated from the success fees for offerings that exceed their minimum requested amount, which range between 5% and 10% of the amount raised. Few platforms operate as full banks, which means they cannot handle the payments on their own and instead must engage an authorized payment service provider or bank, which incurs additional costs of 1% - 3% for the funded venture. Expenses to produce a video, often a core element in an offering, together with the costs of preparing and running the

campaign and maintaining the investor relations afterwards, also must have to be taken into account by the venture.

– Table 1 –

Table 1 provides an overview of the German crowdfunding market. The first six projects were funded at the end of November 2011 on the Innvestment and Seedmatch platforms. As of December 2014, 14 active crowdfunding platforms were facilitating equity crowdfunding or revenue-sharing models in Germany. Nine more platforms started operations but closed before their first offering. The total funding volume of equity crowdfunding platforms in Germany in 2011 was around EUR 0.45 million. It rose to EUR 35.3 million by the end of 2014. Seven of the 14 active platforms had one or no offerings during this period, and 95% of the total volume was raised on five platforms: Seedmatch (approximately EUR 19 million), Innvestment (EUR 2.3 million), Bergfuerst (EUR 4.1 million), Fundsters (EUR 1 million), and Companisto (EUR 7.1 million). In total, 171 offerings by the end of 2014 came from 165 different ventures. Thirteen offerings were unsuccessful in that the minimum amount the venture requested by the company was not raised during the funding process.

### **3 Sampling and identification**

#### *3.1 Sampling*

To identify the differential effect of a credit supply shock on the inclination of ventures to seek crowdfunding, we sample new ventures that use or that do not use crowdfunding, as shown in Figure 1. We begin with the members of the

Federal Association of Startups in Germany (*Bundesverband Deutsche Startups*). It had 264 members by the end of 2014, of which 64 used crowdfunding. The formal prerequisites to be listed on a German crowdfunding platform are very similar to those required for a membership in the association. We thus identified 93 crowdfunding offerings with available information that applied for funding through the German crowdfunding platforms Bankless24, Bergfuerst, Companisto, Fundsters, Innvestment, Mashup Finance, or Seedmatch between November 2011 and December 2014. The resulting sample included 157 ventures that used crowdfunding (Group 1) and 200 ventures that did not (Group 2). Figure 1 also indicates, which of these ventures completed the funding request. The comparison of their descriptive statistics confirms that we compare very similar ventures.

We obtain the data by continuously pulling information from each crowdfunding platform’s webpage. The dependent variable is an indicator equal to “1” if the venture attempted to obtain external finance through crowdfunding and “0” otherwise. Of all 157 offerings, 85% were successful, and the ventures raised about EUR 200,000 from 280 investors on average. With an average company valuation of approximately EUR 1.95m, the investors acquired about 10% of a venture. Before turning to the ventures’ characteristics, we explain how we collected the data about the venture-bank relationships that we used to identify the effects of bank stress on the odds of using crowdfunding.

### *3.2 Identification through bank bailouts*

To assess the role of equity crowdfunding as a way to mitigate credit constraints of young ventures, we seek to compare the conditional likelihood that new ventures seek crowdfunding, according to whether they are tied to healthy

banks or stressed banks.

To this end, we collect bank-venture relationships for all 357 ventures from the Creditreform database. For each company, it provides a unique bank identification number that indicates the financial institutions with which it has a major credit relationship. We combine these data with the BaFin database to control for consolidation and obtain complete bank names. In total, we identify 82 banks (see Table 10), which we categorize as stressed or healthy, according to the five alternative criteria illustrated in Figure 2.

– Figure 2 –

For the 82 banks, our base-line identification defines stressed banks as those that received equity support from the SoFFin. 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 collapse of Lehman Brothers. The fund was designed to strengthen the capital base of German banks that were hit by taking over problematic positions and providing other guarantees. It had supported a total of 10 German banks since its inception, with a total volume of outstanding equity and guarantees of 192 billion Euros in 2009. By the end of 2014, the SoFFin remained exposed to three German banks with share and hybrid capital equivalent to a total volume of about EUR 17bn.

We matched the bank names from the Creditreform database with public information about which banks were supported by the SoFFin. However, ventures may self-select into bank relationships depending on the health of that bank. For example, participating in the SoFFin support program may induce certain entrepreneurs to avoid seeking credit from such a bank.

Therefore, we also define stressed banks by using the comprehensive assessment by the European Banking Authority (EBA) that took place in November 2014, which is *after* we observe the crowdfunding choices of new ventures in this sample. The assessment by the EBA cannot by itself indicate credit supply strain; rather, it offers a testimony of systemic relevance. Our first EBA based measure of stress is therefore whether a bank had a restructuring plan in place before 2013. As illustrated in Figure 2, we distinguish generally between banks assessed directly by the EBA and those connected to a bank holding company that was assessed. Finally, we consider any regional savings banks connected to a Landesbank distressed, because their responsible bank holding company was exposed to the US subprime market shock (Puri et al., 2011).

We also follow Berger and Udell (2004) and calculate CAMEL (i.e., capital, asset quality, management quality, and liquidity) covariates for every bank, which we use as proxies for its financial health. Table 2 offers an overview of the descriptive statistics of the CAMEL covariates, separated by the different stress indicators.

– Table 2 –

Banks that are supported by the SoFFin or have an affiliation with a stressed Landesbank exhibit worse CAMEL profiles than non-supported or un-affiliated banks. Table 3 summarizes the results of the EBA’s EU-wide stress tests as additional indicators of stressed banks. Of the 82 banks in the sample, 6 were assessed directly. The parents of another 36 banks were assessed indirectly. Half of the directly assessed banks had a restructuring plan before 2013, and their Common Equity Tier 1 ratio in the fully loaded adverse scenario was 7.1% on average. The indirectly tested banks also exhibited similar traits.

### 3.3 *Venture and crowdfunding traits*

Table 4 provides an overview of the crowdfunding offerings of the ventures in the sample that had no missing values. Horizontally, we distinguish three panels. The first depicts the traits of firms that use and do not use crowdfunding, such as firm size and other factors motivated by venture capital literature and discussed more extensively in the Results section. Within each panel, we depict the descriptive statistics for ventures with a relationship to a bank that is supported by the SoFFin, which is our main indicator of bank distress.

Regarding venture characteristics, we find that crowdfunding users with ties to stressed bankers tend to exhibit higher asset tangibility, are significantly less often located in cities, and have better credit ratings. Yet the ventures do not differ in terms of size, female board participation, the number of board members, or receipt of a supporting scholarship from the federal government. The right-hand panel also clearly illustrates that none of the differences between firms tied to stressed versus healthy banks are significantly different when we compare crowdfunders with non-crowdfunders. Thus, we need a statistical approach to identify the factors that predict which type of ventures use crowdfunding.

The second panel shows the crowdfunding characteristics. New ventures did not differ significantly in terms of crowdfunding volumes, the number of investors, or firm valuations in the comparison of firms tied to stressed banks versus those connected to non-SoFFin banks. The only significant difference



is the lower success rate of obtaining the aimed volume when the bank of a venture is stressed. Finally, the third panel shows that our indicator of bank government support in 2008, SoFFin, effectively gauges the significant difference in financial profiles, reflected by the so-called CAMEL profiles of banks. We discuss the individual effects of these variables subsequently; here, we limit ourselves to noting the upshot of this result: Banks supported by the SoFFin differ significantly, and these differences should help predict, which firms use crowdfunding as a substitute for bank finance.

## 4 Model and results

### 4.1 Specification and baseline results

Table 5 contains the descriptive statistics for our main test variable, an indicator variable (*soffin*) that takes a value of “1” if the bank is supported and “0” otherwise. In total, 24% of all ventures in the sample have a relationship to a bank supported by the SoFFin. However, the share of companies whose bank is supported by the SoFFin is 37% among the group of ventures that used crowdfunding – more than twice the share of the group of ventures that did not use crowdfunding (15%). A venture facing larger credit constraints thus appeared more likely to apply for crowdfunding, after we control for several venture traits, as we discuss shortly.

– Table 5 –

We predict the likelihood that a venture  $i$  applies successfully for crowdfunding  $y_i = 1$ , conditional on venture traits  $x_i$  and whether it is tied to a bank that was bailed out by the *soffin* <sub>$i$</sub> . We use a logit model as a baseline

specification and estimate:

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

In addition to our main variable to test for SoFFin support, we added the covariates summarized in Table 4 and defined in Table 11 step-by-step. Table 6 contains the marginal effects of the baseline logit regression model to explain crowdfunding.

– Table 6 –

A range of goodness-of-fit indicators, the Pseudo  $R^2$ , and Nagelkerke’s  $R^2$  support the good discriminatory power of the model, despite the relatively low sample size (Hosmer and Lemeshow, 2012). We also compare the predicted probabilities against a moving average of the proportion of cases using a locally weighted scatterplot smoothing graph, which confirms the fit of the model. Likewise, the area under the receiver operating characteristic curve (“AURROC”) of 0.84 for Column 7 in Table 6 strongly indicates that the probability of using crowdfunding is explained quite well by the covariates.

The comparison of the coefficients across ordinary least squares, logit, and probit models tells a qualitatively similar story about the impact of a regressor on the probability of crowdfunding. Robust estimation procedures are qualitatively similar, mitigating potential misspecification concerns. Henceforth, we report the results from the logit regressions.

The marginal effect of the main variable of interest shows that the likelihood of applying for crowdfunding increases when a venture’s bank is supported by the SoFFin. The marginal effect is positive and statistically significant in all

models. Economically, the effect in column (7) is also important. If a new venture is connected to a bank supported by the SoFFin, the probability that it applies for crowdfunding increases by 17.5%. Against the backdrop of an unconditional probability to apply for funds of 43.9% (=157/357), this effect is large.

These results support the hypothesis that young ventures are more likely to tap innovative, alternative sources of external funding, especially then when their conventional providers of credit are stressed. To assess whether this result is driven by observable traits related to the degree of information asymmetries and the quality of the venture, we discuss individual control variables next.

#### 4.1.1 *Credit Scores*

Credit scores are a common tool that banks use to evaluate ventures' loan applications, but it is unclear if these ratings affect the availability of debt for young ventures. Robb and Robinson (2014) explore this question with U.S. data from the Kauffman Survey, and observe that information about the ventures' past payment behavior can have a negative effect on access to finance among young ventures. Brown et al. (2012) confirm this view and suggest that information provided by an external credit agency can affect the availability of financing for young ventures; ventures with a good rating have better chances of obtaining a loan, whereas ventures with bad ratings face difficulties getting a loan. In line with prior literature, we expect that ventures with bad credit scores are more likely to use crowdfunding.

External credit ratings provided by Buergel range from A (good) to C (bad). The underlying variable (*credit*) is coded accordingly, such that rating class A takes a value of "1", indicating that the business relation is approved; rating

class B is coded "2", which covers approvable business relations and class C is coded with "3", or a bad rating, which means that the business relation is a matter of trust or discretion. Buergel is one of the largest databases on German companies, with more than 3.9 million entries. With BoniCheck, a product of Euler Hermes, it offers an instrument for assessing ventures' solvency. From the Buergel database, we deduced whether an external credit rating, in the form of the BoniCheck indicator, was provided for each venture and, if so, what that rating was. Similar to the credit scores provided by Creditreform or Dun & Bradstreet, the BoniCheck relies on past payment behavior, relative to trade credit from utilities and suppliers. This information is complemented by Buergel's subjective assessment of the ventures' future ability to fulfill credit obligations, derived from information about the ventures' order situation or industry (Brown et al., 2012).

The distribution of good, fair, and bad credit scores is comparable within both groups, exhibiting a total mean of 1.88, or a fair score on average. The estimated marginal effect of credit ratings is significantly positive in all models. A bad credit rating increases the probability of using crowdfunding by 31.2% compared with ventures that have a fair rating.

#### *4.1.2 Size*

The decision to finance a venture is based on many factors. Larger ventures can use economies of scale to reduce information asymmetries, but they also have access with different sources of financing, because their risk exposure and the scale of transaction costs differ. They often own more pledgeable collateral and have more diverse cash flows. Small ventures instead are informationally more opaque. Thus, size is an important choice factor when it comes to financ-

ing young ventures (Berger and Udell, 1998). Small ventures often struggle to resolve informational asymmetries with investors and lenders at acceptable costs, and they therefore are exposed to higher charges for smaller amounts of capital. Transaction costs also influence funding methods. Small amounts often incur relatively high transaction costs, which is why some available sources for certain kinds of ventures are not relevant (Titman and Wessels, 1988). For example, the public issues of equity shares during an initial public offering requires a scale that most small companies cannot reach in their early stages, so small ventures are excluded from this type of financing (Cassar, 2004).

In summary, smaller ventures often face problems obtaining traditional sources of outside financing, which could influence their use of crowdfunding. Empirical studies generally propose a positive link between venture size and outside financing, leverage, and bank financing (Coleman, 2000; Cosh et al., 2009). Therefore, we expect that smaller ventures are more likely to use crowdfunding than large ones.

The mean size (log of total assets) of the sample ventures is 11.78. Ventures that made no use of crowdfunding are larger in terms of total assets, with a log of 12.35 ( $\approx$  EUR 230.000), than ventures that use of crowdfunding, whose logged size was 10.99 ( $\approx$  EUR 60.000). We specify the log of assets to measure *size* so that we can mitigate the influence of outliers in the skewed size distribution.<sup>2</sup>

The coefficient for *size* is negative and statistically significant in all models. In line with the expected effect, the coefficient estimate indicates that smaller

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<sup>2</sup> Alternative treatments of the outliers, such as winsorizing, did not alter our results qualitatively.

ventures are more likely to use crowdfunding; a greater size, in terms of logged total assets, decreases the probability per unit change by 8%.

#### *4.1.3 Tangibility*

Another trait related to financing, particularly for young ventures, is the structure of their assets (Cassar, 2004). In case a bankruptcy occurs, the financial loss for investors can be reduced if the assets are more tangible and generic (Harris and Raviv, 1991; Titman and Wessels, 1988). Moreover, the adverse selection and moral hazard costs should decrease when ventures pledge assets as collateral or charges get fixed on the tangible assets. Tangible assets increase liquidation value, so companies with a higher share of tangible assets should gain access to traditional sources of finance more easily. The lower costs of financing then tend to result in a higher degree of leverage in the capital structure of these ventures. Empirical evidence suggests that banks base their financing decision, to a certain degree on whether they can hedge the loan with tangible assets (Berger and Udell, 1998; Storey, 1994). Considering the substantial information asymmetries at the beginning of a venture's life cycle and the information needed to forecast future development, investors have relatively few ways to reduce their risk exposure, other than relationship banking. The asset structure, in terms of the share of tangible assets, often serves as a screening tool for banks, such that it has significant effects on financing at the beginning of a venture (Cassar, 2004). Consistent with theoretical predictions, some authors suggest a positive relationship between the share of tangible assets and leverage for large ventures, but research pertaining to small ventures is rare, with a just a little evidence of a relationship between the asset structure and the use of debt (e.g. Michaelas et al., 1999). Nevertheless, we expect that the lower the share of tangible assets of a venture, the

higher the likelihood of using crowdfunding.

To calculate the asset structure of each venture for every year since its foundation, we divided the non-current assets by total assets, then take the average of these values to define the variable (*tangibility*), ranging from "0" to "1". For the entire sample, tangible assets constitute around 15% of the total assets of the ventures, but among ventures that did not use crowdfunding, the average tangible assets were greater 18% than it was for ventures that used crowdfunding (10%).

The coefficients for the *tangibility* variable also were negative in all models and significantly different from zero. Therefore, ventures with a lower share of tangible assets appear to have a higher probability of using crowdfunding. A 1% decrease in the share of tangible assets increases the probability of using crowdfunding by about 0.4%.

#### *4.1.4 Characteristics of the Management Team and Venture*

Financial ratios and external ratings alone cannot explain the financing decisions of new ventures. Regarding young ventures in particular, many investors include the owner or management team in their assessment, because their importance during the first years of operations cannot be underestimated (Cassar, 2004). For example, due to credit discrimination or the risk aversion of some financiers, the gender composition of the management team can influence the capital structure (Coleman, 2000). Arenius and Autio (2006) provide evidence that female-owned businesses are often financed differently than male-owned businesses. Other authors suggest that female-owned ventures have worse initial economic conditions, with a lower capital base (Verheul and Thurik, 2001), and they face the problem of being less likely to obtain

external funding (Coleman, 2000). Furthermore, they usually use different sources to finance their business than do male-owned ventures (Neider, 1987; Lerner et al., 1997) and face particular difficulties applying for and securing bank loans (Riding and Swift, 1990; Coleman, 2000; Anna et al., 2000). Ventures with mixed gender or purely female teams thus may be more likely to use crowdfunding than ventures with a male management team.

The number of members in the management team also can affect the chances of obtaining external capital. Chandler and Hanks (1998) show that ventures founded and led by a team often are 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 ventures attracting external financing. Therefore, we posit that ventures with smaller management teams are more likely to use crowdfunding.

To control for management team characteristics, we add the number of management team members (*heads*) and the gender composition of the management team. The latter is specified as an ordinal variable (*gender*), with "1" indicating a male-only team, "2" a mixed team, and "3" a female-only team. Most of the management teams in the sample were purely male, as the 1.21 mean for the gender composition shows. Ventures that used crowdfunding included slightly more women in their teams (1.38) than ventures that did not use crowdfunding (1.1). With respect to the number of heads in the management team, the groups were comparable, with a total average of 1.59 persons, though the ventures that did not use crowdfunding were slightly larger on average.

The scholarship variable indicated whether the venture received support from the Federal Ministry of Economics and Energy ("Bundesministerium für



Wirtschaft und Energie”, BMWi), in the form of an EXIST founder scholarship, a nationwide funding program, which supports innovative businesses that started in universities and research institutions during their early phases, such that it could be interpreted as a signal of quality. Approximately 20% of the ventures in the sample received this kind of support, with similar distributions across ventures that used and did not use crowdfunding.

Most financiers invest only within a close geographic scope (Gupta and Sapienza, 1992), and rural areas are often characterized by worse access to financing (Strotmann, 2006). Therefore, ventures from rural areas should exhibit a higher likelihood of using crowdfunding than ventures from urban areas. The dichotomous variable (*city*) equals "1" if the headquarters is located in a city with more than 500,000 (urban) inhabitants and "0" otherwise (rural). Of all ventures, 73% are located in cities with more than 500,000 inhabitants, though ventures that did not use crowdfunding were slightly more often located in urban areas (74%) than ventures that used crowdfunding (73%).

The hypothesis for the city variable predicted that ventures in rural areas should have a higher likelihood of using crowdfunding, because they have less access to finance. The coefficient for this variable was not statistically significant though, the negative sign indicated that ventures in rural areas are more likely to use crowdfunding.

In the last model in Table 6, the variables capturing the number of management heads and the location of the headquarters are both negative but not significant. The existence of a scholarship seems to increase the probability of using crowdfunding but is also not different from zero. The gender composition also has an important role, with a positive effect of using crowdfunding when the management team is female. Compared with solely male teams, the

probability of using crowdfunding increases significantly by 28% when there are male and female heads and by about 42% when the management team is purely female.

#### *4.1.5 Rating of Sophisticated Investors*

A business plan is one of the most important steps to take when launching a venture. In addition to providing economic efficiency, it exists mainly to raise funds to start or expand a project. Mason and Harrison (1996) thus assert that the business plan is the minimum requirement for any financing application, because more than three-quarters of business angels base their investment decision on this document. Different studies investigate the decision-making process adopted by venture capital companies and suggest that the owner, the business strategy, and financial issues are not the only determinants of investment decisions (Zacharakis and Meyer, 1998; Hall and Hofer, 1993). Many investors focus on product potential, industry-specific outlooks, and growth opportunities. Sweeting (1991) shows that equity investors typically spend less than 10 minutes on the first screening, and Hall and Hofer (1993) indicate that they spend less than six minutes. Business angels typically devote up to nine minutes to the screening process (Mason and Rogers, 1997). As an emergent and therefore rather unusual tool for financing a venture due to possible legal uncertainties, crowdfunding likely represents a second choice, such that ventures likely tried to obtain funds through traditional sources of capital first. Therefore, we expect that ventures that do not provoke detailed investigation or consideration by sophisticated investors are more likely to use crowdfunding.

The funding decision is often modeled as a stepwise process (Haines et al.,

2003), with three different phases: the initial screening, the detailed investigation, and the negotiation and deal closing. The information provided on the ventures' websites provides a way to imitate the screening process and obtain ratings from different, sophisticated investors about the quality of the ventures in the data sample, as well as whether they would move on to the second step of the process, the detailed investigation, or would decide not to pursue them after the first screening. To gather this measure, we presented all the ventures to seven different equity investors from Germany, who indicated if they would further investigate investing in each venture. To avoid bias, the selected investors differed in their characteristics, such as deal volume, industry focus, type, and location. The variable (*rating*) is the sum of the single ratings, which provide a dummy variable equal to "1" for interesting follow-up investment opportunities and "0" for ventures that the investors would not take into consideration. The average rating was almost identical for both groups. On average, about 50% of the investors would take a venture from the sample into consideration for further investigation, and the difference between the groups was small. This last explanatory variable controls for whether the ventures used crowdfunding because they were not considered for detailed investigation by sophisticated investors. Although the negative coefficient of the rating variable indicated that ventures classified as non-qualified for further investigation by investors had a higher probability of using crowdfunding than companies that were considered by more investors, the coefficient was not significantly different from zero.

#### *4.2 Bank characteristics*

A possible concern in our analysis is that our results could be driven by unobservable bank characteristics that may be correlated with the SoFFin indicator and subsequent lending and risk taking. The SoFFin indicator could therefore merely confound unobserved traits with credit supply crunch effects.

To mitigate this concern, we included bank-level control variables in a next step, measured as the average over the period 2009-2014. They included the same control variables we described previously, such that we considered various proxies of financial health, measured according to the CAMEL supervisory ratings system (i.e., capital, asset quality, management quality, and liquidity). Table 7 reports the results of the baseline model with a stepwise integration of CAMEL covariates.

– Table 7 –

The positive effect of crunched banks on the use of crowdsourced finance indicated by support from the SoFFin, remained statistically and economically significant even when we controlled directly for financial bank profiles. The concern that the SoFFin indicator merely confounded unobserved traits as credit supply shocks thus was invalidated by the intact, significant SoFFin effect.

#### *4.3 Alternative bank stress indicators*

Some of the ventures were founded after the capital injections by the SoFFin, so that our results could be driven by the ventures' choice of a bank

supported by the SoFFin, rather than a non-supported bank. Table 8 shows the effect of the alternative bank stress indicators illustrated in Figure 2.

– Table 8 –

Column (1) replicates the baseline results with bank-specific controls. The alternative bank stress indicators in column (2) refer to the connection of one of the local savings banks with a stressed Landesbank, as in Puri et al. (2011). These authors show that local savings banks restricted loan supply when they were connected to a Landesbanken with substantial subprime exposure. We similarly include an indicator of whether a regional savings bank in our sample belonged to a stressed Landesbank. Although the marginal effect of the Landesbanken variable was positive, indicating a higher probability of using crowdfunding when the respective bank of a venture belonged to a stressed Landesbank, the coefficient was very small and not significant.

Next, we included the results of the EU-wide bank stress test by the EBA, published in November 2014, because it gauges information that was not available to ventures that might have selected banks on quality. First, we used the EBA variable which indicates whether a bank was assessed directly or indirectly, and we split this sample into directly assessed banks and banks with holdings in directly assessed banks in column (3). The direct assessment by the EBA is only an indication of systemic importance, according to the regulator, we separately specify in columns (4) and (5), whether a bank was assessed directly or merely connected to a holding company that was stress tested by the EBA. The effect of being directly assessed by the EBA was generally similar to the SoFFin indicator in that it was positive, but it could not be estimated with sufficient precision to confirm statistical significance. Distinguishing between directly and indirectly assessed banks shed further light on the EBA

assessment indicator: Whereas the effect of a direct assessment increased the probability of using crowdfunding by about 10%, the indicator of indirectly assessed banks was not significant.

In column (6), we specify a more direct measure of the health of the banks tested (direct and indirectly). Financial institutions reported, during the comprehensive assessment in November 2014, whether they had a restructuring plan in place before December 2013. The new ventures, sampled between 2011 and 2014, are unlikely to have had full knowledge of such restructuring initiatives when choosing whether to apply for crowdfunding, conditional on their existing bank relationships. For the restructuring plan variable, the marginal affirmed indeed that the probability of using crowdfunding increased by 17%.

Finally, in columns (7) through (10), we specify a range of interaction terms of the direct assessment in the EBA test and the respective outcomes (i.e., CET1 ratio in the adverse scenario 2016, the difference between the CET1 ratio in the adverse scenario 2016 and the CET1 ratio starting in 2013, and an binary indicator of whether the CET1 ratio in the adverse scenario 2016 was lower than 6%). These results corroborate prior findings that new ventures with ties to banks that had restructuring plans in place and were tested directly by EBA were more likely to tap crowdfunding.

In summary, for a range of alternative indicators of bank distress, and in particular the existence of restructuring plans shared with the EBA, we found results that were qualitatively similar to those we obtained with the SoFFin indicator, albeit with some weaker statistical significance.

#### 4.4 *Using vs. successfully completing crowdfunding*

The previous analysis indicates that ventures are more likely to use crowdfunding when their bank is stressed. But applying for crowdfunding does not automatically imply the successful completion of the funding request. Only 85% of the ventures in our sample were able to convince the crowd and collect the minimum requested funding volume. Thus, the wisdom of the crowd may be just as skilled as conventional intermediaries in selecting lemons out of the pool of applicants.

To test this conjecture, we differentiated between ventures that applied for crowdfunding and those that successfully obtained crowdfunding financing as a function of stressed versus healthy bank relationships. With this information, we provide more direct evidence of whether the wisdom of the (investor) crowd can substitute for bank credit as a major funding source of new ventures if banks are shocked.

– Table 9 –

In Table 9, we compare (1) the probability of applying for crowdfunding with (2) the probability of successfully completing a crowdfunding request in the full sample and (3) the probability of successfully completing a crowdfunding request among ventures that applied for crowdfunding. The relationship with a stressed bank increased the probability of using crowdfunding in the baseline model by 17%, and the same variable explained an increase of 22% in the probability of successfully completing a crowdfunding request. The successful completion of a crowdfunding request among the 157 ventures only did not depend on indicators of bank distress. Thus, credit supply shocks appear to determine the choice to seek alternative funding forms, but do not necessarily

discriminate between projects that can or cannot convince the crowd.

## 5 Conclusion

Financing is a key component of entrepreneurial activities. By observing, which ventures cooperated with banks that had to be bailed out by the German government, we identify an effect of an exogenous credit supply shock on the likelihood of using equity crowd funding. To this end, we manually collected a unique data set that provided information about the financing decisions of young ventures in Germany. Specifically, we used data from 357 young ventures to test how certain characteristics, in terms of bank relationship, size, asset structure, and other factors, affect the probability that the venture will use crowdfunding.

Our results show that a relationship of a venture with a bailed out bank increases the probability that a venture uses crowdfunding by 18%. This effect is both economically and statistically significant. The analysis also shows that bad credit scores increase the probability that a venture uses crowdfunding by 31%. Supply-side restrictions move banks to handle their lending more restrictively, and ventures that cannot demonstrate their creditworthiness are not financed. This result suggests that among opaque new ventures, riskier projects tend to tap equity crowdfunding instead of bank financing.

We also find that smaller ventures and ventures with fewer tangible assets are more likely to use crowdfunding. The small amounts obtained in a crowdfunding offering makes this finding plausible. Larger ventures often need greater volumes and have access to other or cheaper sources of capital, such as initial public offerings. Management team characteristics have no statistically



significant effect. Likewise, the rating of the venture's quality by experts, the location of the headquarters, the receipt of a scholarship, and the number of heads all showed no significant influence on a venture's use of crowdfunding. That is, the use of crowdfunding is not a question of management or other organizational factors.

The most important finding is that ventures 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 critical source of capital in stressful times for banks.

Table 1  
German Crowdfunding Market Overview

Platform	Year	2011	2012	2013	2014	Total
Bankless24		-	-	0.18 (2)	0.37 (4)	0.55 (6)
Bergfuerst		-	-	3.0 (1)	1.1 (1)	4.1 (2)
Companisto		-	0.55 (6)	2.65 (15)	3.9 (9)	7.1 (30)
Fundsters		-	-	0.56 (5)	0.48 (6)	1.04 (11)
Innovestment		0.1 (2)	1.0 (13/8)	0.85 (11/4)	0.3 (7)	2.25 (33/12)
Mashup Finance		-	0.1 (1)	0.11 (1)	-	0.21 (2)
Seedmatch		0.35 (4)	2.2 (22)	7.32 (22/1)	9.17 (20)	19.04 (68/1)
Others		-	0.0 (1)	0.55 (11)	0.45 (7)	1.0 (19)
Total		0.45 (6)	3.85 (43/8)	15.22 (68/5)	15.77 (54)	35.29 (171/13)

Notes: This table presents the volume raised in the German equity crowdfunding market with successful campaigns, in millions of EUR, during the period 2011-2014. The number of (successful/unsuccessful) offerings appear in brackets. Source: Own elicitation.



Table 3  
Descriptive Statistics: EBA Stress Tests

	<u>EBA indirect</u>				<u>EBA direct</u>				<u>Total</u>			
	Mean	SD	p5	p95	Mean	SD	p5	p95	Mean	SD	p5	p95
CET1 16	0.073	0.009	0.055	0.085	0.071	0.018	0.055	0.107	0.073	0.010	0.055	0.085
Restructuring plan	0.472	0.506	0	1	0.500	0.548	0	1	0.476	0.505	0	1
CET1 16 - CET1 13	0.050	0.018	0.016	0.080	0.044	0.023	0.018	0.080	0.049	0.019	0.016	0.080
CET1 16 < 8%	0.861	0.351	0	1	0.833	0.408	0	1	0.857	0.354	0	1
Observations	36				6				42			

Notes: These descriptive statistics refer to the results of the EBA, EU-wide stress tests conducted in October 2014 on the bank level. The statistics refer to all tested banks in the full sample (42 banks, 282 relationships) and separately for ventures with a direct relationship to a tested bank (6 banks, 207 relationships) and an indirect relationship to a tested bank (36 banks, 75 relationships). For each variable, the table presents the mean, standard deviation, 5th percentile, and 95th percentile.

Table 4  
Descriptive Statistics of Ventures, Crowdfunding Projects, and Associated Banks

Crowdfunding SoFFin	Yes						No						
	Mean	SD	Mean	SD	Difference in Means	Equal Variances	Mean	SD	Mean	SD	Difference in Means	Equal Variances	Diff-in-Diff
Venture Characteristics													
Credit	2.043	0.629	2.143	0.692	-0.099	yes	1.661	0.524	1.810	0.750	-0.148	no	-0.049
Size	10.866	1.576	11.226	1.315	-0.360	yes	12.317	1.826	12.513	1.586	-0.196	yes	0.165
Tangibility	0.123	0.137	0.069	0.089	0.054**	no	0.184	0.212	0.216	0.204	-0.033	yes	-0.087
Gender	1.449	0.777	1.286	0.667	0.164	yes	1.081	0.351	1.000	0.000	0.081**	no	-0.083
City	0.638	0.484	0.857	0.355	-0.219**	no	0.742	0.439	0.810	0.402	-0.068	yes	0.152
Heads	1.464	0.655	1.629	0.843	-0.165	yes	1.653	0.722	1.667	0.796	-0.013	yes	0.151
Rating	3.275	1.235	2.486	1.337	0.790*	yes	3.419	1.362	3.381	1.396	0.038	yes	-0.751*
Scholarship	0.203	0.405	0.200	0.406	0.003	yes	0.218	0.414	0.143	0.359	0.075	yes	0.072
Crowdfunding Characteristics													
CF Min. Amount	69,936	116,214	53,164	20,022	16,771	yes							
CF Max. Amount	271,052	434,322	272,857	495,471	-1,805.0	yes							
CF Realized Amount	216,295	385,257	233,773	498,250	-17,478.1	yes							
CF Success	0.797	0.405	0.914	0.284	-0.117*	no							
Number of CF Investors	289.672	328.759	315.000	337.048	-25.33	yes							
Firm Valuation before CF	2,253,699	2,719,899	1,907,944	1,131,583	345,754	no							
Bank Characteristics													
Capital	0.049	0.023	0.030	0.002	0.019***	no	0.051	0.040	0.029	0.000	0.0216***	no	0.003
Asset Quality	0.002	0.004	0.008	0.001	-0.006***	no	0.004	0.012	0.008	0.000	-0.004	yes	0.001
Management	0.726	0.085	0.747	0.074	-0.021	yes	0.772	0.387	0.734	0.000	0.038	yes	0.058
Earnings	0.047	0.025	-0.027	0.030	0.074***	yes	0.044	0.021	-0.022	0.000	0.066***	no	-0.009
Liquidity	0.386	0.326	0.418	0.054	-0.032	no	0.427	0.340	0.428	0.000	-0.001	no	0.031
Sec./Ear. Assets	0.427	0.204	0.525	0.038	-0.097***	no	0.414	0.213	0.531	0.000	-0.117***	no	-0.020
Fees/Interest	0.414	0.210	0.501	0.095	-0.087***	no	0.425	0.218	0.517	0.000	-0.093***	no	-0.005
Observations	69		35				124		21				

Notes: Descriptive statistics for the outcome of the equity crowdfunding offerings, characteristics of the ventures, and bank characteristics over the period 2011-2014 in Germany on the venture level, separated by the SoFFin indicator. The sample includes all ventures with no missing values. For each variable, the table presents the mean, standard deviation, 5th percentile, 95th percentile, difference-in-means, and difference-in-differences. A offering is successful when the realized amount is larger than the minimum amount requested. Monetary variables are in thousands of EUR.

Table 5  
Descriptive Statistics: Stress Indicators

	<u>Crowdfunding</u>										<u>Total</u>				
	no					yes					Obs.	Mean	SD	p5	p95
	Obs.	Mean	SD	p5	p95	Obs.	Mean	SD	p5	p95	Obs.	Mean	SD	p5	p95
SoFFin	200	0.145	0.353	0	1	157	0.369	0.484	0	1	357	0.244	0.430	0	1
Landesbanken	200	0.100	0.301	0	1	157	0.115	0.320	0	1	357	0.106	0.309	0	1
EBA	200	0.765	0.425	0	1	157	0.822	0.384	0	1	357	0.790	0.384	0	1
EBA direct	200	0.550	0.499	0	1	157	0.618	0.488	0	1	357	0.580	0.494	0	1
EBA indirect	200	0.215	0.412	0	1	157	0.204	0.404	0	1	357	0.210	0.408	0	1
Restructuring plan	153	0.307	0.463	0	1	129	0.566	0.498	0	1	282	0.426	0.495	0	1

Notes: These descriptive statistics reflects the characteristics of the stress indicators in the full sample. Statistics are presented for all ventures in the full sample (357 ventures) and separately for ventures that used crowdfunding (157 ventures) over the period 2011-2014 and ventures that not use crowdfunding (200 ventures). For each variable, the table presents the mean, standard deviation, 5th percentile, and 95th percentile.

Table 6  
Marginal Effects for the Use of Crowdfunding

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SoFFin	0.285*** (0.052)	0.253*** (0.052)	0.263*** (0.048)	0.270*** (0.049)	0.188*** (0.059)	0.189*** (0.062)	0.175*** (0.058)
Credit							
fair		0.137** (0.058)	0.090 (0.058)	0.084 (0.058)	0.048 (0.063)	0.095 (0.065)	0.046 (0.062)
bad		0.487*** (0.082)	0.427*** (0.086)	0.416*** (0.087)	0.334*** (0.100)	0.381*** (0.102)	0.312*** (0.100)
Gender							
mixed			0.323** (0.118)	0.337** (0.117)	0.334** (0.121)	0.218 (0.137)	0.284** (0.126)
female			0.393*** (0.079)	0.399*** (0.078)	0.401*** (0.101)	0.457*** (0.093)	0.409*** (0.103)
City				-0.050 (0.053)	-0.003 (0.059)	-0.059 (0.061)	-0.014 (0.058)
Heads				-0.008 (0.032)	-0.011 (0.037)	-0.025 (0.038)	-0.005 (0.036)
Rating				-0.017 (0.016)	-0.019 (0.018)	-0.024 (0.019)	-0.023 (0.017)
Scholarship				0.068 (0.058)	0.015 (0.064)	0.037 (0.066)	0.016 (0.062)
Size					-0.086*** (0.014)		-0.078*** (0.014)
Tangibility						-0.006*** (0.002)	-0.004** (0.002)
Observations	357	357	357	357	249	249	249
Pseudo $R^2$	0.049	0.107	0.157	0.164	0.260	0.202	0.280
Nagelkerke's Pseudo $R^2$	0.087	0.182	0.260	0.270	0.401	0.323	0.426
AUC	0.612	0.705	0.749	0.763	0.828	0.777	0.837

Notes: This table presents the average marginal effects from logit regression, where the dependent variable is the use of crowdfunding. The sample consists of the 157 ventures that used crowdfunding and 200 ventures that did not use crowdfunding. The variable definitions are provided in the Appendix. Standard errors appear in brackets. Significance levels are as follows: \*=10%, \*\*=5%, \*\*\*=1%.

Table 7  
Marginal Effects: Use of Crowdfunding with Bank Characteristics

Treatment Effect	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SoFFin	0.172*** (0.061)	0.224*** (0.068)	0.175*** (0.058)	0.207** (0.099)	0.174*** (0.058)	0.169*** (0.059)	0.174*** (0.059)	0.279** (0.138)
<u>venture characteristics</u>								
Credit fair	0.046 (0.063)	0.039 (0.063)	0.046 (0.063)	0.046 (0.062)	0.045 (0.062)	0.046 (0.062)	0.046 (0.063)	0.027 (0.062)
bad	0.311*** (0.100)	0.314*** (0.099)	0.311*** (0.100)	0.310*** (0.100)	0.313*** (0.100)	0.306*** (0.100)	0.312*** (0.100)	0.294*** (0.099)
Gender mixed	0.283** (0.126)	0.290** (0.124)	0.283** (0.126)	0.282** (0.126)	0.290** (0.126)	0.278** (0.127)	0.283** (0.126)	0.310** (0.125)
female	0.408*** (0.103)	0.404*** (0.103)	0.408*** (0.103)	0.404*** (0.104)	0.408*** (0.104)	0.409*** (0.102)	0.410*** (0.102)	0.391*** (0.105)
City	-0.017 (0.061)	0.003 (0.059)	-0.012 (0.059)	-0.018 (0.059)	-0.009 (0.060)	-0.024 (0.061)	-0.016 (0.060)	-0.023 (0.064)
Heads	-0.006 (0.036)	-0.006 (0.036)	-0.006 (0.036)	-0.006 (0.036)	-0.006 (0.036)	-0.005 (0.036)	-0.005 (0.036)	0.002 (0.036)
Rating	-0.023 (0.017)	-0.020 (0.017)	-0.023 (0.017)	-0.023 (0.017)	-0.022 (0.017)	-0.023 (0.017)	-0.023 (0.017)	-0.020 (0.017)
Scholarship	0.016 (0.062)	0.015 (0.062)	0.016 (0.062)	0.016 (0.062)	0.015 (0.063)	0.017 (0.062)	0.016 (0.062)	0.010 (0.061)
Size	-0.078*** (0.014)	-0.079*** (0.014)	-0.077*** (0.014)	-0.078*** (0.014)	-0.077*** (0.014)	-0.078*** (0.014)	-0.078*** (0.014)	-0.081*** (0.014)
Tangibility	-0.004** (0.002)	-0.004** (0.002)	-0.004** (0.002)	-0.004** (0.002)	-0.004** (0.002)	-0.004** (0.002)	-0.004** (0.002)	-0.004** (0.002)
<u>Bank characteristics</u>								
Capital	-0.002 (0.010)							0.011 (0.016)
Asset Quality		-0.100 (0.073)						-0.137* (0.079)
Management			-0.000 (0.002)					0.004 (0.003)
Earnings				0.004 (0.011)				0.010 (0.014)
Liquidity					-0.000 (0.001)			-0.003 (0.002)
Sec/Ear. Assets						0.001 (0.001)		0.007 (0.004)
Fees/Interest							0.000 (0.001)	-0.002 (0.003)
Observations	249	249	249	249	249	249	249	249
Pseudo $R^2$	0.280	0.286	0.280	0.281	0.280	0.281	0.280	0.299
Nagelkerke's Pseudo $R^2$	0.426	0.434	0.426	0.427	0.426	0.427	0.426	0.450
AUC	0.837	0.838	0.836	0.837	0.837	0.838	0.837	0.847

Notes: This table presents the average marginal effects from a logit regression, where the dependent variable is the use of crowdfunding. Independent variables include venture characteristics and characteristics of the respective banks as CAMEL covariates. The sample consists of the 157 ventures that used crowdfunding and 200 ventures that did not use crowdfunding. The variable definitions are provided in the Appendix. Standard errors appear in brackets. Significance levels are as follows: \*=10%, \*\*=5%, \*\*\*=1%.



Table 8  
Marginal Effects with Alternative Treatment Effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
SoFFin	0.187***									
	(0.057)									
Landesbanken		0.006								
		(0.081)								
EBA			0.030							
			(0.064)							
EBA direct				0.106*			0.176*	1.220*	0.016	0.009
				(0.058)			(0.094)	(0.726)	(0.203)	(0.205)
EBA indirect					-0.113					
					(0.069)					
Restructuring plan						0.169***	0.197**			
						(0.054)	(0.107)			
EBA direct X Restructuring plan								-0.045		
								(0.127)		
CET1 16								0.167*		
								(0.091)		
EBA direct X CET1 16								-0.139		
								(0.097)		
CET1 16 - CET1 13									-0.061*	
									(0.032)	
EBA direct X CET1 16 - CET1 13									0.029	
									(0.039)	
CET1 16 < 8%										-0.276*
										(0.151)
EBA indirect X CET1 16 < 8%										0.198
										(0.207)
Control variables included?	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	249	249	249	249	249	196	196	196	196	196
Pseudo $R^2$	0.270	0.242	0.243	0.252	0.250	0.296	0.314	0.298	0.304	0.295
Nagelkerke's Pseudo $R^2$	0.414	0.378	0.379	0.390	0.388	0.447	0.468	0.449	0.456	0.446
AUC	0.832	0.823	0.822	0.826	0.825	0.846	0.849	0.844	0.847	0.843

Notes: This table presents the marginal effects from a logit regression, where the dependent variable is the use of crowdfunding. Independent variables include the results of the EBA EU-wide stress test, respective interactions, and a Landesbanken dummy. Venture characteristics are included in each model but are not shown. The sample consists of the 157 ventures that used crowdfunding and 200 ventures that did not use crowdfunding. The variable definitions are provided in the appendix. Standard errors appear in brackets. Significance levels are as follows: \*=10%, \*\*=5%, \*\*\*=1%.

Table 9  
Marginal Effects: Use and Outcome of Crowdfunding

	(1) Use of Crowdfunding (full sample)	(2) Successful Use of Crowdfunding (full sample)	(3) Successful Use of Crowdfunding (only ventures that used crowdfunding)
SoFFin	0.175*** (0.058)	0.216*** (0.058)	0.077 (0.087)
Credit			
fair	0.046 (0.062)	0.135** (0.064)	0.224** (0.110)
bad	0.312*** (0.100)	0.203** (0.098)	0.152 (0.124)
Gender			
mixed	0.284** (0.126)	0.318** (0.134)	0.000
female	0.409*** (0.103)	0.333*** (0.109)	0.027 (0.091)
City	-0.014 (0.058)	0.019 (0.061)	0.033 (0.071)
Heads	-0.005 (0.036)	0.035 (0.038)	0.178** (0.085)
Rating	-0.023 (0.017)	-0.017 (0.018)	0.015 (0.022)
Scholarship	0.016 (0.062)	0.050 (0.066)	0.135 (0.100)
Size	-0.078*** (0.014)	-0.041*** (0.015)	0.083*** (0.024)
Tangibility	-0.004** (0.002)	-0.004** (0.002)	-0.003 (0.003)
Observations	249	249	95
Pseudo $R^2$	0.280	0.193	0.370
Nagelkerke's Pseudo $R^2$	0.426	0.305	0.482
AUC	0.837	0.786	0.886

Notes: This table presents the average marginal effects from a logit regression where the dependent variable is the use of crowdfunding for the full sample ( Column (1) ), the successful use of crowdfunding (realized amount > requested amount) for the full sample (Column (2) ), or the successful use of crowdfunding for the sample of ventures that used crowdfunding (Column (3) ). The variable definitions are provided in the appendix. Standard errors appear in brackets. Significance levels are as follows: \*=10%, \*\*=5%, \*\*\*=1%.

**Fig. 1. Sample of New Ventures that Apply for Crowdfunding or Not**

Notes: This figure shows the sample of ventures that applied to one of the six largest equity crowdfunding platforms in Germany for funds between 2011 and 2014. Out of 157 applicants, 133 ventures successfully completed their funding request, 23 applying ventures did not complete requests, and 200 ventures did not apply at all. Some ventures applied multiple times for funding. The data on non-applicants is obtained from the German Federal Association of Startups. The data about crowdfunding applicants were collected from observing applicant data directly in the online platforms maintained by Bankless24, Berfuerst, Companisto, Fundsters, Innvestment, Mashup Finance, Seedmatch, and others.

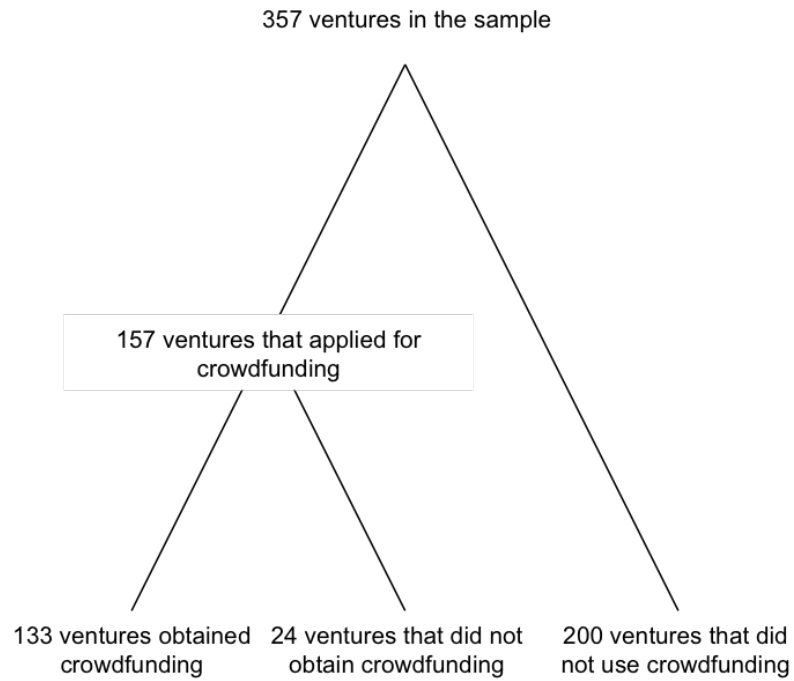


Fig. 2. Definitions of Stressed Banks

Notes: This figure presents the 82 banks in the sample listed in Table 10 that are connected to the 357 ventures shown in Figure 1. The link between ventures and banks is collected from the Creditreform database. The base line identification defines stressed banks as those that received equity support from the SoFFin. Next, we also define banks as stressed if they had, according to the comprehensive assessment by the European Banking Authority (EBA) of 2014, a restructuring plan in place since before 2013. We distinguish between banks assessed directly by the EBA (6) and those that were connected to a bank holding company that was assessed. Finally, we consider all those regional savings banks that were connected to a Landesbank distressed, because their responsible bank holding company was exposed to the U.S. subprime market shock. (Puri et al., 2011).

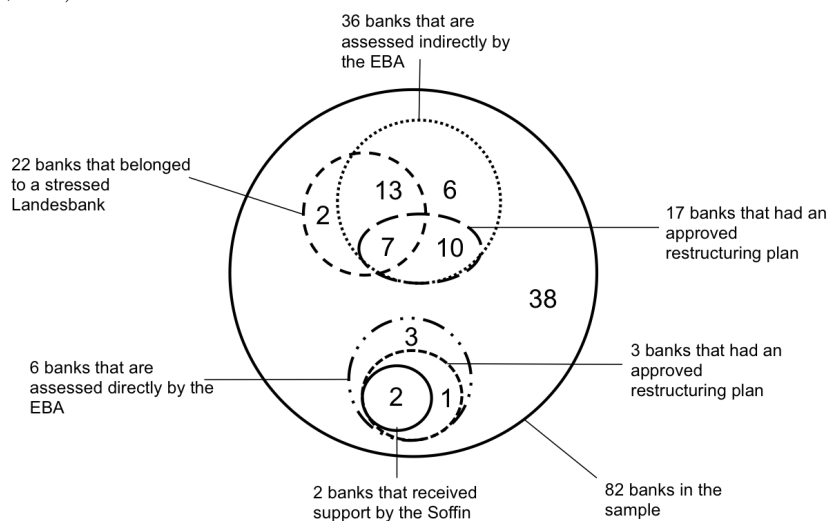


Table 10  
Bank Overview

BvD ID	Bank Name	Bank-Venture Observations	Category	SoFFin	Landesbank	EBA direct	EBA indirect
13046	Bank fuer Sozialwirtschaft	2	cooperative				
13047	ING-DiBa	1	private				
13124	Volksbank Potsdam	13	cooperative				
13190	Commerzbank	84	private	X		X	
13192	Donner & Reuschel	2	private				
13216	Deutsche Bank	77	private			X	
13263	Frankfurter Sparkasse Sprendlingen	2	savings				X
13264	Frankfurter Volksbank	1	cooperative				
13296	Heidelberger Volksbank eG	1	cooperative				
13319	IKB Deutsche Industriebank AG	3	private	X		X	
13326	Koelner Bank	1	cooperative				
13331	Sparkasse Dachau	1	savings		Bayern LB		X
13366	Kreissparkasse Ahrweiler	1	savings				
13379	Sparkasse Zollernalb	1	savings				X
13380	Sparkasse Bamberg	2	savings		Bayern LB		X
13400	Sparkasse Dueren	1	savings		West LB		X
13418	Kreissparkasse Gross-Gerau	2	savings				X
13437	Kreissparkasse Koeln	2	savings		West LB		X
13444	Kreissparkasse Ludwigsburg	1	savings				X
13498	Kreissparkasse Waiblingen	1	savings				X
13570	Nassauische Sparkasse	1	savings				X
13655	Sparkasse Bochum	1	savings		West LB		X
13724	Sparkasse Karlsruhe Ettlingen	2	savings				X
13727	Sparkasse Koblenz	2	savings				
13732	Sparkasse Landshut	1	savings		Bayern LB		X
13740	Sparkasse Mainz	2	savings				
13742	Sparkasse Markgraefterland	1	savings				X
13762	Sparkasse Passau	1	savings		Bayern LB		X
13803	Stadt- und Kreis-Sparkasse Darmstadt	1	savings				X
13804	Stadt- und Kreissparkasse Erlangen	3	savings		Bayern LB		X
13839	Sparkasse Aachen	1	savings		West LB		X
13842	Stadtsparkasse Augsburg	1	savings		Bayern LB		X
13858	Sparkasse Harburg-Buxtehude	1	savings				X
13866	Stadtsparkasse Duesseldorf	3	savings		West LB		X
13869	Verbundsparkasse Emsdetten Ochtrup	1	savings		West LB		X
13885	Sparkasse Hannover	4	savings				X
13894	Kreissparkasse Kaiserslautern	2	savings				
13896	Kasseler Sparkasse	1	savings				X
13912	Stadtsparkasse Muenchen	7	savings		Bayern LB		X
13937	Stadtsparkasse Schwerte	1	savings		West LB		X
14008	Volksbank Ludwigsburg eG	1	cooperative				
14011	Volksbank Paderborn-Hoexter-Detmold	1	cooperative				
14037	Sparkasse Hoexter	1	savings		West LB		X
14067	Volksbank Stuttgart	2	cooperative				
14090	Sparkasse Muelheim an der Ruhr	1	savings		West LB		X
14104	Berliner Sparkasse	31	savings			X	
14123	Herner Sparkasse	1	savings		West LB		X
14133	Postbank	18	private				X
14166	Volksbank Mittelhessen	1	cooperative				
14199	Sparkasse Leipzig	1	savings		Sachsen LB		
14469	Ostsaechsische Sparkasse Dresden	2	savings		Sachsen LB		
14530	Volksbank Karlsruhe	1	cooperative				
14654	Deutsche Kontor Privatbank AG	1	private				
15415	Raiffeisenbank Gundelfingen	2	cooperative				
27737	National Bank	1	private				
29867	Sparkasse KoelnBonn	4	savings		West LB		X
40293	Hamburger Sparkasse	10	savings			X	
40583	GLS Gemeinschaftsbank	5	cooperative				
40867	Sparkasse Westmuensterland	1	savings		West LB		X
41395	VR-Bank Rhein-Sieg	1	cooperative				
42705	Volksbank Rhein-Nahe-Hunsrueck	1	cooperative				
42771	Sparkasse Oder-Spree	1	savings				
43024	Volksbank Neckartal	1	cooperative				
43128	Volksbank Erfurt	1	cooperative				
43289	Nordthueringer Volksbank	1	cooperative				
43393	Stadtsparkasse Magdeburg	2	savings				X
43617	VR-Bank Starnberg-Herrsching-Landsberg	1	cooperative				
43968	Volksbank St. Blasien	1	cooperative				
44034	Sparkasse Maerkisch-Oderland	1	savings				
44155	VR-Bank Passau	1	cooperative				
44562	Sparkasse Bremen	1	savings				X
45341	Raiffeisenbank Heinsberg	1	cooperative				
45375	Sparkasse Herford	1	savings		West LB		X
45877	Raiffeisenbank Parsberg-Velburg	1	cooperative				
46123	Volksbank Welzheim	2	cooperative				
46801	HypoVereinsbank	11	private				
47101	VR Bank Muenchen Land	1	cooperative				
47634	Volksbank Brilon-Baeren-Salzkothen	1	cooperative				
47699	Vereinigte Volksbank Maingau	1	cooperative				
47734	LBBW	2	landesbank			X	
49769	Sparkasse Schaumburg	1	savings				X
49838	Volksbank Sauerland	1	cooperative				
Total Bank Observations		82		2	22	6	36
thereof cooperative banks		(357)		(87)	(38)	(207)	(75)
thereof landesbanken		27					
thereof private banks		(47)					
thereof savings banks		1					
		(2)					
		9					
		(198)					
		45					
		(110)					

Notes: These descriptive statistics detail the banks in the full sample. The number of bank-venture observations appear in brackets.

Table 11  
Definition of Variables

Variable name	Source	Description	Measurement unit
<u>Crowdfunding characteristics</u>			
Crowdfunding	Crowdfunding platforms	Dummy variable equal to one if the venture used crowdfunding	binary
CF Min. Amount	Crowdfunding platforms	Minimum amount of the respective crowdfunding offering	EUR
CF Max. Amount	Crowdfunding platforms	Maximum amount of the respective crowdfunding offering	EUR
CF Realized Amount	Crowdfunding platforms	Realized amount of the respective crowdfunding offering	EUR
CF Success	Crowdfunding platforms	Dummy variable equal to one if the venture used successfully crowdfunding (realized amount > minimum amount)	binary
Number of CF Investors	Crowdfunding platforms	Number of investors in the respective crowdfunding offering	#
Valuation of Venture before CF	Crowdfunding platforms	Valuation of Venture before the crowdfunding offering, which is done by the platform	EUR
<u>Venture characteristics</u>			
Size	Bundesanzeiger	Log of total assets as average since foundation	Log of EUR
Tangibility	Bundesanzeiger	Percentage of tangible assets as average since foundation	%
Heads	Creditreform	Number of heads in the management team	#
Gender	Creditreform	Gender composition of the management team (male/mixed/female)	categorical
Credit Rating	Buergel	Credit rating of the venture (good/fair/bad)	categorical
		Rating of seven sophisticated investors if they would further investigate an investment for each venture (0/1)	categorical
City	Creditreform	Dummy variable equal to one if the location of headquarter of the venture is based in a city with more than 500,000 inhabitants	binary
Scholarship	BMWi	Dummy variable equal to one if the venture received the EXIST scholarship by the BMWi	binary
<u>Treatments</u>			
SoFFin	BMFS	Dummy variable equal to one if the bank of the venture received funds from the SoFFin	binary
Landesbanken	Sparkassen-Verband	Dummy variable equal to one if the bank of the venture is a savings bank that owns holdings in one of the affected Landesbanken (Bayern LB, Sachsen LB, West LB)	binary
EBA	European Banking Authority	Dummy variable equal to one if the bank of the venture is directly or indirectly included in the 2014 EU-wide stress test conducted by the European Banking Authority (EBA)	binary
EBA direct	European Banking Authority	Dummy variable equal to one if the bank of the venture is directly included in the 2014 EU-wide stress test conducted by the European Banking Authority (EBA)	binary
EBA indirect	European Banking Authority	Dummy variable equal to one if the bank of the venture is indirectly over holdings included in the 2014 EU-wide stress test conducted by the European Banking Authority (EBA)	binary
CET1 16	European Banking Authority	Fully loaded Common Equity Tier 1 (CET1) ratio in the adverse scenario 2016	%
CET1 16 - CET1 13	European Banking Authority	Difference between the CET1 ratio starting 2013 and the fully loaded CET1 ratio in the adverse scenario 2016	%
CET1 16 < 8%	European Banking Authority	Dummy variable equal to one if the CET1 ratio of the tested bank is lower than 8% in the adverse scenario 2016	binary
Restructuring plan	European Banking Authority	Dummy variable equal to one if the bank of the venture had an restructuring plan before 2013	binary
<u>Bank Characteristics</u>			
Capital	Bankscope	Proxy for capital adequacy of a venture's bank measured as the ratio of total equity to total assets	%
Asset quality	Bankscope	Proxy for asset quality of a venture's bank measured as the ratio of loan loss provisions to total gross loans	%
Management	Bankscope	Proxy for managerial quality of a venture's bank measured as the ratio of total costs to total income	%
Earnings	Bankscope	Proxy for earnings of a venture's bank measured as the return on average equity	%
Liquidity	Bankscope	Proxy for liquidity of a venture's bank measured as liquid assets to deposits and short-term funding	%
Sec./Ear. Assets	Bankscope	Proxy for liquidity of a venture's bank measured as securities to total earning assets	%
Fees/Interest	Bankscope	Non-interest income divided by net interest income	%

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