Entrepreneurial optimism, credit availability, and cost of financing: Evidence from U.S. small businesses☆

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ABSTRACT

Using a large sample of U.S. small businesses and a new measure of optimism, we examine the role of entrepreneurial optimism in small business lending. We provide evidence that optimistic entrepreneurs are not rationed by lenders. Quite the opposite, our results suggest that they often have better credit accessibility and obtain lower cost of financing. Our results are robust to alternative measures of optimism and controls for private information between lenders and borrowers.

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1. Introduction

While the prevalence of entrepreneurial optimism is well-recognized, its impact on various economic choices is still a subject of an ongoing debate. This debate to a certain extent reflects the two opposing views on the nature of optimism that exist in the literature. On the one hand, optimism is viewed as a type of bias characterized by distorted perceptions of the future (Weinstein (1980)), and consequently an optimist is someone who either overestimates the probability of a favorable outcome or underestimates the probability of an unfavorable outcome. A number of studies in finance and entrepreneurship emphasize this negative view of optimism.[2] These studies argue that optimistic bias (sometimes referred to as overoptimism or overconfidence) results in too much entry, excessive risk taking, inferior performance and overlending. Entrepreneurial optimism is also considered as one of the possible explanations of the private equity premium puzzle documented by Moskovitz and Vissing-Jorgensen (2002).

On the other hand, there is a strand of the psychology and medicine literature (see Scheier and Carver (1985), Scheier et al. (1994)) that views optimism as generalized positive expectations about the future (also called dispositional optimism). In the

finance literature, a recent study by Puri and Robinson (2007) documents that optimistic entrepreneurs work more and have higher productivity than other entrepreneurs and argues that optimism in a mild form is actually beneficial for small businesses.

While prior studies focus on the effect of optimism on risk taking and performance, very little attention has been devoted to the issue of the potential implications of entrepreneurial optimism for the availability of credit to and the cost of bank financing for small businesses. Do lenders turn down loan applications by optimistic entrepreneurs more or less often? Are banks and other financial institutions charging optimistic entrepreneurs higher or lower rates? Do financial intermediaries require more or less collateral from optimistic entrepreneurs? These are all important questions that have not been systematically studied, which is surprising given the fact that bank debt is the major source of financing for small firms. The only studies that deal with this issue are De Meza and Southey (1996) and De Meza (2002). Both studies argue that those individuals that are unrealistically optimistic self-select to become entrepreneurs and that entrepreneurial optimism increases overlending. The theoretical model of De Meza and Southey (1996) predicts that the presence of optimistic entrepreneurs will result in a lower quality of borrowers, excessive lending, and lower expected return per loan for lenders. In this situation, banks[3] might have an incentive to limit credit to optimistic entrepreneurs in order to protect themselves from the entrance of lower quality borrowers to the current borrower pool and the eventual decrease in their expected rates of return. To the best of our knowledge, the prior literature provides no empirical testing of the predictions of De Meza and Southey (1996), or of any other potential relationship between entrepreneurial overoptimism and lending. Our study aims to fill this gap in the literature by examining whether the behavior of financial institutions that lend money to small businesses is consistent with the positive or negative view of entrepreneurial optimism.

The Achilles heel of any behavioral corporate finance study is the empirical measure of managerial bias. Toward this end, we design an innovative measure of optimism. In particular, we use the difference between the probability that the entrepreneur's application for loans will be denied given the firm characteristics and credit conditions and the entrepreneur's subjective assessment of this probability as our primary measure of optimism. As a robustness check, we also use several different versions of our main optimism measure. We discuss the design of our optimism measure in more detail in Section 3.

Using our optimism measures, we first examine the effect of entrepreneurial optimism on the availability of credit. Following the literature in small business lending, we adopt two measures of credit availability – whether small businesses pay their trade credit late and whether lenders approve their most recent loan applications. (See e.g., Petersen and Rajan, 1994, Cole, 1998 and Cole et al., 2004. Using data from the Federal Reserve Board's 2003 Survey of Small Business Finance (SSBF), we find evidence that optimistic entrepreneurs have better access to credit, consistent with the positive view of entrepreneurial optimism. For instance, we document that optimistic entrepreneurs are less likely to pay their trade credit late and their loan applications are more likely to be approved.

Our second set of analyses focuses on the relation between optimism and the cost of financing. Specifically, we examine two characteristics of small business loans: whether entrepreneurs are requested to provide collateral or guarantee, and the interest rate spread over the concurrent prime rate that they are charged. We document additional evidence in support of the positive view of optimism. For instance, an optimistic entrepreneur is less likely to be required to provide collateral or a personal guarantee. Moreover, an optimistic entrepreneur is charged a lower interest rate, on average.

We realize that our optimism measure could be polluted by lenders' private information that may be difficult to observe in our data. While it is impossible to completely eliminate the pollution due to potential unobserved factors, we take a number of approaches to alleviate the effect of this potential pollution on our main findings. First, in relevant specifications, we control for lenders' private information on the borrower's quality by including the distance and the length of relationship between lenders and borrowers, as well as the communication method used for loan applications. These variables are found in the existing literature to correlate with lenders' private information (See Petersen and Rajan, 1994; Berger and Udell, 1995; Cole, 1998; Petersen and Rajan, 2002). Second, we design a proxy for banks' unobservable private information based on their historical loan decisions. Using the proxy for unobservable private information in our main regressions, we find that our results do not change. These findings indicate that it is not very likely that our measure of optimism merely reflect banks' private information.

In our opinion, this study makes contributions to the following fields in the finance and entrepreneurship literature. Broadly, our paper adds to the literature on the impact of optimism on the economic choices. Previous empirical studies examine the effect of optimism on businesses' and individuals' investment behavior (Barber and Odean (2001), Malmendier and Tate (2005a, 2005b, 2008), Cassar and Friedman (2007)) or their financing decisions (Landier and Thesmar (2009)). Our paper uses a unique measure of entrepreneurial optimism and extends the literature by providing evidence on whether and how optimism affects small business' access to credit using the U.S. Federal Reserve Board's SSBF data.

The current literature on small business lending focuses mainly on the asymmetric information problem between lenders and borrowers and the ways to alleviate it via relationship lending, collateral requirements, choice of loan terms and maturity, use of bank guarantees, etc.[3] This study, for the first time, documents empirically the relation between entrepreneurial optimism and banks' lending decisions. We show that entrepreneurs' behavioral attributes, such as optimism, impact financiers' decisions. Specifically, financiers do not ration optimistic entrepreneurs. In contrast, they are more willing to provide loans to optimistic

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[3] See Petersen and Rajan (1994), Berger and Udell (1995), Cole (1998), Harhoff and Korting (1998), Elsas and Krahnen (1998), Scott and Dunkelberg (1999), Machauer and Weber (2000).

entrepreneurs, potentially due to the expectation that these entrepreneurs work harder, generate higher productivity, and have more prudent financial behaviors (Puri and Robinson (2007)).

The remainder of the paper is organized as follows: Section 2 reviews relevant literature and develops testable hypotheses; Section 3 introduces the method that we apply to measure entrepreneurial optimism; Section 4 summarizes the sample and data; Section 5 reports the results of our empirical analysis and discusses additional robustness checks; finally, Section 6 summarizes our primary conclusions.

2. Literature review and hypotheses development

In this section, we briefly review the existing literature on small business lending and entrepreneurial optimism, and put forth several hypotheses regarding the effect of entrepreneurial optimism on credit availability and the cost of credit for small businesses.

The literature on small business lending emphasizes the importance of bank credit for small firms. Despite the fact that they have small asset bases and cannot offer much collateral, small firms tend to borrow significant amounts of money (Berger and Udell (1998), Cole (2013), and Robb and Robinson (2014)). Berger and Udell (1998) report that roughly 50% of the small firms' financing comes in the form of debt. Cole (2013) reports that the average ratio of total liabilities to total assets was between 47% and 48% during the 1993–2003 period. Robb and Robinson (2014) examine the capital structure of small businesses in the first year of their operation and also find a significant use of debt financing – startups use about five times as much debt as equity – which comes mainly from outside sources. Additionally, small firms tend to concentrate their external borrowing from commercial banks (Petersen and Rajan (1994), Cole and Wolken (1995), Berger and Udell (1998)). Robb and Robinson (2014) document that the majority of outside debt is in the form of various types of bank loans such as owner-backed bank loans, business bank loans, and business credit lines.

A number of empirical studies investigate whether entrepreneurs are more optimistic than the rest of the population. For example, Landier and Thesmar (2009) find that entrepreneurs overestimate employment expansion and sales growth. Cooper et al. (1988) find that entrepreneurs significantly overestimate the probability that their businesses will survive. Busenitz and Barney (1997) find that entrepreneurs exhibit overconfidence and representativeness (the tendency to overgeneralize from a few characteristics and observations). A recent study by Arabsheibani et al. (2012) documents that entrepreneurs are of above average optimism, and are overly optimistic even before starting their companies. In a similar vein, other studies also provide evidence that entrepreneurs tend to be optimistic (see, for example, Cassar (2010), Arabsheibani et al. (2000), and Cooper et al. (1988)).

Given the importance of bank financing for small businesses and the prevalence of optimism among entrepreneurs, it is surprising that, to our best knowledge, there are no empirical studies that examine the role of optimism in small business lending. The few theoretical studies that explore this relationship do so through the prism of the negative view of optimism. For example, De Meza and Southey (1996) argue that the presence of optimistic entrepreneurs leads to excessive lending, and lower expected return per loan for lenders. Thus, banks may be better off limiting credit to optimistic entrepreneurs to protect themselves from the entrance of lower quality borrowers to the current borrower pool and the eventual decrease in their expected rates of return. Similarly, Manove and Jorge Padilla (1999) argue that banks cannot readily differentiate optimists from other agents. To protect themselves, they are going to limit lending by credit rationing, charging higher interest rates, and requiring for more collateral.

On the other hand, there is a strand of the psychology literature (see, for example, Scheier and Carver (1985), and Scheier et al. (1994)) that views optimism as generalized positive expectations about the future. A wealth of empirical evidence from the psychology and medical literatures tends to support this positive view of optimism. There is a scarcity of studies in the area of finance, both theoretical and empirical, that link the positive view of entrepreneurial optimism to lenders' actions. A recent empirical study by Puri and Robinson (2007) provides some evidence that we believe could be relevant to the potential positive impact of entrepreneurial optimism on lenders' decisions. The study finds that optimistic entrepreneurs work harder and are associated with higher productivity. Additionally, they anticipate longer age-adjusted work careers, and are more likely to think that they will never retire. Importantly, Puri and Robinson (2007) show that moderate optimists display reasonable financial behavior: they are more likely to pay their credit card balances on time, they have long planning horizons, and they report that they save more because saving is a good thing to do. On the other hand, extreme optimists display financial habits and behavior that are generally not considered prudent, suggesting that that extreme optimism is closer to the overconfidence bias documented in the literature. Based on their findings, Puri and Robinson (2007) argue that optimism in a mild form could actually be beneficial to entrepreneurs. If this were the case, we expect that lenders will consider this positive effect of optimism when making their lending decisions.

Building upon these opposite views regarding the role of optimism, our hypotheses relate entrepreneurial optimism to the potential behavior of lending institutions. The negative view of optimism suggests that optimistic entrepreneurs would face tighter credit constraints and higher cost of financing as lenders try to limit their exposure to that type of entrepreneurs. This is also what the theoretical model of De Meza and Southey (1996) predicts. Conversely, the positive view of optimism, combined with the empirical results in Puri and Robinson (2007), suggests that optimistic entrepreneurs may have better access to credit and lower cost of financing than other entrepreneurs as lenders could be more willing to provide loans to entrepreneurs with positive attitude toward the future who work harder and have higher productivity, and thus are more capable of paying back the debt. Based on these opposing views of optimism, we put forth the following hypotheses:

H1A. Optimistic entrepreneurs have worse access to credit: they are more likely to pay trade credit late and less likely to have their loan applications approved, other things equal.

H1B. Optimistic entrepreneurs have better access to credit: they are less likely to pay trade credit late and less likely to be denied loan applications, other things equal.

H2A. Optimistic entrepreneurs have higher cost of borrowing, other things equal.

H2B. Optimistic entrepreneurs have lower cost of borrowing, other things equal.

We also note that the predictions from our hypotheses may be consistent with an alternative explanation. For example, if optimistic entrepreneurs are able to influence lenders, then lenders may make it easier for such entrepreneurs to borrow money, a result consistent with Hypothesis H1B and H2B.

As we discuss in detail in Section 4 below, we follow the literature and use two proxies for small businesses' access to credit. Petersen and Rajan (1994) argue that paying trade credit late is a very expensive way to obtain finance, and a firm is likely to do so only when rationed by institutional lenders. Our second proxy for credit is the probability of approval of the recently applied loans. With regard to the cost of borrowing, we adopt two measures: lenders' requirement that entrepreneurs provide collateral or personal guarantee for the loans approved, and the interest rate charged by the lenders.

3. A new measure of entrepreneurial optimism

One of the challenges incurred in empirical studies of behavioral corporate finance is measuring managerial behavioral biases. Without such an empirical measure, the optimistic manager approach is difficult to distinguish from traditional agency theory (Baker et al. (2004)) or models of costly external financing built on asymmetric information (Stein (2003)). In the spirit of Puri and Robinson (2007), we use the difference between the unbiased probability that the entrepreneur's application for loans will be denied given the firm characteristics and credit conditions and the entrepreneur's subjective assessment of this probability as our measure of optimism.

Let $E_U(d|x)$ be the unbiased probability that entrepreneur i will be denied a loan if she applies for it conditional on a vector of firm characteristics and credit conditions x. Similarly, let $E_S(d|x)$ be entrepreneur's subjective assessment of this probability. Our measure of optimism is the simply

$$\text{Optimism}_i = E_U(d|x) - E_S(d|x)$$

To estimate $E_U(d|x)$ and $E_S(d|x)$, we use data from the Federal Reserve Board's 2003 and 1998 SSBFs. In particular, the 2003 SSBF asks entrepreneurs the following question: "During the last three years, were there times when [FIRM] needed credit, but did not apply because you thought the application would be turned down?" Entrepreneurs' answers to this question (Yes, or No) would be impacted by the true credit condition of the firm as well as the entrepreneurs' hubris or level of optimism. Note that if the firm did not need credit, the answer to the question would be "Legitimate Skip," which allows us to identify and drop such observations from the analysis. We use the answer to this question as our value for $E_S(d|x)$. Specifically, $E_S(d|x)$ is equal to one if the entrepreneur's answer to the above question is "Yes", and zero if the answer is "No."

To estimate $E_U(d|x)$, we use data on actual loan denials and approvals. Both the 2003 and 1998 SSBFs provide information on whether a firm's most recent loan application was denied or approved. We run a logit regression where the dependent variable is equal to 1 if the entrepreneur was previously denied a loan and 0 otherwise, and the explanatory variables include a number of firm characteristics and credit conditions measures. Additionally, because we use the information on loan approvals and denials later when we analyze the effect of optimism on bank loan decisions, we estimate the logit model using data from the 1998 SSFB survey. The predicted probability based on this logit regression is our value of $E_U(d|x)$.

By construction, the difference $E_U(d|x) - E_S(d|x)$ can take on values in the interval $(-1, 1)$. It will be close to -1 when the model predicts that the entrepreneur would not be denied credit, but she is afraid to apply (i.e., she is "pessimistic"). For entrepreneurs without behavioral bias $E_U(d|x) - E_S(d|x)$ should be close to 0. On the other hand, its value will be close to 1 if the model predicts that the entrepreneur should be denied credit, but she applies anyway (i.e., she is optimistic) because she over-estimates the firm's chances of success. Thus, $E_U(d|x) - E_S(d|x)$ increases with the optimism of the entrepreneur. Lastly, it should be noted that $E_U(d|x)$ could also differ from $E_S(d|x)$ because of random errors that rational entrepreneurs make. Thus, $E_U(d|x) - E_S(d|x)$ could have two components: a bias and an error. However, the error is by assumption unpredictable given the information set x and its mean should be zero. As a robustness check, we use the fractional rank of the first optimism measure, from 0 to 1, as our second measure of optimism.

It should be noted that the survey question in SSBF is about entrepreneurs' self-assessment on the probability of getting new loans from financial institutions, or entrepreneurs' view of financing risks.[4] However, we feel that optimism about financing risks should be closely related to one's overall level of optimism. Thus, although here we focus on optimism regarding the financing of the business, our analysis is very relevant to the general theme of entrepreneurial optimism.

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[4] Nanda and Rhodes-Kropf (2010) define financing risk as the uncertainty that the project will be funded in the future.

We use the above-mentioned measures of entrepreneurial optimism to empirically test the hypotheses outlined in the previous section. We believe our measures of optimisms are superior to some of the demographic characteristics on which previous studies rely on to measure optimism. The main reason is that demographic characteristics might proxy for a host of other things. Also, as often happens in the empirical analysis, a subset of the demographic characteristics might have insignificant coefficients or coefficients with opposite signs from those predicted. This makes it difficult to interpret whether managerial optimism has a significant impact or not. Using a single measure of optimism makes it easier to gauge statistical significance and interpret the coefficients.

Similar to the optimism measure in Puri and Robinson (2007), ours is also open to potential alternative interpretations. The most obvious alternative is that it could be picking up unobservable private information rather than differences in entrepreneurs' expectations. While this is a potential criticism of any such econometric approach, we believe that our measure does not introduce any systematic biases. It is true that an entrepreneur that we classify as optimistic might be simply applying for a loan because the bank and the entrepreneur have positive private information that is not available to others (e.g., the bank believes the business will have positive NPV projects in the future). On the other hand, it is also conceivable that an entrepreneur who, according to our model, looks like she should get a loan might be reluctant to apply because she thinks the bank may turn her down (e.g., the bank, because of its expertise in and knowledge of the business, might deem the future prospects of the business to be rather weak). Such cases certainly introduce noise in our estimation, but not any systematic bias. Nevertheless, in the analysis that follows, we try to control for lenders' potential private information regarding borrower's quality using measures well documented in the literature to alleviate this concern. We discuss the alternatives in Section 5 in great detail.

4. Data and summary statistics

The primary source of data for this study is the Federal Reserve Board's 2003 SSBF data, although we use some data from the 1998 SSFB survey when estimating the measure of optimism. The firms surveyed in each year constitute a nationally representative sample of about 4000 small businesses operating in the U.S., where a small business is defined as a non-financial, non-farm enterprise employing fewer than 500 full-time equivalent employees.

The SSBFs provide information on each enterprise's balance sheet, income statement, its credit history, the firm's characteristics, including two-digit SIC code, organizational form, age, location, how the firm was established, and demographic characteristics of each firm's primary owner, including gender, age, business experience, and education. The surveys also provide detailed information about each firm's most recent borrowing experience. This includes whether the firm applied for credit and for firm that applied, whether the potential lender approved or denied the firm's credit application. For firms to which the lender extended credit, the surveys provide information on the terms of the loan.

Of the 4240 firms surveyed in the 2003 SSBF, we exclude firms that are inherited or acquired as a gift or publicly traded. We require that the primary owners of firms are responsible for daily management. We also exclude firm for which information on assets is not available. This leaves us 3360 firms, out of which 1456 applied for credit. In the analysis of most recently approved loans, we exclude renewals of pre-existing credit lines leaving us with a sample of 943 observations. The SSBF survey uses multiple imputations to correct for missing or sensitive data and oversamples larger firms. In our statistical analysis, we carefully take into account the impact of multiple imputations and incorporate the sampling weights.

Table 1 summarizes selected characteristics of our sample. These firms have an average age of 15 years, with average assets of $1.5 million. It should be noted that these statistics reflect the means of the small business population and are smaller than the sample means which are by design biased toward larger small businesses. Small businesses exhibit high debt/assets ratio. For instance, the mean debt ratio of 2003 survey firms is 91.7%. Current liability on average accounts for 42.5% of total liability. About 80% of the small businesses are located in the urban areas. Corporation is the most popular organizational forms and accounts for 56.0% of the population.

Male entrepreneurs and white entrepreneurs account for 77.9% and 92.0% of the sample, respectively. More than 50% of the entrepreneurs have college and graduate degrees. Entrepreneurs on average have 21 years of business experience, with a median around 20 years. The average personal wealth of the primary owner is about $1.4 million, with a median around half million. About 2% of the owners have bankruptcy history.

About 41% of the sample had times when their trade credit is paid late. About 43% of the sample applied for credits from various financial institutions in last three years prior to the survey. The percentages of applied loans that were always approved are 84.0%. For about 8.2% of the sample, loans that they applied for over the past three years were always denied.

Panel D of Table 1 summarizes the characteristics of approved small business new loans (renew of credit lines are excluded). The average size of loans applied is $832 thousands. The length of loans is 64 months on average. The average loan interest rate is 5.9%. About 60.3% of the loans require certain type of collateral, and 56.8% of the loans require guarantee. About 59% of the loans are fixed interest rate loans. The average distance between the firm and the lender is 85 miles. The length of the relationship between the firm and the lender is 87 months on average.

5. Empirical analysis

5.1. Measures of entrepreneurial optimism

To measure entrepreneurial optimism, as described in Section 3, we use data from the 1998 SSBF to estimate a logit regression, where the dependent variable is a dummy equal to one if within the past three years (before the survey was taken) the

Table 1
Summary statistics.
The sample consists of 3360 small businesses operating in the U.S. surveyed by the Federal Reserve Board's 2003 SSBF. Panel A and Panel B summarize the characteristics of both the small businesses and the principal owners who are also responsible for the daily management of the business. Panel C summarizes measures of credit availability to small businesses. Panel D reports the characteristics of most recently approved new loans. Renews of line of credits are excluded. Means and medians are reported.

	Mean	Median	N
Panel A. Firm characteristics			
Firm age	15.3	13.0	3360
Assets ($000)	1579	120	3360
Tangible assets/total assets	35.1%	25.0%	3360
Profit margin	11.3%	10.0%	3316
Debt ratio	91.7%	36.4%	3360
Current liability/total liability	42.5%	31.2%	2660
Cash/assets	24.1%	11.3%	3360
Firm delinquency	1.4	1	3360
Percentage with positive growth	44.5%		3251
Percentage of corporation	56.0%		3360
Percentage of urban firms	79.6%		3360
Industry (SIC 2-digit code)			
73 business services	10.63%		3360
87 engineering & management services	9.02%		3360
17 special trade contractors (construction)	6.85%		3360
58 eating & drinking places	5.80%		3360
80 health services	5.54%		3360
59 miscellaneous retail	5.15%		3360
65 real estate	4.17%		3360
50 wholesale trade-durable goods	4.05%		3360
72 personal services	3.90%		3360
75 auto repair, services, & parking	3.07%		3360
Panel B. Owner characteristics			
Percentage of male entrepreneurs	77.9%		3360
Percentage of white entrepreneurs	92.0%		3360
Percentage of college graduate and post graduate	29.9%		3360
Percentage with bankruptcy history	2.1%		3360
Delinquency	1.23	1	3360
Business experience	20.8	20	3360
Personal wealth ($000)	1352.7	487.5	3360
Panel C: Credit availability			
Percentage of firms that trade credit is paid late	41.1%		2224
Percentage of firms applied for loans in last three years	43.6%		3360
Percentage of firms that were always approved	84.0%		1466
Percentage of firms that were always denied	8.2%		1466
Panel D: Characteristics of most recently approved new loans			
Amount applied ($000)	832.2	100.0	943
Loan length (months)	65.7	48.0	894
Loan interest rate	5.93%	5.75%	943
Relationship with lender (months)	86.9	46	943
Distance from lender (miles)	85.4	5.0	943
In person	74.4%		
Collateralized	60.3%		943
Guaranteed	56.8%		943
Percentage of fixed interest loans	59.0%		943
Loan types			
Percentage of line of credit (new)	31.0%		943
Percentage of capital lease	2.1%		943
Percentage of mortgage	17.7%		943
Percentage of vehicle loans	18.3%		943
Percentage of equipment loans	19.2%		943

entrepreneur applied for credit and was always denied or sometimes denied, and zero otherwise.[5] In formulating our model, we follow the existing literature on the availability of credit to small businesses, which includes a number of papers that analyze loan denials using data from the SSBFs. (See, e.g., Cole, 1998; Coleman, 2002; Blanchflower et al., 2003; Cole et al., 2004; Blanchard et al., 2008; Asiedu et al., 2012; and Cole and Sokolyk, 2016). Our independent variables include firm characteristics that potentially

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[5] As robustness check, we exclude from estimation the observations for firms reporting with sometimes denied; the results are qualitatively similar.

could impact whether financiers will grant the applicant a loan or not. These variables include firm size, measured as the natural logarithm of total assets, firm age, profit margin, the ratio of tangible assets to total assets, the ratio of debt to total assets, the percentage of current liabilities out of the total liabilities, the ratio of cash to total assets, a count variable indicating how many times the firm had been delinquent, a dummy variable indicating whether the firm has positive sales growth, the natural logarithm of the number of times entrepreneurs had applied for loans over the past three years, a dummy variable indicating whether the firm is

Table 2
Measure of entrepreneurial optimism – logistics regression.

The table presents the estimation results of a logit regression of the probability that an entrepreneur was always denied or sometimes denied when applying for credit over the last three years based on SSBF 1998. The dependent variable is an indicator variable which is equal to one if during the last three years (prior to each survey), the entrepreneur was always denied or sometimes denied when applying for credit, and is equal to zero otherwise. The control variables are described in detail in Appendix B. The coefficients estimated off this model then are applied to the 2003 survey to determine the probability that an entrepreneur's loan application will be denied given the same set of control variables. The difference between the predicted probability from this approach and the entrepreneur's subjective zero-one assessment of this probability is our measure of optimism. Standard errors are reported in parentheses. ***, **, and * denote statistical significance at 1%, 5%, and 10% confidence level, respectively.

	Always deny or sometimes deny
Ln (Assets)	−0.1871***
	(0.0633)
Ln (firm age)	−0.4364
	(0.1453)
Profit margin	−0.0490
	(0.1167)
Percentage of tangible assets	0.2320
	(0.3488)
Debt/assets	0.0181
	(0.0277)
Current liability/total liability	0.7241**
	(0.2983)
Cash/assets	−0.6116
	(0.5387)
Business delinquent	0.2943***
	(0.0900)
Positive growth	−0.4255**
	(0.2126)
Ln (N of times applied)	0.7991***
	(0.1777)
Corporation	−0.3307
	(0.2222)
Urban	0.8136***
	(0.2647)
Owner bankrupt	3.1593***
	(1.1196)
Owner delinquent	0.3450***
	(0.1005)
ind73	0.7932***
	(0.3054)
ind87	0.3833
	(0.3878)
ind17	−0.6227
	(0.4085)
ind58	0.0120
	(0.6038)
ind80	0.4984
	(0.5299)
ind59	0.5920
	(0.4304)
ind65	−0.4935
	(0.8196)
ind50	−1.1492*
	(0.6557)
ind72	0.6995
	(0.5501)
ind75	0.4647
	(0.5390)
Constant	−0.4294
	(0.8909)
Observations	730
Pseudo R-squared	0.2119

organized as a corporation, a dummy variable indicating whether the firm is located in an urban area, a dummy variable indicating whether the owner had a bankruptcy in the past, and a count variable indicating how many times the owner had been delinquent. Industry dummies are also included.

The results from the logit regression are presented in Table 2. As the results show, firm size, debt maturity structure, sales growth, owner bankruptcy history, both firm and owner delinquency, firm location, and the number of times owner applied for credit over the past three years are significantly associated with our dependent variable. Specifically, owners are less likely to be denied credit at firms that are larger, less reliant upon short-term funding, with positive sales growth, and located in rural rather than urban areas. Not surprisingly, we also find that owner bankruptcy/delinquency history and firm delinquency history significantly increases the probability that entrepreneurs are going to be denied credit. Moreover, we find a significant and positive correlation between the number of times applying for credit and the probability of being denied. The pseudo R-square of the logit regression is 21.2%.

Based on the logit regression, we then estimate the predicted likelihood that the firm's owner will be denied credit by applying the coefficients reported in Table 2 to the 2003 SSBF data. This is our estimate for $E_U(d|x)$ in the formula for the optimism measure. The difference between $E_U(d|x)$ and $E_S(d|x)$, which, as noted above, is equal to one if the entrepreneur answers "Yes" to the question: "During the last three years, were there times when [FIRM] needed credit, but did not apply because you thought the application would be turned down?" and zero if she answers "No," is our optimism measure.

Before we proceed to our main analysis, we test the validity of our optimism measure. In Panel A of Table 3, we present the distribution of the optimism measure. The mean around zero, which suggests that on average entrepreneurs in the database tend to make the correct decision – they do not apply for credit if there is high likelihood to be rejected, and vice versa. For the majority of cases (2118), the optimism measure is positive. In 441 cases (17%), the optimism measure has negative value, indicating pessimistic entrepreneurs.

Table 3
Robustness of optimism measure.

Panel A provides summary statistics of our optimism measure. In Panel B, we examine the relation between our measure of optimism and various demographic characteristics of entrepreneurs that are documented in the literature to be related to optimism, including gender, ethnicity, business experience, education (college and above), and personal wealth. In Panel C, we report the correlation coefficients between our optimism measure and entrepreneurs' economic outlook and their self-assessment on the reasons why their loan applications were denied. Standard errors are reported in parentheses. ***, **, and * denote statistical significance at 1%, 5%, and 10% confidence level, respectively.

Panel A: Summary statistics of the optimism measure

Mean	−0.013
1%	−0.958
5%	−0.873
10%	−0.739
25%	0.0242
50%	0.0694
75%	0.143
90%	0.254
95%	0.340
99%	0.656
Standard deviation	0.351
Proportion > 0	2118
Proportion ≤ 0	441
N of observations	2559

Panel B: Optimism and entrepreneur demographic characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
Male	0.0357**					0.0217
	(0.0176)					(0.0180)
White		0.0884***				0.0933***
		(0.0255)				(0.0257)
Ln (business experience)			0.0191*			0.0060
			(0.0116)			(0.0124)
Education				0.0449***		0.0446***
				(0.0139)		(0.0141)
Ln (owner wealth)					0.0310***	0.0199
					(0.0114)	(0.0123)
Constant	−0.0420***	−0.0945***	−0.0698**	−0.0372***	−0.0325***	−0.1706***
	(0.0158)	(0.0245)	(0.0351)	(0.0101)	(0.0099)	(0.0425)
Observations	2559	2559	2559	2559	2559	2559
Adjusted R-squared	0.0012	0.0043	0.0007	0.0037	0.0025	0.0102

Panel C: Optimism and other self-assessment

Correlation	Fear of rejection due to economic outlook (slow economy)	Self-assessment: loan denied due to reasons such as too young, not enough experience, prejudice or discrimination
Optimism	−0.117***	−0.194***

In Panel B of Table 3, we relate our optimism measure to various demographic characteristics of entrepreneurs. Existing studies show that gender, race, education, experience, and personal wealth impact the level of optimism.[6] For instance, males are typically more optimistic than females. White entrepreneurs are found to be more optimistic than entrepreneurs from other races. Education increases the level of optimism, while experience tends to reduce optimism because individuals learn from experience to achieve less biased subjective assessment. Wealthy people on average are more optimistic. The results presented in Panel B in general support these patterns.

In Panel C of Table 3, we link the optimism measure to entrepreneurs' assessment on the economy outlook and reasons why their previous loan application was denied. We find that more optimistic entrepreneurs are less likely to be afraid of applying for loan due to weak economic outlook. Furthermore, we show that more optimistic entrepreneurs are less likely to think that banks denied their loan applications due to reasons such as their being too young, not having enough experience, or simply prejudice or discrimination. These provide further evidence on the validity our optimism measure.

5.2. Entrepreneurial optimism and credit availability

Using the optimism measure we develop in the previous section, in this section we examine whether and how entrepreneurial optimism impacts credit availability. We use two proxies for credit availability. The first measure is a dummy variable which is equal to one if the firm had paid late on trade credit, and is equal to zero otherwise. Petersen and Rajan (1994) argue that paying late on trade credit is a very expensive way to obtain finance, and a firm is likely to do so only when it has been rationed by institutional lenders. The second measure is an indicator variable which is equal to one if the loan for which the firm most recently applied is approved, and is equal to zero otherwise. If financiers curtail lending to optimistic entrepreneurs, we should observe a negative association between optimism and the probability of approval. On the other hand, if the positive optimism theory holds, there should be a positive relation between optimism and the probability of approval. Specifically, our regression models are the following:

$$\text{Trade credit paid late} = \alpha + \beta_1 \times \text{Optimism} + \beta_2 \times \text{Firm characteristics} + \beta_3 \times \text{Owner characteristics} + \varepsilon \qquad (1)$$

$$\text{Approval} = \alpha + \beta_1 \times \text{Optimism} + \beta_2 \times \text{Firm characteristics} + \beta_3 \times \text{Owner characteristics} + \beta_4 \times \text{Private Infor} + \varepsilon \qquad (2)$$

We run probit regressions on whether firms paid trade credit late and use several versions of our optimism measure in Panel A of Table 4.[7] In Model (1) we employ our main optimism measure, which is the difference between E_U (d|x) and E_S (d|x). In Model (2), we define the Optimistic Dummy, an indicator variable equal to one if the optimism measure has a value of greater than 0.17 (the median of its distribution), and has a value of zero otherwise. In Model (3), we use the fractional rank of the main optimism measure.

In all models, we include measures of firm characteristics which are often used in the literature to represent the level of informational asymmetry between small businesses and banks, such as firm assets, firm age, percentage of tangible assets, profit margin, the ratio of debt to total assets, the ratio of current liabilities to total liabilities, the ratio of cash to total assets, a count variable indicating how many times the firm had been delinquent, a dummy variable indicating whether the firm has positive sales growth, the natural logarithm of the number of times entrepreneurs had applied for loans over the past three years, whether the business is organized as a corporation, and whether it is located in the urban area. (See e.g., Petersen and Rajan (1994), Berger and Udell (1995), Cole (1998), Coleman (2002), Cole et al. (2004), Asiedu et al. (2012), Cole and Sokolyk (2016). In addition, we also control for several characteristics of owners that are found to influence the credit availability in the existing literature. Specifically, we include a dummy which is equal to one if the owner is male and zero if female, a dummy which is equal to one if the owner is White and zero otherwise, a dummy which is equal to one if the owner has a college or higher degree, owner's business experience in years, the natural logarithm of owner's reported personal wealth, and a dummy variable which is equal to one if the owner had previously declared bankruptcy and zero otherwise; and a count variable for the number of personal obligation on which the owner was delinquent. We also include the Dun & Bradstreet (DB) credit scores to control for a business's creditworthiness. Specifically, we use a set of dummy variables representing the rankings of the DB credit score.[8] In the 2003 survey, the higher the ranking, the lower the credit risk of the firm. All specifications also include industry dummies.

We find that overall optimistic entrepreneurs are less likely to pay their trade credit late as shown in Models (1)–(3), indicating better access to the credit, supporting the positive view of optimism (our hypotheses H1B). Among the control variables, the analysis shows that small businesses with more tangible assets, more cash, and those that are set up as corporations are less likely to pay trade credit late. On the other hand, firms that had been delinquent and that applied for credit more often are more likely to pay trade credit late. We further find that owner's business experience and owner's previous bankruptcy record are significantly and negatively associated with the probability of paying trade credit late. The former result indicates that more experienced

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[6] See, for example, Shane (2007).

[7] We also ran tobit regressions on the fraction of trade credit paid late using the same set of independent variables. We find that optimism is significantly negatively associated with the fraction of trade credit paid late. This set of results is available upon request.

[8] If the original Dun & Bradstreet credit scores fall in the range of 0–10, the SSBF DB score ranking is 1; if the score is 11–25, then the ranking is 2; if the score is 26–50, then the ranking is 3; if the score is 51–75, then the ranking is 4; if the score is 76–90, then the ranking is 5; if the score is 91–100, the ranking is 6.

Table 4

Entrepreneurial optimism and credit availability.

In this table, we examine how entrepreneurial optimism impacts credit availability. We apply two measures of credit availability, whether entrepreneurs paid trade credit late and whether entrepreneurs' most recent loan applications are approved. Panel A summarizes the results from probit regressions where the dependent variable is equal to one if the firm paid late on trade credit, and is equal to zero otherwise. The sample includes 1920 observations where trade credit was used. In Panel B, we present the results from probit regressions to analyze whether entrepreneurial optimism impacts the likelihood that a loan application is approved or denied, where the dependent variable is equal to one if the firm's application was approved and is equal to zero if it was denied. The sample includes 815 new loan applications. We exclude 835 cases of renewals of existing lines of credit. Standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% confidence level.

	(1)	(2)	(3)
Panel A: Probability of trade credit paid late			
Optimism	−0.3002**		
	(0.1210)		
Optimistic dummy		−0.2827**	
		(0.1229)	
Optimism fractional rank			−0.4203**
			(0.1713)
Firm characteristics			
Ln (assets)	0.0083	0.0136	−0.0016
	(0.0319)	(0.0320)	(0.0321)
Ln (firm age)	0.1146	0.1278	0.0920
	(0.0851)	(0.0854)	(0.0857)
Percentage of tangible assets	−0.3903**	−0.3966**	−0.3834**
	(0.1684)	(0.1683)	(0.1688)
Profit margin	0.0394	0.0463	0.0441
	(0.0778)	(0.0775)	(0.0785)
Debt/assets	0.0266	0.0231	0.0248
	(0.0199)	(0.0201)	(0.0203)
Current liability/total liability	−0.0576	−0.0841	−0.0271
	(0.1327)	(0.1317)	(0.1346)
Cash/assets	−0.5608***	−0.5409**	−0.6010***
	(0.2149)	(0.2157)	(0.2141)
Positive growth	−0.0719	−0.0596	−0.0960
	(0.0908)	(0.0907)	(0.0914)
Firm delinquent	0.5538***	0.5432***	0.5662***
	(0.0491)	(0.0489)	(0.0497)
Corporation	−0.2778***	−0.2655***	−0.2926***
	(0.0983)	(0.0982)	(0.0994)
Urban	−0.1702	−0.1907*	−0.1177
	(0.1098)	(0.1096)	(0.1124)
Ln (N of times applied)	0.1453*	0.1207	0.1833**
	(0.0838)	(0.0838)	(0.0864)
Owner characteristics			
Male	−0.1467	−0.1477	−0.1504
	(0.1084)	(0.1084)	(0.1084)
White	−0.2663	−0.2666	−0.2639
	(0.1715)	(0.1714)	(0.1713)
Ln (business experience)	−0.2603**	−0.2611**	−0.2605**
	(0.1040)	(0.1040)	(0.1041)
Education	0.3156***	0.3138***	0.3143***
	(0.0989)	(0.0989)	(0.0990)
Ln (owner wealth)	−0.1312	−0.1339	−0.1380
	(0.1098)	(0.1097)	(0.1094)
Owner bankrupt	−0.8970***	−1.0667***	−1.0041***
	(0.2733)	(0.2786)	(0.2766)
Owner delinquent	−0.0378	−0.0542	−0.0388
	(0.0722)	(0.0730)	(0.0730)
Constant	0.0107	0.2222	0.3531
	(0.5133)	(0.5123)	(0.5197)
Industry dummies	Yes	Yes	Yes
DB dummies	Yes	Yes	Yes
Observations	1920	1920	1920
Pseudo R-squared	0.224	0.224	0.224
Panel B: Probability of loan approval			
Optimism	1.2205***		
	(0.1949)		
Optimistic dummy		1.1989***	
		(0.1931)	
Optimism fractional rank			1.6354***
			(0.2621)

Table 4 (continued)

	(1)	(2)	(3)
Firm characteristics			
Ln (assets)	0.2350***	0.1997***	0.2381***
	(0.0707)	(0.0705)	(0.0699)
Ln (firm age)	0.0638	−0.0202	0.0504
	(0.1520)	(0.1506)	(0.1496)
Percentage of tangible assets	−0.4371	−0.3721	−0.4649
	(0.2955)	(0.2956)	(0.2949)
Profit margin	−0.2264	−0.2190	−0.2170
	(0.1984)	(0.2005)	(0.2009)
Debt/assets	−0.0432	−0.0304	−0.0311
	(0.0376)	(0.0380)	(0.0387)
Current liability/total liability	−0.5542*	−0.3978	−0.5519*
	(0.2925)	(0.2897)	(0.2906)
Cash/assets	0.5611	0.4705	0.6178
	(0.3925)	(0.3901)	(0.3904)
Positive growth	0.3837**	0.2905	0.3902**
	(0.1801)	(0.1771)	(0.1762)
Firm delinquent	0.0658	0.1227	0.0709
	(0.0764)	(0.0778)	(0.0772)
Corporation	−0.3919*	−0.4499**	−0.3728*
	(0.2007)	(0.1997)	(0.1998)
Urban	−0.3368	−0.2027	−0.4141*
	(0.2398)	(0.2366)	(0.2321)
Ln (N of times applied)	−0.7440***	−0.5817***	−0.7111***
	(0.1630)	(0.1646)	(0.1652)
Owner characteristics			
Male	−0.1070	−0.1016	−0.0912
	(0.1980)	(0.1973)	(0.1974)
White	0.7834***	0.7762***	0.7951***
	(0.2781)	(0.2772)	(0.2801)
Ln (business experience)	−0.0035	0.0051	0.0242
	(0.1637)	(0.1632)	(0.1631)
Education	0.2368	0.2259	0.2418
	(0.2045)	(0.2032)	(0.2016)
Ln (owner wealth)	0.0002	0.0114	0.0002
	(0.2081)	(0.2086)	(0.2042)
Owner bankrupt	−0.3438	0.2393	0.2427
	(0.4980)	(0.5042)	(0.5409)
Owner delinquent	−0.3472***	−0.2598**	−0.2881***
	(0.1027)	(0.1021)	(0.1035)
Private information			
Ln (relationship)	0.0780	0.0746	0.0795*
	(0.0489)	(0.0490)	(0.0482)
Ln (distance)	0.0947*	0.0947*	0.0948*
	(0.0514)	(0.0514)	(0.0514)
In person	0.2504	0.2520	0.2141
	(0.2164)	(0.2161)	(0.2173)
Constant	−1.8964*	−2.7075**	−3.1239***
	(1.0726)	(1.0752)	(1.0824)
DB score dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Loan type dummies	Yes	Yes	Yes
Observations	815	815	815
Pseudo R-squared	0.439	0.439	0.440

entrepreneurs have better access to credit. The latter, more likely, suggests that owners with personal bankruptcy records make extra efforts to avoid paying trade credit late.

In Panel B of Table 4, we run probit regressions to examine whether entrepreneurial optimism impacts the probability of loan approval. In addition to the control variables we use in Panel A, we also include dummies representing loan types and proxies for the private information that financial institutions may have about the small businesses and owners and loan types. Specifically, we include the distance between the lender and the borrower, the length of relationship, and the communication method. The small business lending literature has shown that, typically, geographic proximity, long-term relationship, and in-person method of communication allow lenders to collect more private information. If our optimism measure is polluted by the unobserved factors related to firm quality, this shall, at least partly, alleviate the effect of the potential pollution on our findings.

As shown in Panel B of Table 4, the coefficients of our optimism measures are all significantly positive, suggesting that the loan applications of optimistic entrepreneurs are more likely to be approved than those of non-optimistic ones. These findings indicate

Table 5
Entrepreneurial optimism and cost of borrowing.

In this table, we examine the relation between entrepreneurial optimism and the cost of borrowing. In Panel A, we examine whether financial lenders more often require optimistic entrepreneurs to provide collateral or guarantee using probit regressions. The dependent variable is equal to one if collateral or guarantee is required for a specific loan, and 0 otherwise. In Panel B, we analyze whether financial lenders charge optimistic entrepreneurs a higher interest rate. The dependent variable in specifications 1–4 is the interest rate of the loan. The dependent variable in specifications 5–8 is the spread between the actual interest rate charged on the most recently applied loans and the concurrent prime rate. Standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% confidence level.

Panel A: Collateral or guarantee			
	(1)	(2)	(3)
Optimism	−0.8423***		
	(0.2882)		
Optimistic dummy		−0.7901***	
		(0.2879)	
Optimism fractional rank			−0.9245**
			(0.3706)
Firm characteristics			
Ln (assets)	−0.0925	−0.0697	−0.1024
	(0.0803)	(0.0802)	(0.0815)
Ln (firm age)	−0.2515	−0.2037	−0.2821
	(0.1676)	(0.1655)	(0.1718)
Percentage of tangible assets	−0.1969	−0.2182	−0.1498
	(0.3241)	(0.3232)	(0.3270)
Profit margin	−0.1409	−0.1204	−0.1147
	(0.2162)	(0.2176)	(0.2170)
Debt/assets	0.1456	0.1421	0.1595
	(0.0990)	(0.1013)	(0.1039)
Current liability/total liability	0.1850	0.1047	0.2433
	(0.3017)	(0.2983)	(0.3123)
Cash/assets	−1.1340***	−1.0817***	−1.2240***
	(0.4027)	(0.4031)	(0.4022)
Positive growth	0.2622	0.3127*	0.2418
	(0.1811)	(0.1777)	(0.1855)
Firm delinquent	−0.1305	−0.1606	−0.0974
	(0.0976)	(0.0988)	(0.0973)
Corporation	0.3731**	0.4011**	0.3249*
	(0.1800)	(0.1799)	(0.1810)
Urban	−0.1577	−0.2375	−0.0737
	(0.2065)	(0.2080)	(0.2089)
Ln (N of times applied)	0.3824*	0.2919	0.4201*
	(0.2207)	(0.2245)	(0.2223)
Owner characteristics			
Male	0.5749***	0.5736***	0.5646***
	(0.2076)	(0.2064)	(0.2049)
White	0.9550***	0.9346***	0.8979**
	(0.3522)	(0.3519)	(0.3521)
Ln (business experience)	0.1171	0.1256	0.1331
	(0.1922)	(0.1918)	(0.1927)
Education	0.3787*	0.3750*	0.3721*
	(0.2057)	(0.2049)	(0.2052)
Ln (owner wealth)	0.0856	0.0770	0.0709
	(0.2266)	(0.2265)	(0.2258)
Owner bankrupt	0.1160	−0.3450	−0.2151
	(0.5467)	(0.5530)	(0.5224)
Owner delinquent	0.1909	0.1354	0.1688
	(0.1409)	(0.1433)	(0.1409)
Loan characteristics			
Loan size	0.2214**	0.2191**	0.2187**
	(0.0931)	(0.0927)	(0.0919)
Loan length	0.2364**	0.2348**	0.2299**
	(0.0961)	(0.0954)	(0.0950)
Fixed interest rate	−0.1054	−0.1088	−0.1252
	(0.2487)	(0.2479)	(0.2474)
Private information			
Ln (relationship)	−0.0379	−0.0374	−0.0387
	(0.0479)	(0.0477)	(0.0472)
Ln (distance)	0.0580	0.0584	0.0601
	(0.0620)	(0.0618)	(0.0619)
In person	0.2108	0.2058	0.2167

Table 5 *(continued)*

Panel A: Collateral or guarantee

	(1)	(2)	(3)
	(0.2478)	(0.2479)	(0.2498)
Constant	−2.6739**	−2.1611	−2.0036
	(1.3305)	(1.3605)	(1.3733)
DB score dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Loan type dummies	Yes	Yes	Yes
Observations	634	634	634
Pseudo R-squared	0.279	0.277	0.275

Panel B: Interest rate and spread over prime-rate

	(1)	(2)	(3)	(4)	(5)	(6)
Optimism	−1.0929*			−1.1993**		
	(0.6067)			(0.5900)		
Optimistic dummy		−1.0807*			−1.1801**	
		(0.5904)			(0.5753)	
Optimism fractional rank			−0.9650			−1.1826*
			(0.7311)			(0.7091)
Firm characteristics						
Ln (assets)	−0.2995**	−0.2713**	−0.3032**	−0.2370*	−0.2060	−0.2461*
	(0.1313)	(0.1308)	(0.1341)	(0.1298)	(0.1291)	(0.1331)
Ln (firm age)	0.3968	0.4572	0.3846	0.3524	0.4187	0.3301
	(0.3305)	(0.3172)	(0.3352)	(0.3227)	(0.3093)	(0.3278)
Percentage of tangible assets	0.1970	0.1630	0.2466	0.1245	0.0874	0.1842
	(0.5160)	(0.5189)	(0.5186)	(0.5159)	(0.5193)	(0.5191)
Profit margin	−0.7768	−0.7478	−0.7349	−0.7901	−0.7583	−0.7447
	(0.5796)	(0.5825)	(0.5814)	(0.5901)	(0.5939)	(0.5917)
Debt/assets	−0.0195	−0.0239	−0.0109	−0.0240	−0.0287	−0.0147
	(0.0806)	(0.0808)	(0.0796)	(0.0766)	(0.0769)	(0.0758)
Current liability/total liability	0.0467	−0.0580	0.0700	−0.1003	−0.2153	−0.0540
	(0.5394)	(0.5434)	(0.5436)	(0.5411)	(0.5446)	(0.5442)
Cash/assets	0.2415	0.3168	0.1552	0.2546	0.3368	0.1494
	(0.7776)	(0.7771)	(0.7871)	(0.7288)	(0.7270)	(0.7383)
Positive growth	−0.1695	−0.1064	−0.1790	−0.1667	−0.0973	−0.1878
	(0.3309)	(0.3285)	(0.3388)	(0.3382)	(0.3370)	(0.3452)
Firm delinquent	−0.2848	−0.3301	−0.2613	−0.2952*	−0.3447*	−0.2684
	(0.1913)	(0.2016)	(0.1870)	(0.1781)	(0.1887)	(0.1735)
Corporation	−0.0213	0.0223	−0.0510	0.0763	0.1241	0.0358
	(0.3410)	(0.3432)	(0.3398)	(0.3356)	(0.3386)	(0.3333)
Urban	−0.2448	−0.3520	−0.1517	−0.2887	−0.4058	−0.1748
	(0.3499)	(0.3488)	(0.3673)	(0.3468)	(0.3456)	(0.3641)
Ln (N of times applied)	−0.1477	−0.2682	−0.1210	0.0647	−0.0670	0.1014
	(0.3577)	(0.3781)	(0.3538)	(0.3710)	(0.3915)	(0.3662)
Owner characteristics						
Male	−0.0265	−0.0241	−0.0350	0.1219	0.1245	0.1134
	(0.4134)	(0.4135)	(0.4130)	(0.3995)	(0.3996)	(0.3997)
White	−1.1595	−1.1656	−1.2287	−1.4012*	−1.4086*	−1.4658*
	(0.7896)	(0.7901)	(0.8139)	(0.7986)	(0.7996)	(0.8189)
Ln (business experience)	−0.6914*	−0.6819*	−0.6946*	−0.7867**	−0.7766**	−0.7855**
	(0.3628)	(0.3635)	(0.3633)	(0.3626)	(0.3632)	(0.3629)
Education	−0.1731	−0.1752	−0.1789	−0.2228	−0.2251	−0.2281
	(0.3639)	(0.3642)	(0.3659)	(0.3617)	(0.3620)	(0.3639)
Ln (owner wealth)	−0.2430	−0.2552	−0.2901	−0.3486	−0.3625	−0.3927
	(0.3387)	(0.3378)	(0.3400)	(0.3300)	(0.3286)	(0.3305)
Owner bankrupt	2.1421	1.5200	1.6911	2.3052	1.6240	1.7961
	(1.4648)	(1.4209)	(1.4538)	(1.5035)	(1.4574)	(1.5041)
Owner delinquent	0.1138	0.0422	0.1015	0.1342	0.0560	0.1171
	(0.2511)	(0.2596)	(0.2509)	(0.2318)	(0.2403)	(0.2331)
Loan characteristics						
Loan size	−0.0914	−0.0940	−0.1002	−0.0768	−0.0798	−0.0847
	(0.1502)	(0.1503)	(0.1515)	(0.1461)	(0.1463)	(0.1477)
Loan length	−0.0935	−0.0906	−0.1048	−0.0856	−0.0826	−0.0944
	(0.2124)	(0.2121)	(0.2139)	(0.2147)	(0.2145)	(0.2162)
Fixed interest rate	0.7457*	0.7483*	0.7116*	0.7479*	0.7504*	0.7167*
	(0.3985)	(0.3987)	(0.3927)	(0.3944)	(0.3948)	(0.3890)
Collateralized or guaranteed	−1.0115**	−1.0043**	−0.9682**	−1.0526***	−1.0440***	−1.0148**

(continued on next page)

Table 5 (continued)

Panel B: Interest rate and spread over prime-rate						
	(1)	(2)	(3)	(4)	(5)	(6)
	(0.3969)	(0.3975)	(0.4007)	(0.3892)	(0.3898)	(0.3928)
Private information						
Ln (relationship)	−0.0844	−0.0832	−0.0896	−0.0227	−0.0215	−0.0276
	(0.0941)	(0.0939)	(0.0941)	(0.0940)	(0.0939)	(0.0942)
Ln (distance)	0.1266	0.1278	0.1339	0.1221	0.1234	0.1294
	(0.1392)	(0.1393)	(0.1402)	(0.1386)	(0.1388)	(0.1397)
In person	−0.2839	−0.2833	−0.2671	−0.4369	−0.4361	−0.4165
	(0.4958)	(0.4965)	(0.4978)	(0.5000)	(0.5009)	(0.5026)
Constant	14.6246***	15.3236***	15.3067***	9.5277***	10.2904***	10.3759***
	(2.9876)	(3.0997)	(3.1775)	(2.9613)	(3.0859)	(3.1637)
DB score dummies	Yes	Yes	Yes	Yes	Yes	Yes
Loan type dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	634	634	634	634	634	634
Adjusted R-squared	0.1809	0.1807	0.1737	0.1718	0.1714	0.1650

that financiers do not ration optimistic entrepreneurs, consistent with our findings from Panel A and with the positive optimism theory. Similar to Cole et al. (2004) and Cole and Sokolyk (2016), we find that smaller firms, firms with more short-term liability and poor growth, and those that applied for credit more often are more likely to be denied loans by financiers. We also find that white entrepreneurs are more likely to get loan approval, but entrepreneurs that had been delinquent are less likely to get loan approval.

Our analysis in this section shows that optimistic entrepreneurs are not rationed by financial lenders as they are less likely to pay their trade credit late and their loan applications are more likely to be approved compared with their less optimistic counterparts. Our findings are thus supportive of the positive view of optimism and complement the results in Puri and Robinson (2007).

5.3. Entrepreneurial optimism and cost of financing

In this section, we further analyze whether financial lenders curtail lending to optimistic entrepreneurs by, for instance, requesting more collateral, requesting guarantee or co-sign from owners, and charging a higher interest rate. Specifically, if lenders curtail lending to optimistic entrepreneurs, then we expect that the loans granted to optimistic entrepreneurs are more often collateralized, guaranteed by owners, and the loan interest rate is higher. Our specifications are summarized as follows:

$$\text{Collateral/Guarantee} = \alpha + \beta_1 \times \text{Optimism} + \beta_2 \times \text{Firm characteristics} + \beta_3 \times \text{Owner characteristics} \\ + \beta_4 \times \text{Loan characteristics} + \beta_5 \times \text{Private Infor} + \varepsilon \tag{3}$$

$$\text{Spread} = \alpha + \beta_1 \times \text{Optimism} + \beta_2 \times \text{Firm characteristics} + \beta_3 \times \text{Owner characteristics} + \beta_4 \times \text{Loan characteristics} \\ + \beta_5 \times \text{Private Infor} + \varepsilon \tag{4}$$

where Collateral or Guarantee is a dummy which is equal to 1 if collateral or guarantee is required for a specific loan; Spread is measured as the difference between the actual interest rate charged and the concurrent prime rate. The control variables are grouped into four categories, including firm characteristics, owner characteristics, lenders' private information, and characteristics of loans approved. The measures of the first three groups are the same as the ones used in Table 4. In addition, we control for characteristics of loans that potentially influence the cost of financing, such as loan size, loan length, whether the loan is fixed interest, and the type of loans. All specifications also include DB score dummies and industry dummies.

Panel A of Table 5 presents the results of probit regressions of whether collateral or guarantee is requested. The coefficients of our optimism measures in Models (1)–(3) are significantly and negatively associated with the probability of collateral/guarantee requirement. These findings suggest that financiers are less likely to require collateral or guarantee from optimistic entrepreneurs compared with other entrepreneurs. Moreover, firms with more cash are less likely to be requested to provide collateral or guarantee. Corporations, firms that applied for credit more often, and those with male and white owners are more likely to be asked to provide collateral or guarantee. Consistent with the existing literature (see, e.g., Chan and Kanatas (1985), Stiglitz and Weiss (1981), and Besanko and Thakor (1987)), we further show that the size and length of loans are positively associated with the collateral requirement.

In Panel B of Table 5, we analyze the relation between optimism and interest rate. In Models (1)–(3), we use the raw interest rate as the dependent variable; in Models (4)–(6), we use the spread between the interest rate and the concurrent prime rate as the dependent variable. In all six specifications, we find a negative coefficient between optimism and interest rate or spread. The coefficients are all significant except specification (3). These findings provide further support to the notion that lenders do not ration optimistic entrepreneurs. Among the control variables, we find that providing collateral or guarantee effectively reduces loan interest

rate. Larger firms on average get lower interest rates. Additionally, white entrepreneurs and entrepreneurs with more experience on average obtain more attractive interest rates.

5.4. Discussion of results

Overall, our analysis in this section provides evidence on an important question related to small business lending: are optimistic entrepreneurs rationed by lenders?

We show that optimistic entrepreneurs are not rationed by lenders. Quite the opposite, our results seem to suggest that they often have better credit accessibility. These findings provide strong support for the positive theory of optimism.

However, similar to the optimism measure in Puri and Robinson (2007), ours is also open to potential alternative interpretations. The most obvious alternative is that it could be picking up private information about business quality that may be difficult to observe rather than differences in entrepreneurs' expectations. We employ a number of approaches to determine whether optimism or the private information drives our results.

As well-established in the small business lending literature, the relationship between lenders and borrowers, the geographic proximity to lenders, and the in-person method of communication with lenders allow financers to collect more private information regarding the quality of the firms. This helps alleviating the moral hazard and adverse selection issues generated by information asymmetry.[9] In our regressions of loan approval and the cost of financings, we include the length of relationship between borrowers and lenders, the distance between them, and the method used to for communication (in person or not). This will, at least partly, help control for the private information that lenders have regarding the firm quality.

In addition, to come up with an alternative measure for banks' private information with regard to borrowers' quality, we run a logit regression where the dependent variable is a dummy variable with value of 1 if loans were approved, and 0 otherwise. The independent variables include various characteristics of firms and entrepreneurs, similar to the ones we used in Panel B of Table 4 excluding the optimism measure. Since the dependent variable represents a series of banks' decisions regarding certain entrepreneur' loan applications within the last three years, we believe that the residuals from the above specification will capture banks' private information, if any, regarding the small business firm and its owner. Then we use the residuals from the logit regression as an independent variable in the cost of financing regressions. The first stage regression is presented in Panel A of Table 6. The cost regressions are reported in Panel B of Table 6.

Our main findings regarding optimism and the cost of bank financing do not change when this new proxy for unobservable private information is added – we still find that optimistic entrepreneurs are less likely to be required to provide collateral or guarantees, and are charged lower interest rates. Thus, while it is impossible to completely eliminate the pollution of our optimism measure that could be due to unobserved factors, it is unlikely that our optimism measure merely reflects banks' private information.

Another potential explanation is that optimistic entrepreneurs, being overly favorable with future outcome, could try more bankers for seeking loans. An optimistic entrepreneur, by trying more banks for a loan, is able to find a more risk-seeking banker who is willing to grant a loan but charge a higher interest rate. In unreported regressions, we test the relationship between optimism and the number of institutions entrepreneurs use. We find a significantly negative coefficient, indicating this is unlikely the case.[10]

6. Conclusion

We examine the impact of entrepreneurial optimism on small businesses credit availability and cost of financing using the 2003 SSBF data. Our study contributes to the current empirical literature on small business lending which has largely ignored entrepreneurial optimism as a factor in banks' lending decisions. We also try to shed more light on the ongoing debate in the literature between the positive and negative views of optimism.

To achieve these goals, we design an innovative measure of optimism. We use the difference between the probability that the entrepreneur's application for loans will be denied given the firm characteristics and credit conditions and the entrepreneur's subjective assessment of this probability as our measure of optimism. A positive difference suggests that the entrepreneur is more optimistic, and vice versa. We also find that our measure is positively correlated with entrepreneurs' personal characteristics that prior studies show to be associated with optimism.

Using this optimism measure, we find that a positive influence of optimism on banks' lending decisions to small businesses. Particularly, we show that financiers do not ration optimistic entrepreneurs. In fact, they are more willing to provide loans to optimistic entrepreneurs. In addition, we document that optimistic entrepreneurs are less likely to be required to provide collateral or guarantee for their loans, and are charged lower interest rates compared to their less optimistic peers. The results are robust to alternative measures of optimism after controlling for the private information that lenders potentially have regarding the quality of the firms. These findings suggest that financiers view optimistic entrepreneurs favorably, thus supporting the positive view of optimism. These findings complement the recent findings by Puri and Robinson (2007) on the role of optimism in entrepreneurship and in the determination of various economic choices.

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[9] See evidence in Petersen and Rajan (1994), Berger and Udell (1995), Cole (1998), Elsas and Krahnen (1998), Harhoff and Korting (1998), Scott and Dunkelberg (1999), Degryse and van Cayselee (2000), and Machauer and Weber (2000) on relationship lending, and in Petersen and Rajan (2002) and Rice and Strahan (2010) on the geographic proximity and the in-person method of communication.

[10] We also examine the relation between optimism and the number of times entrepreneurs applied for loans. We again find a negative coefficient, but not significant.

Table 6

Additional robustness check: control for bank private information.

In Panel A, we run logistic regression using the SSBF 2003 data, where the dependent variable is a count variable which is equal to 1 if entrepreneurs' loan application was approved, and 0 otherwise. The residuals are estimated off the regression and used as proxy for private information banks hold. In Panel B, we repeat some of the specifications in Table 6 by including this new measure of bank of private information as an additional control variable. Standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% confidence level.

Panel A: Logistic regressions	
Variables	MRL Approval
Ln (assets)	0.3228***
	(0.0930)
Ln (firm age)	−0.0714
	(0.2050)
Percentage of tangible assets	−0.8966**
	(0.4382)
Profit margin	−0.8250**
	(0.3239)
Debt/assets	−0.0288
	(0.0613)
Current liability/total liability	−0.5024
	(0.4156)
Cash/assets	0.0723
	(0.6622)
Positive growth	0.2863
	(0.2422)
Firm delinquent	−0.0384
	(0.1108)
Corporation	−0.4333
	(0.2790)
Urban	−0.4011
	(0.3041)
Ln (N of times applied)	−1.1759***
	(0.2196)
Male	0.0093
	(0.2838)
White	1.5273***
	(0.3623)
Ln (experience)	0.1421
	(0.2480)
Education	−0.0245
	(0.2544)
Ln (wealth)	0.2916
	(0.2972)
Owner Bankrupt	0.2507
	(0.7102)
Owner delinquent	−0.5193***
	(0.1474)
Ln (relationship)	0.1511**
	(0.0675)
Ln (distance)	0.0529
	(0.0726)
In person	0.2550
	(0.3031)
Constant	−2.2630
	(1.4447)
DB score dummies	Yes
Loan type dummies	Yes
Industry dummies	Yes
Observations	815
Pseudo R-squared	0.334

Panel B: Optimism and cost of borrowing using residuals from panel A as measure of banks' private information			
	(1)	(2)	(3)
Variables	Collateral or guarantee	Interest rate	Spread
Optimism	−0.9295***	−1.0067*	−1.0891**
	(0.3042)	(0.5571)	(0.5376)
Bank private information	0.1983	−0.2657	−0.3395
	(0.2216)	(0.4788)	(0.4818)
Ln (assets)	−0.0848	−0.3051**	−0.2441*
	(0.0802)	(0.1331)	(0.1317)
Ln (firm age)	−0.2600	0.4031	0.3605
	(0.1679)	(0.3271)	(0.3184)

Table 6 *(continued)*

Panel B: Optimism and cost of borrowing using residuals from panel A as measure of banks' private information

Variables	(1) Collateral or guarantee	(2) Interest rate	(3) Spread
Percentage of tangible assets	−0.1959	0.1927	0.1190
	(0.3238)	(0.5164)	(0.5153)
Profit margin	−0.1865	−0.7040	−0.6972
	(0.2218)	(0.6045)	(0.6149)
Debt/assets	0.1432	−0.0098	−0.0116
	(0.0984)	(0.0798)	(0.0761)
Current liability/total liability	0.1725	0.0639	−0.0783
	(0.3014)	(0.5322)	(0.5335)
Cash/assets	−1.1149***	0.2168	0.2230
	(0.4015)	(0.7875)	(0.7378)
Positive growth	0.2601	−0.1540	−0.1468
	(0.1812)	(0.3350)	(0.3419)
Firm delinquent	−0.1363	−0.2783	−0.2870
	(0.0988)	(0.1913)	(0.1778)
Corporation	0.3513*	0.0099	0.1162
	(0.1812)	(0.3554)	(0.3521)
Urban	−0.1844	−0.2190	−0.2557
	(0.2037)	(0.3585)	(0.3547)
Ln (N of times applied)	0.3806*	−0.1589	0.0503
	(0.2236)	(0.3583)	(0.3710)
Male	0.5942***	−0.0407	0.1038
	(0.2075)	(0.4098)	(0.3962)
White	0.9782***	−1.2032	−1.4569*
	(0.3526)	(0.7804)	(0.7847)
Ln (experience)	0.1238	−0.7005*	−0.7983**
	(0.1922)	(0.3591)	(0.3582)
Education	0.3789*	−0.1703	−0.2192
	(0.2047)	(0.3657)	(0.3634)
Ln (wealth)	0.0910	−0.2663	−0.3785
	(0.2279)	(0.3358)	(0.3284)
Owner bankrupt	0.1906	2.0571	2.1966
	(0.5544)	(1.4520)	(1.4877)
Owner delinquent	0.1724	0.1471	0.1767
	(0.1436)	(0.2477)	(0.2275)
Loan size	0.2266**	−0.0952	−0.0817
	(0.0940)	(0.1519)	(0.1481)
Loan length	0.2327**	−0.0869	−0.0772
	(0.0967)	(0.2104)	(0.2134)
Fixed interest rate	−0.1076	0.7442*	0.7460*
	(0.2491)	(0.3981)	(0.3935)
Ln (relationship)	−0.0368	−0.0892	−0.0288
	(0.0485)	(0.0954)	(0.0950)
Ln (distance)	0.0545	0.1287	0.1248
	(0.0618)	(0.1395)	(0.1389)
In person	0.2134	−0.2825	−0.4351
	(0.2504)	(0.4978)	(0.5023)
Collateral or guaranteed		−1.0066**	−1.0463***
		(0.3967)	(0.3892)
Constant	−2.9430**	14.9415***	9.9326***
	(1.3803)	(3.1796)	(3.1430)
DB score dummies	Yes	Yes	Yes
Loan type dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Observations	634	634	634
Pseudo R-squared	0.281		
Adjusted R-squared		0.1806	0.1722

Appendix A. Dependent variables

Trade credit paid late	A dummy variable, which is equal to one if the firm had paid its trade credit after the due date, 0 otherwise
Approval	a dummy variable, which is equal to one if the firm's loan application is approved, 0 otherwise
Collateral or guarantee	A dummy variable, which is equal to one if the firm is requested to provide collateral or guarantee for the loan extended, 0 otherwise
Spread over prime-rate	The difference between the interest rate of a specific loan and the concurrent prime-rate

Appendix B. Independent variables

Firm characteristics	
Ln (Assets)	Natural logarithm of firm's total assets
Ln (Firm age)	Natural logarithm of the length of ownership by the current owners plus one
Percentage of tangible assets	The ratio of tangible assets (net PPE and land) to total assets
Debt ratio	The ratio of total debt (both trade credit and interesting bearing loans) to total assets
Current liability/total liability	The ratio of current liabilities to total liabilities
Profit margin	The ratio of net income to sales
Cash/Assets	The ratio of cash to total assets
Positive growth	A dummy variable, which is set to equal to one if the sales growth is positive, and 0 otherwise
Firm delinquent	A count variable representing the number of times that the firm had been delinquent
Corporation	A dummy variable, which is set to equal to one if the business is organized as a corporation, 0 otherwise
Urban	A dummy variable, which is set to equal to one if the business is located in MSA, 0 otherwise
Ln (N of Times Applied)	Natural logarithm of the number of times firms had applied for credit over the past three years.
DB score dummies	If the original Dun & Bradstreet credit scores fall in the range of 0–10, the SSBF DB score ranking is 1; if the score is 11–25, then the ranking is 2; if the score is 26–50, then the ranking is 3; if the score is 51–75, then the ranking is 4; if the score is 76–90, then the ranking is 5; if the score is 91–100, the ranking is 6.
Industry dummies	Two digit SIC code
Owners' characteristics	
Gender	A dummy variable, which is set to equal to one if the primary owner is male, 0 if female
Education	A dummy variable, which is set to equal to one if the entrepreneur is college graduate or have post-graduate degrees, and 0 otherwise
Experience	number of years of experience as managing or owning a business
White	A dummy variable, which is set to equal to one if the entrepreneurs is White, and 0 otherwise
Ln (Wealth)	Natural logarithm of the entrepreneur's other personal wealth, excluding the small business
Owner bankrupt	A dummy variable, which is set to equal to one if the entrepreneur was bankrupt before, and 0 otherwise
Owner delinquent	A count variable representing the number of times that the owner had been delinquent on personal obligations.
Lenders' private information	
Ln (Distance)	natural logarithm of the geographic distance between the financial institution and small business
Ln (Relationship)	Natural logarithm of the length of relationship between the financial institution and small business
In person	A dummy variable, which is set to equal to one if the entrepreneur communicates with the lender in person, and 0 otherwise
Loan characteristics	
Loan Size	Natural logarithm of the amount of loan granted
Loan Length	Natural logarithm of the length of loans measured in months
Fixed interest rate	A dummy variable, which is equal to one if the loan is of fixed interest rate, 0 otherwise
Loan type dummies	Loan type includes new line of credit, capital lease, mortgage, vehicle loans, equipment loans, and other loans

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