

**Unequal Hard Times:  
The Influence of The Great Recession on Gender Bias in Entrepreneurial Investment**

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**ABSTRACT**

This article draws on an analysis of panel data from the Kaufman Firm Survey to investigate how the Great Recession affected gender gaps in entrepreneurial access to financing, net of individual and firm-level characteristics. We find that female-led firms were significantly more likely than male-led firms to encounter difficulty in acquiring funding when the small-business lending market contracted in 2009 and 2010. We assess the consistency of our results with three different theories of bias or discrimination, concluding that our findings are most consistent with predictions based on sociological and social psychological theories of gender bias. In particular, our analyses show that the disparity in access to credit arose in part because female-led ventures with low credit scores encountered a significantly larger penalty than did similar male-led ventures during these years, a finding which indicates that the recession led to the application of double standards that disadvantaged women. These findings shed light on the mechanisms that generate a gender disadvantage for female entrepreneurs and, more broadly, highlight how the relevance of ascribed status characteristics (e.g., gender) may vary systematically with macroeconomic conditions.

## **Introduction**

The Great Recession that arose on the heels of the financial crisis and housing market crash of 2007-2008 profoundly affected workers and firms. As consumer demand stagnated and investment markets stumbled, businesses stopped creating jobs and instead laid off workers. Consequently, unemployment in the United States climbed to levels not seen since the Great Depression (Grusky, Western, and Wimmer 2011). Furthermore, although some initially conjectured that the recession might spark the rate of new venture formation given that some individuals who had been pushed out of wage labor might opt to start their own businesses, the empirical evidence has shown the opposite. Shane (2011) found that the rate of new business formation fell 17.3 percent between 2007 and 2009 while the business closure rate increased 11.6 percent in the same timeframe. And, the small business investment market was particularly hard hit by the recession, with total investment contracting to a low point in 2011 that was 18 percentage points lower in than it had been in 2008 (Cole 2012).

Although the impact of the Great Recession was widespread, some populations were hit harder than others. One axis on which the recession was differentially felt was that of gender. In particular, because the majority of job losses were concentrated in industrial sectors such as construction and manufacturing, which have historically been dominated by white, unionized males, men bore the brunt of the recession when measured by job losses (Hout, Levanon and Cumberworth 2011; Folbre 2010). Casting into stark contrast the gender disparity in rates of job loss, the popular press dubbed the economic downturn a “mancecession” (Thompson 2009). A closer look, however, reveals a more complicated picture. For instance, although men were more likely to lose their jobs, women who were laid off experienced greater earnings losses than their male counterparts did when they returned to work (Cha 2014).

In contrast to research on gender disparities in the impact of the Great Recession on workers in the wage labor market however, possible gender disparities in the effects of the downturn on entrepreneurs have, to the best of our knowledge, not been studied. To address this gap, we analyze gender differences in how the recession affected entrepreneurs, focusing specifically on their ability to obtain financing. Although the recessionary environment likely made it more difficult for all loan applicants to obtain funding, did the downturn also affect the size of the net gender gap in financing for entrepreneurs?

An investigation of the gender-differentiated effects of the recession on access to credit is important for two key reasons. First, several survey studies find that women-led firms tend to acquire less investment even after factors such as human capital, industry, and credit histories are taken into account (Carter and Shaw 2006; Cavalluzzo, Cavalluzzo and Wolken 2002; Coleman and Robb 2009; see Jennings and Brush 2013 for a review). Recent experimental studies have also found that investors and potential investors are systematically less likely to view women entrepreneurs as competent, credible and investment-worthy than equivalently qualified male counterparts (Bigelow et al. 2011; Brooks et al. 2014; Thébaud 2014). But, not *all* studies have found evidence of a net disadvantage for female-led firms (see e.g. Carter et al. 2007; Orser, Riding, and Manley 2006), and when a gender penalty is detected, the size of the penalty tends to vary. This suggests that the degree of gender-based disadvantage in entrepreneurial investment is likely contingent upon the contexts in which investors are making their decisions. Thus, an examination of how evidence of gender disparities varies under differing macroeconomic conditions offers a rare opportunity to refine our theoretical understanding of the social conditions under which gender bias in entrepreneurship is likely to emerge. By doing so, it may

help shed light on the puzzle of when and how gender biases persist even in the face of increasingly meritocratic values and procedures (Castilla 2008; Castilla and Benard 2010).

Second, an examination of how the recession might (or might not) have differentially impacted the ability of male-led vs. female-led firms to obtain financing provides an opportunity to empirically test the competing predictions that different theories of discrimination make about the contextual conditions under which evaluative biases will be more or less salient. In particular, sociological theories of status-based discrimination suggest that gender should matter more during periods of widespread uncertainty, such as recessionary circumstances. Taste-based theories of discrimination, on the other hand, suggest that the enhanced risk of failure that businesses face during a recession should push them to operate as efficiently as possible, leaving little room to indulge in costly discrimination. Statistical theories of discrimination, which posit that gender is used only because it serves as a proxy for information about the underlying distribution of some quality (e.g. productivity), would not necessarily predict any change during the recession, as the availability of information and diagnosticity of gender as a proxy for that desired information have not changed. In sum, these theories generate similar predictions during equilibrium periods, often making it difficult to definitively identify the mechanism(s) involved in any biases that are observed; the fact that these theories make divergent predictions when macro-economic conditions change is thus advantageous in that it provides insight as to which of these theoretical accounts is most responsible for gender disparities in loan rates.

To examine the effect of the great recession on funding outcomes for entrepreneurs, we analyze data from the Kauffman Firm Survey, a panel study which allows us to identify rates of formal investment for a sample of entrepreneurial ventures between the years 2007 and 2011 while controlling for a host of covariates that measure human capital and firm characteristics and

performance. Specifically, we evaluate trends in the relative influence of gender on the likelihood of gaining funding during this time period, and analyze how these trends coincided with the contraction in the small business investment market. Our findings suggest that, while all firms had a harder time gaining funding when this market contracted, women-led firms were disproportionately more likely to be denied funding during this period. Moreover, whereas gender became a more relevant predictor of funding during this period, indicators of firm performance and human capital did not. Furthermore, women-led firms with a low credit score were particularly likely to be penalized, which suggests that a gender-based double standard of performance emerged during this period.

Together, these findings indicate that widespread market uncertainty at the macro-level may in fact exacerbate unconscious gender biases at the micro-level, and that such biases are likely motivated by gender status beliefs. As such, our study contextualizes the theoretical discussion about the relevance of ascribed cultural statuses, such as gender, to economic decision-making.

### **Gendered Disadvantage in Entrepreneurial Investment**

Compared to male-led start-ups, firms founded by women tend to acquire less external debt and equity financing (see Jennings and Brush 2013 for a review) which is often critical for the survival and success of an entrepreneurial venture. Some of the gap can be explained by differences in human capital, firm performance and network ties. For instance, women tend to be segregated into less lucrative industries (Loscocco et al. 1991; Marlow and McAdam 2010), run smaller businesses (Jennings and Brush 2013; Kalleberg and Leicht 1991), have relatively less human capital (Kim, Aldrich and Keister 2006; Loscocco et al. 1991), and social capital

(Renzulli, Aldrich and Moody 2000; Ruef, Aldrich, and Carter 2003). All of these factors contribute to their lower probability of gaining substantial external investment.

Whether the gender gap in funding persists after controlling for these factors, however, is unclear. On the one hand, several studies find that gender differences remain even when these factors are taken into account (Carter and Shaw 2006; Cavalluzzo, Cavalluzzo and Wolken 2002; Coleman and Robb 2009; Wu and Chua 2012). Moreover, recent studies that use the strongest research design for ruling out unmeasured differences between male and female entrepreneurs (i.e. experimentally manipulating the gender of an entrepreneur) document that potential lenders and technology licensing officers favor male-owned start-ups despite the lack of any actual differences aside from the gender of the entrepreneur (Bigelow et al. 2011; Brooks et al. 2014; Shane et al. 2012; Thébaud 2014). However, a number of other studies have *not* found evidence that female-led firms are disadvantaged or that they are judged by differing criteria once the background characteristics of firms and entrepreneurs are taken into account (Carter et al. 2007; Haines, Orser, and Riding 1999; Orser, Riding, and Manley 2006). Furthermore, when gender bias is detected, the size of the penalty also tends to vary.

Overall, we draw two overarching conclusions from this body of prior work. First, because disparate outcomes for men and women were documented several times in experimental studies where quality was held constant through random assignment, we presume that there is, at least in some settings, a tendency toward bias in favor of male entrepreneurs or against female-led firms. Second, because the findings of studies using observational data find mixed results, we believe that investors' likelihood of relying on gender beliefs when making investment decisions is contingent upon features of an evaluative context. Drawing on theory and prior research in economics and sociology, we theorize and empirically evaluate the extent to which market

uncertainty constitutes an important contextual feature that moderates the salience of gender beliefs in investment decisions.

### **Mechanisms of Gender Discrimination**

When divergent outcomes arise for male versus female-led firms, what mechanisms are responsible? We outline three different theoretical accounts. “Taste-based” (Becker 1957) theories of discrimination suggest that evaluators, such as investors and employers, simply hold a preference for male-led firms. However, this theory is difficult to square with the fact that such a preference is inherently economically inefficient. Moreover, this mode of discrimination is difficult to reconcile with legal mandates that outlaw such discriminatory lending practices, as well as the more informal commitment to meritocratic values that many individuals and firms now espouse. Statistical theories of discrimination (Arrow 1973; Phelps 1972) attempt to resolve this puzzle. By this account, investors are rational actors who do not have any intrinsic preference for men over women but instead tend to evaluate individuals differently on the basis of gender because they believe gender serves as a proxy for the statistical distribution of characteristics, such as productivity, which are difficult to observe for any given individual. This strategy is ostensibly a shorthand way of reducing uncertainty about any pertinent unmeasured qualities of individuals or their organizations. Although variants of the theory propose differing assumptions about the way in which such unmeasured qualities are distributed (e.g., differences in means, variances, or both; see e.g. England 1992 or Correll and Benard 2006 for a discussion), they all assume that discrimination arises from an *informational* bias (i.e. investors’ lack of information).

In contrast to statistical theories, status-based theories of discrimination suggest that discriminatory outcomes emerge from a *cognitive* bias on the part of investors (Correll and



Benard 2006). In this framework, evaluators such as investors, often unconsciously, rely on a widely shared cultural belief that men are generally more competent in the domain of entrepreneurship than are women (Ridgeway 2011; Thébaud 2010; 2014), a belief which is made salient by the well-established cultural association between entrepreneurship and stereotypically masculine attributes, like competitiveness and risk-taking (Bruni et al. 2004; Buttner and Rosen 1988; Gupta et al. 2009). By this account, women entrepreneurs may be less likely to garner financing because investors are less likely to assume they are competent or skilled entrepreneurs, a notion which has been supported experimentally (Bigelow et al. 2011; Thébaud 2014) as well as anecdotally (Buttner and Moore 1997; Carter and Cannon 1992; Maniero and Sullivan 2006).

However, in addition to informing expectations of competence, status beliefs can also inform the standards that are used to determine whether a given performance is indicative of ability (Correll, Benard and Paik 2007; Foschi 1996). When status beliefs are salient, women tend to have their performances judged by a stricter standard than men because when women perform well, their performances are inconsistent with (low) expectations for their ability and are, as a result, more highly scrutinized (Foschi 1996; 2008; Foschi, Lai and Sigerson 1994). Therefore, in addition to predicting that women will have a harder time gaining investment, a status beliefs account also predicts that women entrepreneurs will need to establish more “evidence” of ability or past performance than their male counterparts in order to have their ventures judged to be of the same quality. Consistent with this account, experimental studies have shown that women may need to demonstrate more evidence of technical knowledge or innovation in order for their ventures to be viewed as equally worthy of investment (Thébaud 2014; Tinkler et al. 2014).

Although both statistical and status-based accounts predict that, all else being equal, female-led firms will garner less investment than male-led firms, the two theories differ in their predictions regarding how individual-level information on pertinent characteristics, such as productivity or credit-worthiness, will be interpreted. Status-based theories posit that evaluators' beliefs about men's and women's differential competence will color their interpretation of a given piece of information, leading the investor to judge the same level of performance more favorably for male and female-led firms. In contrast, theories of statistical discrimination do not predict that different performance standards will be applied to the same information when it is about men as opposed to about women (Correll and Benard 2006). Moreover, because gender is primarily used to overcome the problems presented by a lack of better information, the availability of such information should attenuate the observed effects of gender. Overall, there are a variety of theoretical mechanisms through which gender might influence the evaluation of an entrepreneur's request for funding. Although our primary aim in this paper is to consider how macroeconomic conditions may (or may not) moderate these discriminatory processes, we later present and discuss analyses in which we attempt to determine which of the theories above best accounts for our findings.

### **Market Uncertainty: Inhibitor or catalyst of the gender gap?**

How, if at all, do difficult macroeconomic conditions, such as those associated with the Great Recession, impact gender disparities in access to credit? As noted earlier, the Great Recession involved an increase in unemployment, a rise in bankruptcies and a tightening of lending standards. At a more abstract level, these characteristics of the macroeconomic environment map conceptually onto two factors that have been predicted to affect the level of bias: uncertainty and competition. In particular, recessionary conditions lead to greater

uncertainty about the likelihood that any small business owner will be successful enough to pay back his or her loan. In addition, banks faced increased competitive pressures in the sense that they were at an increased risk of failure.

Existing theories make conflicting predictions about how these factors should impact the degree of gender bias. On the one hand, Becker (1957) has argued that, to the extent that discriminatory employers or investors put themselves at a competitive disadvantage relative to others, greater competition should reduce discrimination. This leads to the prediction that when banks are under more pressure to select the best loan candidates, as they would be during a recession, loan evaluators might be less likely to discriminate. While this seems to suggest that the gender gap would narrow due to the recession, the theory is not specific about how long it might take for competitive pressures to drive out discrimination. Thus, this theoretical account of discrimination seems to suggest that gender gaps would narrow during the recession, or that there would be no change. On the other hand, social psychological accounts suggest that implicit cultural stereotypes about gender are most relevant under conditions of high uncertainty (Foschi 1996; Gorman 2006; Kanter 1977; Ridgeway and Correll 2004). Moreover, individuals tend to fall back on old biases and prejudices when there is greater competition for scarce economic resources (Olzak 1992; Tolnay and Beck 1995). Thus, we might expect that the gender gap in financing would widen during the recession. Below, we discuss these arguments in more detail, as well as the empirical predications that they imply.

In his classic (1957) work on discrimination, Becker conceptualizes prejudice as a particular form of discrimination that arises out of individuals' "taste" or preference to avoid interacting with members of certain minority groups. This type of discrimination contrasts with other forms, such as statistical discrimination that arises as a result of using group-level

characteristics known or believed to be correlated with certain outcomes to infer unobservable attributes of a specific member of that group. To the extent that an individual has a “taste” for discrimination, he will require minority groups to compensate him by being more productive at a given wage or accepting a lower wage for identical productivity. If an employer indulges his taste for discrimination by, for example, refusing to hire a minority worker, he pays a cost in the form of higher wages for a given level of productivity or less productivity for a given wage. While it may be feasible to bear such costs in a less competitive environment, Becker argues that we should observe less discrimination in more competitive settings because firms that indulge in a taste for discrimination will be less profitable and will not survive. In this manner, competition helps to drive out discrimination. Applied to the empirical context at hand, Becker’s work therefore suggests that the gender gap in funding would be diminished during an economic downturn in which banks had more reason to be concerned about their profitability and survival. Consistent with this notion, one study finds that gender differences in entrepreneurial investment are smaller when local banking markets are more competitive (Cavalluzzo, Cavalluzzo and Wolken 2002).

In contrast to this scenario however, sociological and social psychological perspectives suggest that gender gaps in entrepreneurial investment would instead emerge and/or widen during years of greatest market uncertainty. Why? First, individuals have been found to be especially likely to rely on old, conventional ideas and heuristics under conditions of uncertainty because they offer cognitive shortcuts for managing information that reduce the complex task of assessing probability (see e.g. Tversky and Kahneman 1974). This tendency can aggravate bias on the basis of gender. For instance, experimental studies suggest that when performance information is lacking or is ambiguous, female job candidates are rated as less competent than

their male counterparts, whereas this bias diminishes when explicit evidence of their performance success has been provided (Foddy and Smithson 1999; Foschi 2006; Heilman et al. 2004; Heilman, Block, and Stathatos 1997). Similarly, when the nature of work is more uncertain because, for instance, selection criteria and standards are not clear, there tend to be larger gender differences in promotion and pay than when such practices are clearer and more systematic (Gorman 2006; Ridgeway 1997; 2011; Reskin and McBrier 2000; Reskin 2001).

In particular, Gorman (2006) finds that when a law firm's work is characterized by greater uncertainty, the firm is less likely to promote women. There is greater work uncertainty when outcomes are more variable and unpredictable, when there is no clear course of action for a specific problem (e.g. what worked in one case may not work in another), and when success is dependent upon "autonomous others", whose actions are themselves unpredictable. In these situations, the uncertain nature of the work increases bias because it increases evaluators' doubts about the linkage between an individual's past performance and their ability to succeed; when it is unclear that previous strategies will work, people rely less on past performance and more on stereotypes and status beliefs which, as noted above, are particularly likely to advantage men in entrepreneurial settings. During an economic recession, the "work" of an entrepreneur is especially uncertain because it is now more subject to unpredictable market actors. Indeed, the predictors of success in such an environment may not be so clear: what predicted success in the past may not do so again in the future. As such, investors may try to mitigate risk by relying more on "intuitive" (i.e. stereotypic) assumptions about what a successful entrepreneur looks like (i.e. a male).

Furthermore, it is possible that the competition for scarce resources that characterizes recessionary markets also exacerbates bias. For instance, some prior studies have suggested that

racial prejudice and discrimination can become more prevalent during economic downturns: when unemployment rates are high, the dominant group (whites, men) may feel that their employment or social status is threatened by the minority group (nonwhites, women) (Johnston and Lordan 2014; Olzak 1992; Quillian 1995; Tolnay and Beck 1995). It is possible that a similar dynamic may occur in our setting because investors have a scarcity of funds at their disposal and most investors are male. As such, it is possible that they may unconsciously “protect” the survival of male-owned firms.

Taken together, these theoretical perspectives suggest that women-led firms will be relatively more disadvantaged during a period of market contraction, net of performance and human capital and firm characteristics. Furthermore, if this pattern emerges because status beliefs become more salient during this period, we should find evidence that investors are more likely to rely on gender-differentiated performance standards during this period. In this context, we believe that this means that female-led firms will have to demonstrate more proof of their creditworthiness in order to be funded at the same rate as their male-led counterparts.

Finally, we consider the predictions of theories of statistical discrimination. Although, as noted earlier, variants of these theories make different assumptions about the statistical distribution of typically unobservable factors, such as productivity or creditworthiness, the operation of statistical discrimination is posited to hinge on the presence or absence of information about what is unobservable. Presumably, then, observed gender differences in evaluative outcomes should be amplified in settings where individual-level information on pertinent characteristics is entirely absent and, conversely, should be attenuated to the extent that better information is available. Because we have no reason to believe that the Great Recession shifted the availability of information about creditworthiness, then we predict that the Great

Recession would not lead to any shift in the extent to which gender might play a role in investment decisions.

## **Data and Methods**

To shed light on these questions, we examine panel data on funding outcomes from a set of entrepreneurs who sought bank loans between 2007 and 2011. Macroeconomic conditions varied significantly over this time period due to the financial crisis, enabling us to test our prediction that recession amplifies the effect of gender on entrepreneurial investment.

### *Sample*

The data for our analysis come from the Kauffman Firm Survey (KFS), a panel study that follows a sample of 4,928 businesses started in 2004. The survey includes detailed information on the characteristics of each business's owner(s), as well as its strategy, organization, performance, and financing in the prior calendar year.<sup>1</sup> A stratified random sample of the approximately 250,000 new businesses<sup>2</sup> listed in Dun & Bradstreet's (D&B) database in 2004 determined the set of firms that were invited to participate in the first wave of the survey, which was administered in 2005. Follow-up surveys were conducted annually through 2012. The composition of the panel has changed over time as some firms have ceased operations and others have failed to respond to the survey. However, the latter issue is not a major concern because the response rate to the survey is quite high: conditional on still being in business, only approximately 11 percent of business owners that participated in the first year of the survey did not respond to follow-ups.

In this article, we focus on responses to a series of questions initiated in 2008 about each firm's experience in seeking financing from banks or other financial institutions. Specifically,

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<sup>1</sup> Thus, the data pertain to calendar years 2004-2011.

<sup>2</sup> New businesses include not only start-ups but also purchases of existing businesses by a new ownership team and purchases of franchises.

business owners were asked if they had applied for any new or renewed loans or lines of credit in the prior calendar year.<sup>3</sup> Our data indicate that applying for a loan was a relatively uncommon event. In any given year, approximately 12.4% of respondents applied for a loan. Male business owners were significantly more likely than female owners were to seek out a loan or line of credit (13.0% vs. 10.5%,  $p < 0.01$ ). However, as we will show later, the data indicate that the apparent gender gap in applications is due to differences in other characteristics that predict loan-seeking, rather than being a function of gender per se.

Respondents who had sought loans were then asked about the outcome of their applications. The response rate to this question and the prior question on loan applications is higher than 99.5% among those who agreed to participate in the survey in a given year. Thus, non-response to these particular questions should not be a concern. In total, our analytical sample includes 1,097 reports of loan application outcomes from 640 firms. For approximately 58 percent of the firms in our sample, we observe the outcome of funding requests in only one year. However, the remaining 42 percent of firms report funding outcomes in multiple years.

### *Dependent Variable*

The dependent variable in our analysis corresponds to the possible answers to the survey question about loan application outcomes described above. Participants could report that their loan applications were “never denied,” “sometimes approved and sometimes denied,” or “always denied.” We coded this as an ordinal variable ranging from one to three, with higher values corresponding to more frequent denial. Approximately 69.7 percent of respondents reported that their loans were never denied. In contrast, 15.4 percent and 14.9 percent of the time respondents said that their applications were sometimes or always denied, respectively. However, as we will

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<sup>3</sup> The specific question was: “Did [BUSINESS NAME] make any applications for new or renewed loans or lines of credit in calendar year [ ]?”



discuss subsequently, these average loan application outcomes mask variation over time and by gender.

### *Independent Variables*

The key independent variable of interest is a dummy variable coded “1” if the firm’s lead owner is female. Women-led firms comprise about 20 percent of responses. We capture changes in the lending environment with a series of year indicators, taking 2007 as the omitted baseline year. To examine how the effects of gender changed over time, relative to the baseline pre-crisis year of 2007, we interacted these year indicators with gender. We are particularly interested in how the interaction terms operate in 2009 and 2010. Precise measures of the timing of the economic downturn vary, with the recession technically defined as starting in December 2007 and ending in June 2009. However, survey data from bank examiners indicates that the impact of the financial crisis on the small business lending market was most pronounced during 2009 and 2010. Figure 1, which reproduces data from the Office of the Comptroller of the Currency’s Survey of Credit Underwriting Practices, shows that less than ten percent of banks reported a net tightening of their lending standards for small businesses in 2007 and 2008, but over 60 percent of banks reported doing so in 2009 and 2010. Consistent with this finding, Cole (2012) shows that the amount of small business loans originated increased between 2001 and 2008 and declined subsequently. Although we would ideally have data over a longer timeframe, data from the 2007-2011 timeframe provide us with a reasonable baseline (2007) and sufficient variation on economic uncertainty in subsequent years to examine our substantive questions of interest.

### *Control Variables*

To disentangle the effects of gender from those of other factors that may influence loan application outcomes, we control for a series of owner and business characteristics. In terms of

owner characteristics, we control for both minority and immigrant status using indicator variables (1= minority, 1=immigrant). The minority category includes racial and ethnic groups that have been found to experience patterns of disadvantage in the area of entrepreneurship (see Fairlie and Robb 2008). These include owners who identify as black, Hispanic, American Indian, Native Hawaiian, or other. Approximately 11.7 percent of respondents identify as a member of one of these groups. We also control for U.S. immigrant status, which characterizes approximately 9 percent of respondents.<sup>4</sup> In addition, we adjust for the human capital of the principal owner. This includes education (measured as 4 categorical variables), age (measured as a series of 7 categorical variables), industry experience (measured by the logged number of years the owner had previously worked in the industry of the start-up), and entrepreneurship experience (measured as a binary variable indicating whether the respondent had previously started a business).

Next, we control for business characteristics. These include indicators for whether the firm includes multiple owners, the credit risk associated with a firm, whether or not the firm holds intellectual property, business size, profitability, revenue, assets and industry. The credit risk measure consists of 5 categories corresponding to credit score risk classes as assigned by Dunn & Bradstreet's U.S. ratings report; higher scores indicate greater creditworthiness. A firm was defined as owning intellectual property (*I=yes*) if they reported that the business owned any patents, copyrights, or trademarks. We measure business size with the log of the number of full-time employees. Following Loscocco et al. (1991), we increase employee size by 1 for each business to permit the log transformation and to account for the owner's labor. The public-access

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<sup>4</sup> Though minority and/or immigrant status are also important dimensions along which stereotypic biases may disadvantage firms in their quest for support, we are not able to reliably investigate how the effects of these variables change over time with these data because both groups comprise small and heterogeneous fractions of our sample.

KFS data does not reveal continuous measures of profit, revenue and assets but instead codes responses to these questions into one of nine categories. For the sake of parsimony, we experimented with various ways of collapsing these variables (e.g., combining categories where the effects of two categories were not statistically distinguishable from one another). In the end, we chose to represent profitability as a three-category variable and coded revenue and assets as four categories.<sup>5</sup> In each case, we used the modal response from our data as the reference category. We control for industry using a series of more than 20 dummy variables representing NAICS codes. Credit risk, intellectual property, profit, revenue and assets are each lagged by one year. Finally, we account for factors specifically related to the businesses prior financing experience. We include indicators of whether the firm has a business credit line, has a business credit card, has trade financing, and/or has applied for a loan previously. Table 1 includes descriptive statistics of all variables in our analyses.

### *Estimation*

We estimate ordered logistic regression models with random effects for firms using the xtologit command in STATA 13. Ordered logistic regression is appropriate because the dependent variable in our analyses can take on any of three hierarchically arranged values. We include random effects because we wish to account for the fact that we observe multiple years of data for some (but not all) firms in our sample and because we are primarily interested in the impact of time-invariant variables (i.e., gender). The model assumes that the variation across firms is random and uncorrelated with the predictor variables. In order to account for the correlated structure of the panel data, all models employ robust standard errors clustered on firms.

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<sup>5</sup> We are currently in the process of obtaining continuous measures of these items via access to the restricted-use version of the KFS data.

## Results

Figure 2 shows the raw percentage of responses in each category of loan denial by the gender of main owner/founder between 2007 and 2011. Panel A suggests that women-owned firms are less likely than male-owned firms to be in the “never denied” category, and Panel C shows that women-owned firms are more likely than male-owned firms to be in the “always denied” category. However, these gender gaps fluctuate during the period of study. For instance, 74 percent of male owned firms versus 68 percent of female owned firms fell into the “never denied” category in 2007, a difference of about 6 percent. By 2010, this gender gap was about twice as large, at 12 percent (68 and 56 percent for male and female owned firms, respectively). The reverse pattern can be seen in the “always denied” category: there is a sharper increase in the percentage of female- owned firms in this category between 2007 and 2010 than there is for male-owned firms. Overall, these descriptive patterns suggest that the recession exacerbated gender gaps in loan denial.

To examine whether these descriptive trends persist after controlling for other factors associated with loan application outcomes, we estimated random effects ordered logistic regression models predicting the likelihood of loan denial. Results are presented in Table 2. Model 1 includes control variables as well as year indicators. Control variables operate as expected. Those with more industry experience and better credit scores were less likely to experience denial. In contrast, immigrants and underrepresented minorities were more likely to be denied funding. Of particular interest for our substantive interests are the year indicators included in model 1. The positive and statistically significant coefficients associated with the indicators for 2009 and 2010 show that firms were significantly more likely to be denied funding in these years, relative to the baseline pre-crisis year of 2007.

Model 2 adds in an indicator for whether the firm is female-led. The positive and significant coefficient on this variable indicates that female-led firms were more likely to be denied funding. In order to test our hypothesis that female-led firms faced disproportionately difficult odds of obtaining a loan during the recession, Model 3 incorporates a series of interactions between years and female. In this model, the main effect of the female indicator represents the effect of being female on loan outcomes prior to the recession in 2007. The coefficient on this variable is positive but not statistically significant, indicating that firms led by women did not experience different outcomes than male-led firms did at this time. However, results show that the interactions of year and female were positive and significant in 2009 and 2010, indicating that female entrepreneurs faced greater difficulty obtaining funding than their male counterparts did during those years. Moreover, the main effects of the 2009 and 2010 year indicators are no longer significant, suggesting that men did not experience any additional difficulty obtaining funding during the recession, after accounting for other observable factors.

Taken together, this suggests a rather nuanced picture of the effects of gender in entrepreneurial lending markets. Gender does not appear to have an effect on lending outcomes under more typical macroeconomic conditions. However, when these conditions worsen, women entrepreneurs face greater difficulty obtaining funding than do male entrepreneurs with similar observable characteristics.

In our primary analyses, we examined the effects of gender over time using pooled models with interaction terms in order to preserve statistical power, which is important given that the number of female entrepreneurs in our data is not extremely large. However, given the potential difficulties of estimating and interpreting non-linear models with categorical interaction terms, we also present analyses run separately on male and female sub-samples. Models 1 and 2

of Table 3 show the results of random effects ordered logistic regression models estimated separately for men and women. Models 3 and 4 present the results of linear regression models for men and women, respectively, estimated using ordinary least squares. Results are consistent with those presented earlier. In both the models for men and for women, the indicator variables for 2009 and 2010 are positive, suggesting a greater likelihood of funding denial. However, the effect is much larger for women than for men. Moreover, the coefficients on the year indicators do not reach even marginal significance for men. Compared to the pooled models, the pattern of statistical significance for women is somewhat attenuated ( $p < 0.10$ ), but this is to be expected given the reduced statistical power from running models on the smaller sub-sample. Results from linear regression models (Models 3 and 4) show a similar pattern of substantive results with increased statistical significance relative to the pooled models ( $p < 0.05$ ).

Thus far, our results suggest that ascriptive characteristics like gender became *more* important predictors of the likelihood of being denied funding during the Great Recession. We interpret this as evidence consistent with the theoretical premise that factors associated with worsening macroeconomic conditions, such as tightening lending standards and widespread uncertainty, may increase reliance on stereotypes, and therefore disproportionately disadvantage groups such as women, who have not traditionally been associated with the agentic qualities stereotypically associated successful entrepreneurship.

However, an alternative possibility is that the findings thus far are not particular to gender but rather are a manifestation of a more general pattern of increased scrutiny, in which not only gender but also more objective factors, such as credit score information or industry experience, become stronger predictors of loan outcomes during the recession. To determine whether this is the case, we ran a series of models paralleling the models presented earlier in

which we examined the changing effects of gender. Instead of interacting gender with year indicators, however, we interacted objective characteristics such as credit score, industry experience, prior entrepreneurship experience and profitability with the year indicators to determine whether the effects of these more “objective” characteristics of firms and their owners also increased in importance when the lending market for small businesses tightened. The results of these tests were quite similar regardless of which “objective” indicator we tested; in short, we did not find any evidence that these factors became more important during the 2009-2010 period. For the sake of brevity, we do not present all the models we ran to examine this issue. Instead, in Table 4 we offer illustrative findings from the models in which we interacted each of the credit score dummies with the indicator that the application was completed in 2010. We focus on 2010 because this was a year in which lending standards tightened substantially (see Figure 1) and it was the year in which we observed the strongest penalty for female entrepreneurs. (Results are the same for 2009.) We first interact the 2010 indicator with each of the 5 credit categories in our data, entering the interactions individually in Models 1-5 to ensure that multi-collinearity does not drive the non-significant results that we obtain. Model 6 presents all the interactions in a single model. As the results show, none of the year interactions are statistically significant. These results stand in stark contrast to our findings about the shifting effects of gender. Taken together, the empirical evidence suggests that the observed increase in the importance of gender during the Great Recession does not seem to be part of a pattern of overall increased scrutiny that similarly affected how lenders made use of more objective types of information.

Finally, to further investigate why and how the disparity in access to credit arises, we ran a set of models in which we included three-way interactions of gender, each of the categories of credit score, and respectively, whether the year was 2009 or 2010. These three-way interactions

test whether the effect of a given credit score on loan application outcomes in a given year was different for male-led firms than for female-led firms. Table 5 presents the results of these analyses. The leftmost column of coefficients includes the three-way interactions for 2009, and the rightmost column includes the three-way interactions for 2010. The findings for 2009 are relatively uninteresting; none of the three-way interactions are significant. Thus, in this year, bias does not seem to manifest itself in differential evaluation of credit scores. In contrast, turning to the results for 2010, the three-way-interaction for the lowest two credit scores is positive and significant. Thus, in that year, the gender penalty manifested itself in a very targeted way such that having a low credit score is more detrimental for women entrepreneurs than for male entrepreneurs. This finding is consistent with Foschi's (1994, 1996) work on double standards, whereby status beliefs prompt evaluators to hold women to more stringent requirements than men.

## **Robustness Checks**

### *Gender Differences in Loan-Seeking Behavior*

Readers may wonder how these findings are affected by the possibility that male and female entrepreneurs differ in their propensity to seek loans. We examined this issue by running a series of panel logistic regression models predicting the log odds of applying for a loan. All models include random effects and robust standard errors clustered on firms. Results of these analyses appear in Table 6. Model 1, which includes year dummies and an indicator of whether the applicant was female, indicates that women are less likely than men to seek out bank loans ( $\beta = -0.384, p < 0.02$ ). However, Model 2, which includes a battery of control variables that were used in our main analysis of loan denial, suggests that observed effects of gender can be



attributed to the fact that male and female businesses differ on other characteristics that predict applying for a loan. As Model 2 shows, the effect of being female becomes positive and only marginally significant ( $\beta = 0.186$ ,  $p < .07$ ) once these other factors are controlled. We interpret this as relatively weak evidence of gender-based differential selection, with women possibly applying at greater rates, net of other observable characteristics.

In exploring the possibility of gender-based differences in the propensity to apply for a loan, our main concern is with the possibility that the elevated denial rates that women faced in 2009 and 2010 stems from these female entrepreneurs being of lower quality on some unobservable dimensions. If that were the case, then any gender differences in loan applications being approved could stem from the fact that loan applications from male-led businesses are superior, rather than because of gender-based status beliefs that disadvantage female entrepreneurs. For this to be the case, however, we would need to assume either that men are more reluctant than women to seek out loans and that they therefore hold themselves to higher quality standards prior to doing so. The flipside of this argument is that perhaps women entrepreneurs are for some reason particularly willing to reach out and seek funding and that they hold themselves to lower standards prior to doing so. We know of no theoretical accounts consistent with either of these stories. In addition, even if gender-based differences in the propensity to seek a loan made it such that male applicants were superior on some unobservable dimensions, this would be consistent with our results only if a second condition were also met: differential selection would have to manifest itself only during the years of 2009 and 2010 when macro-economic conditions were highly uncertain. For example, perhaps women were more inclined to reach out to banks for financial assistance during the recession while men were more

reluctant, and as a result, the pool of women applying for a loan was of lower quality than the pool of men applying in ways that are not captured by our control variables.

To test this possibility, Model 3 of Table 6 incorporates interactions between female and year. Note that in this model, as in the previous model, the coefficients on the year indicators are negative and significant, indicating that male applicants were less likely to apply for a loan during the economic downturn. In this model, the coefficient on the female indicator captures the effect of being female in the baseline year of 2007. This coefficient is positive but does not reach significance at conventional levels, indicating that women were no more or less likely than men to apply for a loan in 2007. Gender differences in application rates do not seem to manifest themselves in later years either; none of the genderXyear interactions are statistically significant. In summary, the results suggest that all entrepreneurs were less likely to seek funding in years subsequent to 2007 and that this pattern did not vary by gender. Overall, based on this examination, we conclude that differential selection into applying for a loan is unlikely to account for the pattern of observed results.

#### *Gender Differences in the Self-reporting of Loan Denial*

Because the data on loan application denial are self-reported, one possible concern is that our results stem from gender differences in the propensity to admit being denied a loan rather than actual gender differences in experiencing denial. For example, perhaps men who are denied a loan are reluctant to disclose this fact, perhaps due to pride, whereas women who have been turned down may be more likely to divulge this information. In order for this to explain our results, however, not only would this need to be the case, but such self-reporting bias would also have to manifest itself only in 2009-2010. While we cannot definitively rule this out, we are not

aware of any theoretically driven reason to suspect this would be the case. However, we undertook two additional analyses to examine this possibility. First, we examined a question asked only in 2009 about the extent to which each owner believed that the economic downturn had affected their business, with possible responses of “not at all” (=1), “a little” (=2) or “a lot” (=3).<sup>6</sup> If men are more reluctant than women to disclose being denied a loan during the recession (perhaps because of a sense of pride or a need to live up to the image of the successful male entrepreneur), then we might expect that men would also be less likely than women to admit that the recession had proven challenging for their business. However, analyses of the responses to this question by gender indicate that the proportions of men and women in each response category are similar, and the mean responses by gender are statistically indistinguishable (mean=2.27, p=0.97).

Second, we compared our primary results about loan denial to another survey question in which respondents were asked if their business had any bank funding. Although men or women might misreport their experience of loan denial due to some embarrassment at this fact, we find it less likely that they would misreport whether they actually have a bank loan or not, given that there were multiple funding options and it seems that having a bank loan is neither a socially desirable or undesirable response compared to other types of funding. We ran panel logistic regression models in which we predicted the likelihood of reporting not having a loan in the current year as a function of the respondent’s answer to the prior year’s question about loan denial, as well as all of the controls in our other models. (Results are available on request.) As expected, reporting more experience with loan denial in the prior year was significantly and negatively associated with having a loan in the current year ( $\beta=-0.56$ ,  $p<.05$ ). To test whether the

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<sup>6</sup> The specific question was “How much did the nation’s financial problems, which became highly visible in 2008, affect [NAME BUSINESS] during the calendar year 2008? Would you say...[a lot, some, not at all]?”

self-reported experience of loan denial was differentially predictive of reporting having a loan in the subsequent year by gender, as we might expect if there were biased reporting of the experience of denial, we included an interaction of gender and loan denial. This interaction term was non-significant ( $p=0.85$ ). In summary, while we cannot definitively rule out the possibility of biased reporting of denial, none of our evidence is consistent with this explanation.

## **Discussion and Conclusion**

In this paper, we investigated the possibility that macroeconomic conditions moderate the probability of gender-based discrimination in the domain of entrepreneurship. Our finding that female-led firms were significantly more likely than men to be denied funding during 2009 and 2010, when the small business lending market was most constrained, and that lenders did not simultaneously increase their emphasis on other more objective factors, leads us to conclude that recessionary conditions increase the unique relevance of gender in the evaluation of entrepreneurial ventures. Moreover, consistent with a status-based account of discrimination, we find that low credit ratings disproportionately disadvantaged women during 2010, suggesting that investors also were more likely to apply gender-differentiated standards of performance during this period. Our analysis and findings contribute to scholarship in the substantive area of gender and entrepreneurship, as well as to work that relates to discrimination and the operation of status processes in markets more generally. We discuss each of these in turn.

In terms of the literature on gender and entrepreneurship, this study helps shed light on the disadvantages that female-owned firms face in terms of funding, a critical outcome that may ultimately influence firm survival and ultimately contribute to the aggregate gender imbalance in the rate of small-business ownership. Our findings are consistent with lab-based studies showing

that status-driven cognitive biases against women entrepreneurs are a key mechanism that contributes to the ability of women-led firms to obtain funding (Thébaud 2014; Tinkler et al. 2014). A key strength of our study relative to others, however, is that the longitudinal nature of our data enables us to exploit variation in macroeconomic conditions to better understand precisely when such biases are more likely to arise.

While our study focuses on a specific type of funding – bank loans and lines of credit - we believe that our findings are instructive for understanding why the effect of gender on the probability of successfully obtaining investment may vary according to the lending domain. For instance, existing work suggests that women have a particularly difficult time obtaining venture capital funds (see e.g., Brush et al. 2014). Our study documents that gender bias in the small-business lending arena is of a contingent nature: whereas biases against women (or in favor of men) emerged during conditions of great uncertainty, such as the Great Recession, the gender gap was not present in every year of our data (i.e., women had worse outcomes than men in 2009 and 2010 in our data, but they received similar treatment to men in other years). We speculate that differences in the effects of gender in different types of funding markets may also have to do with differing levels of uncertainty, albeit of a different sort than was the focus of the present study. Specifically, levels of uncertainty in outcomes for the funder varies substantially between venture capital and bank loans: banks typically demand evidence of collateral and have greater recourse in the case of bankruptcy, whereas venture capitalists bear more downside risk. Thus, given what we know about the role of uncertainty in the manifestation of bias, it is perhaps not surprising that women are more consistently disadvantaged in the ability to obtain venture capital than in their ability to obtain credit from banks.

Finally, while our primary analyses focused on evaluative factors influencing whether banks were willing to supply loans to women-led businesses, our supplemental analyses showed that women-led firms were not disproportionately less likely to apply for a loan, after controlling for other characteristics, as additionally informative. This leads us to conclude that the credit gap we observe is largely driven by the behavior of investors rather than possible self-defeating behaviors of women entrepreneurs. In general, this result is inconsistent with the argument that “women don’t ask” (Babcock and Lashever 2007). Rather, it seems that women entrepreneurs ask for funding at the same rates as men, when other factors are taken into account, but that conditional on asking, women get denied at higher rates than men do during hard times.

This paper also adds to our understanding of the validity of different theories that account for gender-based disadvantage. In this study, our results were most consistent with status-based theories of bias and were inconsistent with taste-based or statistical theories of discrimination. Of course, the finding that status-based mechanisms were at play here does not imply that the mechanisms that other theories propose to account for discrimination do not hold sway in other settings. However, we also think the factors that characterize the lending market are increasingly common in other settings, and thus we think that status-based accounts of bias are increasingly likely to be the form that gender discrimination takes. In particular, this is a setting in which explicit discrimination on the basis of gender (or race, for that matter) is legally barred. This makes it increasingly difficult for managers or owners to exercise taste-based discrimination. Moreover, this type of discrimination seems increasingly inconsistent with the types of organizational cultures that firms ostensibly seek to promote. Moreover, we note that lenders have increasing amounts of information at their fingertips. While there will always be some uncertainty in the outcome of any loan, the availability of information is only likely to increase.

In this sense, the locus of discrimination is increasingly likely to exist in the interpretation of information rather than what is done in its absence.

Finally, our paper contributes to the literature on the intersection of status and gender in economic outcomes more generally. Our findings, which are most consistent with status-based, rather than taste-based or statistical accounts of discrimination, contribute to the body of work in sociology that argues that economic decision-makers are more likely to cognitively rely on individuals' or firms' categorical status characteristics during conditions of greater macroeconomic uncertainty. However, it also contributes to the broader scholarly dialogue regarding the relevance of social status to economic decision-making. For instance, economic sociologists have long argued that economic decision-making can be influenced by an actor's position within a hierarchical structure of social relationships (Burt 1992; Granovetter 1985; Podolny 2010). And, consistent with the idea that cultural norms, values, and practices also shape economic activity (DiMaggio 1994; Zelizer 2013), economic decisions have also been shown to be influenced by an organization's membership in a salient social category, such as an industry, that is itself culturally imbued with status value (Sharkey 2014). Both network-based and categorical forms of status become relevant to decision-makers largely because they are thought to reduce uncertainty in economic exchange. Consistent with this idea, previous research finds that an organization's network status cues information about its reliability and trustworthiness as an exchange partner, and as such, tends to form a particularly salient basis of decision-making under conditions of greater market uncertainty (Podolny 1994; 2001). Our work extends this finding by identifying how the culturally constructed status associated with categories of individually ascribed traits can also become more relevant during times of market uncertainty.

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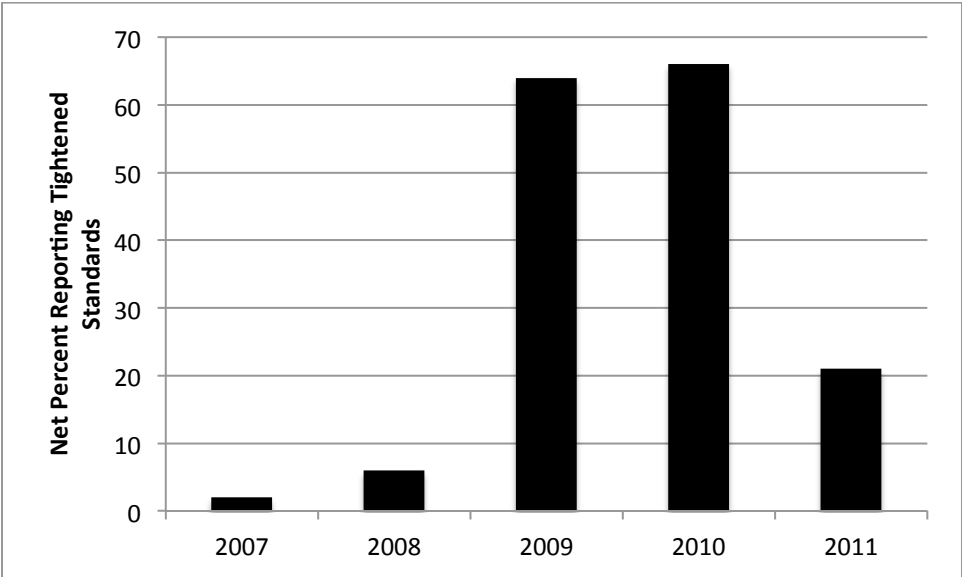
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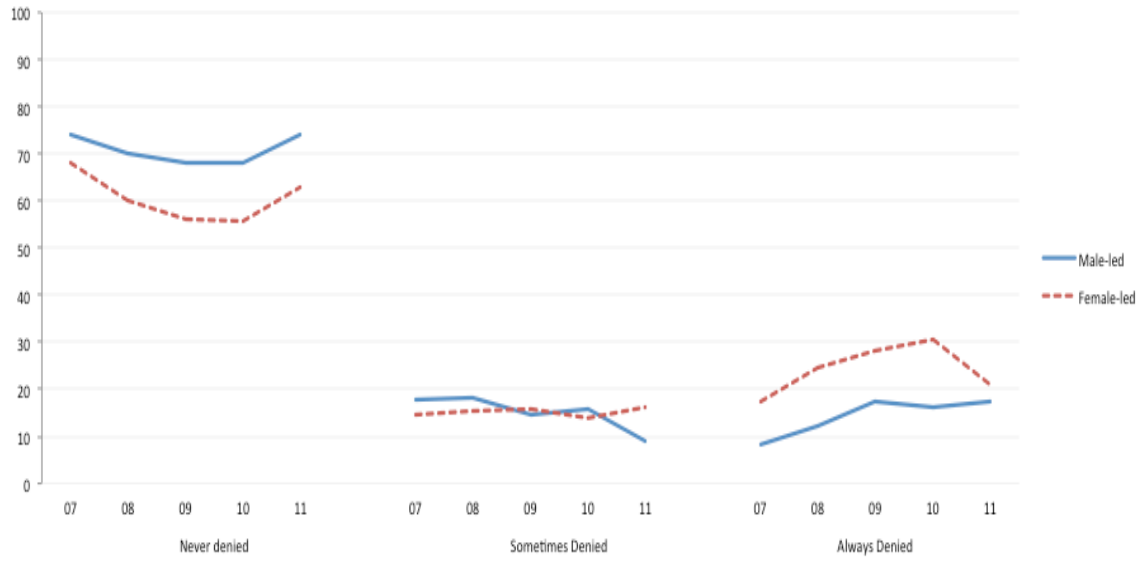
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**Figure 1. Net Tightening of Lending Standards for Small Business Loans**



Source: Office of the Comptroller of the Currency. 2014. “Survey of Credit Underwriting Practices.” <http://www.occ.gov/publications/publications-by-type/survey-credit-underwriting-practices-report/pub-survey-cred-under-2013.pdf>

**Figure 2. Rates of Funding Denial By Gender, 2007-2011**



Panel A.

Panel B.

Panel C.

**Table 1. Means and Standard Deviations of Variables Used in Analysis of Loan Denial**

	Female (n=224 firm- years)	Male (n=873 firm- years)	Female- Male Difference is Significant at p<0.05 (two-tailed)
Outcome of Loan Application			
Never Denied (=1)	61.16	71.94	Yes
Sometimes Denied (=2)	15.62	15.35	
Always Denied (=3)	23.21	12.71	Yes
Year			
2008	.227 (.420)	.238(.426)	
2009	.218 (.414)	.210(.408)	
2010	.133 (.341)	.166(.372)	
2011	.165 (.372)	.135(.342)	
OWNER CHARACTERISTICS			
Minority	.111(.315)	.119(.324)	
Immigrant	.053(.225)	.102(.302)	Yes
Education			
High School or Less	.093(.292)	.080(.272)	
Some college	.361(.481)	.333(.471)	
College	.281(.450)	.278(.448)	
Some/Completed Graduate	.263(.441)	.308(.461)	
Age (Reference=35-44)			
18-24	0	.006(.075)	
25-34	.196(.398)	.129(.336)*	Yes
35-44	.366 (.482)	.284(.451)*	Yes
45-54	.281(.451)	.369(.483)*	Yes
55-64	.142(.351)	.187(.390)	
65-74	.013(.115)	.022(.149)	
Industry Experience (ln years)	1.81(1.11)	2.53(.905)*	Yes
Prior Entrepreneurship Experience (1=yes)	.442(.497)	.487(.500)	
BUSINESS CHARACTERISTICS			
Ownership team (1=Yes)	.531(.500)	.541(.499)	
C-Corp (1=yes)	.045(.206)	.105(.307)*	Yes
Intellectual Property Holder (1=yes)	.142(.351)	.203(.403)*	Yes
Ln Num Employees <sub>t-1</sub>	1.19(1.05)	1.61(1.09)*	Yes
Profit <sub>t-1</sub>			
\$500 or less	.397(.490)	.327(.469)*	Yes
\$501-10,000	.129(.336)	.111(.314)	
\$10,001 or more	.473(.500)	.561(.496)*	Yes
Total Assets <sub>t-1</sub>			
\$25,000 or less	.187(.391)	.113(.317)*	Yes
\$25,001-\$100,000	.245(.431)	.182(.386)*	Yes
\$100,001-\$1,000,000	.433(.496)	.494(.500)	
\$1,001,001 or more	.134(.341)	.210(.408)*	Yes
Revenue <sub>t-1</sub>			
\$500 or less	.125(.331)	.084(.277)	



\$501-100,000	.285(.453)	.132(.338)*	Yes
\$100,001-\$1,000,000	.392(.489)	.439(.496)	
\$1,000,001 or more	.196(.398)	.345(.476)*	Yes
Has Business Credit Line (1=yes)	.419(.494)	.552(.497)*	Yes
Has Business Credit Card (1=yes)	.343(.476)	.444(.497)*	Yes
Made Purchases Through Trade Financing	.500(.500)	.496(.500)	
Credit Score <sub>t-1</sub>			
Credit Score=536-670	.093(.292)	.137(.344)	
Credit Score=493-535	.419(.494)	.298(.458)*	Yes
Credit Score=423-492	.361(.481)	.397(.489)	
Credit Score=376-422	.062(.242)	.077(.268)	
Credit Score=101-375	.062(.242)	.088(.283)	
Previously Applied for a Business Loan	.455(.499)	.461(.498)	

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**Table 2. Estimated Coefficients From Random Effects Ordered Logistic Regression Models Predicting The Frequency of Loan Denial (Pooled Sample)**

	Model 1	Model 2	Model 3
2008	.437 (.326)	.441 (.326)	.340 (.363)
2009	.969* (.391)	.963* (.392)	.676 (.441)
2010	.985* (.446)	1.000* (.447)	.577 (.483)
2011	.278 (.485)	.255 (.489)	.159 (.545)
Female		.867* (.386)	.101 (.619)
Female X 2008			.377 (.688)
Female X 2009			1.390+ (.799)
Female X 2010			2.059* (1.012)
Female X 2011			.517 (.861)
<b>OWNER CHARACTERISTICS</b>			
Minority	1.355** (.437)	1.325** (.438)	1.355** (.452)
Immigrant	1.164* (.520)	1.282* (.525)	1.314* (.542)
Education (Reference=some college)			
High School or Less	-.984 (.617)	-.897 (.613)	-1.016 (.647)
College	-.465 (.406)	-.448 (.408)	-.436 (.422)
Some/Completed Graduate	.104 (.402)	.109 (.401)	.064 (.417)
Age (Reference=35-44)			
18-24	.692 (2.473)	.982 (2.487)	.838 (2.527)
25-34	.067 (.437)	.134 (.440)	.087 (.455)
45-54	-.403 (.371)	-.359 (.370)	-.425 (.384)
55-64	-.940* (.474)	-.896+ (.468)	-1.006* (.487)
65-74	-1.361 (.966)	-1.408 (.932)	-1.445 (.932)
Industry Experience (ln years)	-.316+ (.166)	-.215 (.168)	-.236 (.173)
Prior Entrepreneurship Experience (1=yes)	.514+ (.309)	.520+ (.308)	.518 (.318)
<b>BUSINESS CHARACTERISTICS</b>			

Ownership team (1=Yes)	-.593+ (.323)	-.611+ (.322)	-.611+ (.328)
C-Corp (1=yes)	.799+ (.441)	.825+ (.437)	.833+ (.451)
Intellectual Property Holder (1=yes)	.300 (.326)	.322 (.325)	.314 (.323)
Ln Num. Employees <sub>t-1</sub>	-.091 (.182)	-.077 (.179)	-.071 (.183)
Profit <sub>t-1</sub> (reference=\$10,001 or more)			
\$500 or less	.810** (.264)	.805** (.262)	.842** (.271)
\$501-10,000	1.074** (.371)	1.069** (.369)	1.099** (.372)
Total Assets <sub>t-1</sub> (reference= \$100,001-\$1,000,000)			
\$25,000 or less	-.092 (.466)	-.078 (.464)	.016 (.469)
\$25,001-\$100,000	.479 (.334)	.441 (.331)	.513 (.343)
\$1,001,001 or more	-.881* (.418)	-.890* (.420)	-.904* (.434)
Revenue <sub>t-1</sub> (reference= \$100,001-\$1,000,000)			
\$500 or less	.409 (.442)	.362 (.444)	.286 (.461)
\$501-100,000	-.533 (.395)	-.603 (.396)	-.611 (.405)
\$1,000,001 or more	.391 (.395)	.429 (.394)	.422 (.402)
Has Business Credit Line (1=yes)	-1.580*** (.303)	-1.557*** (.305)	-1.569*** (.309)
Has Business Credit Card (1=yes)	-.179 (.248)	-.160 (.248)	-.181 (.252)
Made Purchases Through Trade Financing (1=yes)	-.448 (.296)	-.482 (.296)	-.552+ (.305)
Credit Score (Reference = 101-375)			
Credit Score=536-670	-1.656** (.576)	-1.695** (.575)	-1.716** (.582)
Credit Score=493-535	-1.042* (.470)	-1.133* (.472)	-1.175* (.477)
Credit Score=423-492	-1.119** (.423)	-1.143** (.424)	-1.147** (.428)
Credit Score=376-422	-.907+ (.532)	-.930+ (.528)	-.962+ (.532)
Previously Applied for a Business Loan	.599* (.303)	.593+ (.305)	.630* (.315)
Log Pseudolikelihood	-732.41	-729.64	-725.91
Wald X <sup>2</sup>	111.32***	111.78***	107.33***
Degrees of freedom	59	60	64

N=1,097 firm-year reports of loan application outcomes

All models include industry and region fixed effects; Robust standard errors in parentheses

+ p<.1, \* p<.05, \*\* p<.01, \*\*\* p<.001 (two-tailed)

**Table 3. Estimated Coefficients From Random Effects Ordered Logistic Regression Models Predicting The Frequency of Loan Denial (Split-Sample Analysis)**

	(1)	(2)	(3)	(4)
	Ordered Logistic Regression		OLS	
	Male	Female	Male	Female
2008	.281 (.356)	.415 (.971)	.046 (.058)	.181 (.145)
2009	.555 (.436)	2.425+ (1.352)	.111 (.070)	.444* (.200)
2010	.530 (.482)	2.996+ (1.559)	.103 (.085)	.528* (.235)
2011	.164 (.536)	.933 (1.335)	.078 (.088)	.230 (.211)
Minority	1.255** (.483)	1.662 (1.212)	.256** (.097)	.287 (.232)
Immigrant	1.399** (.541)	.513 (1.629)	.257* (.113)	.105 (.325)
Education (Reference=some college)				
High School or Less	-.739 (.678)	-3.081 (2.210)	-.125 (.125)	-.313 (.331)
College	-.398 (.447)	.273 (1.160)	-.083 (.075)	.019 (.205)
Some/Completed Graduate	.337 (.439)	-.259 (1.376)	.022 (.079)	-.034 (.244)
Age (Reference=35-44)				
18-24	.883 (2.365)	.000 (.)	.200 (.479)	.000 (.)
25-34	.400 (.494)	-1.222 (1.419)	.026 (.089)	-.103 (.244)
45-54	-.154 (.409)	-2.423* (1.039)	-.005 (.074)	-.218 (.166)
55-64	-1.167* (.504)	.102 (1.328)	-.164* (.073)	.043 (.241)
65-74	-1.765+ (1.038)	-1.542 (2.558)	-.239 (.160)	-.361 (.440)
Industry Experience (ln years)	-.174 (.194)	.204 (.420)	-.034 (.034)	-.004 (.084)
Prior Entrepreneurship Experience (1=yes)	.419 (.326)	1.099 (.928)	.048 (.056)	.135 (.168)
<b>BUSINESS CHARACTERISTICS</b>				
Ownership team (1=Yes)	-.659+ (.346)	-.095 (.913)	-.086 (.061)	-.068 (.153)
C-Corp (1=yes)	.758+ (.442)	2.511 (1.547)	.132 (.080)	.261 (.282)
Intellectual Property Holder (1=yes)	.355 (.347)	1.683+ (.870)	.014 (.059)	.030 (.160)
Ln Num. Employees <sub>t-1</sub>	-.165	.552	-.040	.060

	(.201)	(.502)	(.036)	(.085)
Profit <sub>t-1</sub> (reference=\$10,001 or more)				
\$500 or less	1.062***	.236	.156**	.024
	(.291)	(.733)	(.051)	(.117)
\$501-10,000	1.071*	.991	.151*	.067
	(.418)	(.958)	(.067)	(.153)
Total Assets <sub>t-1</sub> (reference= \$100,001-\$1,000,000)				
\$25,000 or less	.104	-.515	.022	-.090
	(.488)	(1.513)	(.090)	(.230)
\$25,001-\$100,000	.354	1.267	.069	.134
	(.368)	(.921)	(.066)	(.161)
\$1,001,001 or more	-.284	-4.083*	-.053	-.629*
	(.437)	(1.748)	(.069)	(.247)
Revenue <sub>t-1</sub> (reference= \$100,001-\$1,000,000)				
\$500 or less	.422	1.888	.084	.259
	(.502)	(1.285)	(.096)	(.201)
\$501-100,000	-.613	.122	-.112	-.033
	(.466)	(.911)	(.082)	(.150)
\$1,000,001 or more	.311	1.068	.074	.047
	(.440)	(1.353)	(.072)	(.241)
Has Business Credit Line (1=yes)	-1.501***	-1.821*	-.244***	-.169
	(.347)	(.754)	(.059)	(.137)
Has Business Credit Card (1=yes)	-.060	-1.150	-.019	-.125
	(.260)	(.820)	(.043)	(.131)
Made Purchases Through Trade Financing (1=yes)	-.376	-1.316	-.080	-.209
	(.339)	(.853)	(.057)	(.147)
Credit Score (Reference = 101-375)				
Credit Score=536-670	-1.821**	-1.634	-.311**	-.291
	(.628)	(1.592)	(.108)	(.294)
Credit Score=493-535	-1.012*	-2.298	-.196+	-.397+
	(.495)	(1.418)	(.101)	(.218)
Credit Score=423-492	-1.021*	-2.942+	-.192*	-.387+
	(.431)	(1.679)	(.095)	(.210)
Credit Score=376-422	-1.029+	-.097	-.176	.033
	(.547)	(1.953)	(.114)	(.309)
Previously Applied for a Business Loan	.644+	1.129	.092	.103
	(.341)	(.945)	(.057)	(.128)
Log Pseudolikelihood	-551.03	-142.99		
$R^2$ (within)			0.059	0.250
$R^2$ (between)			0.253	0.379
Degrees of freedom	59	43	59	54
N (firm-year reports of loan application outcomes)	873	224	873	224

Robust Standard errors in parentheses; All models include industry and region fixed effects.

+ p<.1, \* p<.05, \*\* p<.01, \*\*\* p<.001 (two-tailed)

Note: The number of degrees of freedom is smaller for female models because the effects of some variables could not be estimated where there were no women entrepreneurs in those cells.

**Table 4. Estimated Coefficients From Ordered Logit Models Testing Changes in Reliance on Objective Indicators**

	(1)	(2)	(3)	(4)	(5)	(6)
Credit Score (Reference = 101-375)						
Credit Score=536-670	-1.652** (.602)	-1.677** (.577)	-1.699** (.576)	-1.701** (.576)	-1.852** (.593)	-1.801** (.617)
Credit Score=493-535	-1.137* (.473)	-1.183* (.482)	-1.137* (.473)	-1.136* (.473)	-1.297** (.490)	-1.326** (.495)
Credit Score=423-492	-1.141** (.423)	-1.131** (.424)	-1.120** (.434)	-1.155** (.424)	-1.290** (.441)	-1.264** (.445)
Credit Score=376-422	-.934+ (.528)	-.909+ (.525)	-.942+ (.528)	-1.218* (.567)	-1.098* (.542)	-1.356* (.575)
Credit Score=536-670 X 2010	-.234 (.927)					-.066 (.991)
Credit Score=493-535 X 2010		.330 (.556)				.349 (.626)
Credit Score=423-492 X 2010			-.187 (.567)			
Credit Score=376-422 X 2010				1.054 (.957)		1.130 (1.017)
Credit Score=101-375 X 2010					-1.516 (1.160)	-1.264 (1.220)
2008	.438 (.326)	.446 (.326)	.446 (.327)	.431 (.326)	.423 (.326)	.421 (.327)
2009	.956* (.395)	.963* (.392)	.967* (.394)	.957* (.392)	.956* (.394)	.950* (.396)
2010	1.028* (.444)	.868+ (.495)	1.057* (.508)	.884+ (.456)	1.105* (.455)	.832 (.546)
2011	.251 (.491)	.270 (.487)	.269 (.494)	.251 (.488)	.237 (.489)	.251 (.493)
Female	.867* (.386)	.863* (.386)	.865* (.387)	.875* (.388)	.875* (.388)	.878* (.388)
Minority	1.322** (.437)	1.329** (.438)	1.335** (.440)	1.336** (.439)	1.299** (.439)	1.319** (.440)
Immigrant	1.280* (.523)	1.278* (.523)	1.279* (.526)	1.264* (.528)	1.274* (.525)	1.251* (.527)
Education (Reference=some college)						
High School or Less	-.895 (.612)	-.900 (.611)	-.899 (.613)	-.900 (.615)	-.918 (.612)	-.919 (.612)
College	-.443 (.407)	-.445 (.406)	-.448 (.408)	-.447 (.409)	-.461 (.408)	-.454 (.408)
Some/Completed Graduate	.110	.110	.108	.095	.098	.086

	(.400)	(.400)	(.401)	(.402)	(.400)	(.401)
Age (Reference=35-44)						
18-24	.987	.956	.974	1.039	.986	1.017
	(2.485)	(2.492)	(2.487)	(2.479)	(2.499)	(2.495)
25-34	.132	.130	.135	.135	.117	.117
	(.439)	(.438)	(.440)	(.441)	(.440)	(.439)
45-54	-.357	-.355	-.356	-.351	-.369	-.354
	(.369)	(.369)	(.370)	(.371)	(.369)	(.370)
55-64	-.895+	-.890+	-.893+	-.905+	-.904+	-.904+
	(.467)	(.468)	(.468)	(.469)	(.468)	(.470)
65-74	-1.402	-1.409	-1.413	-1.426	-1.435	-1.449
	(.931)	(.935)	(.935)	(.932)	(.937)	(.941)
Industry Experience (ln years)						
	-.214	-.211	-.215	-.224	-.219	-.223
	(.167)	(.167)	(.168)	(.167)	(.168)	(.167)
Prior Entrepreneurship Experience (1=yes)						
	.519+	.514+	.517+	.526+	.526+	.526+
	(.308)	(.309)	(.309)	(.309)	(.308)	(.310)
BUSINESS CHARACTERISTICS						
Ownership team (1=Yes)						
	-.608+	-.602+	-.611+	-.629+	-.610+	-.619+
	(.322)	(.321)	(.323)	(.325)	(.321)	(.322)
C-Corp (1=yes)						
	.825+	.820+	.821+	.820+	.832+	.820+
	(.436)	(.434)	(.437)	(.438)	(.436)	(.436)
Intellectual Property Holder (1=yes)						
	.319	.316	.323	.328	.314	.315
	(.325)	(.323)	(.325)	(.326)	(.325)	(.325)
Ln Num. Employees <sub>t-1</sub>						
	-.076	-.077	-.077	-.073	-.076	-.072
	(.179)	(.179)	(.180)	(.180)	(.179)	(.180)
Profit <sub>t-1</sub> (reference=\$10,001 or more)						
\$500 or less	.807**	.816**	.806**	.788**	.807**	.801**
	(.262)	(.260)	(.262)	(.262)	(.260)	(.260)
\$501-10,000	1.059**	1.065**	1.073**	1.060**	1.065**	1.049**
	(.372)	(.370)	(.369)	(.371)	(.371)	(.376)
Total Assets <sub>t-1</sub> (reference=\$100,001-\$1,000,000)						
\$25,000 or less	-.074	-.070	-.071	-.038	-.062	-.012
	(.465)	(.463)	(.463)	(.462)	(.460)	(.457)
\$25,001-\$100,000	.441	.444	.446	.453	.436	.452
	(.331)	(.331)	(.331)	(.332)	(.330)	(.330)
\$1,001,001 or more	-.890*	-.884*	-.887*	-.881*	-.872*	-.860*
	(.419)	(.416)	(.420)	(.426)	(.422)	(.423)
Revenue <sub>t-1</sub> (reference=\$100,001-\$1,000,000)						
\$500 or less	.366	.354	.354	.367	.362	.360
	(.442)	(.444)	(.444)	(.447)	(.445)	(.446)
\$501-100,000	-.596	-.597	-.606	-.627	-.624	-.638
	(.399)	(.395)	(.397)	(.398)	(.395)	(.399)
\$1,000,001 or more	.429	.431	.429	.432	.436	.440
	(.395)	(.393)	(.394)	(.395)	(.389)	(.390)

Has Business Credit Line (1=yes)	-1.558***	-1.556***	-1.556***	-1.566***	-1.574***	-1.579***
	(.305)	(.304)	(.305)	(.308)	(.303)	(.304)
Has Business Credit Card (1=yes)	-.166	-.167	-.161	-.167	-.151	-.169
	(.247)	(.248)	(.248)	(.248)	(.246)	(.246)
Made Purchases Through Trade Financing (1=yes)	-.476	-.475	-.478	-.481	-.510+	-.497+
	(.296)	(.296)	(.296)	(.296)	(.295)	(.296)
Previously Applied for a Business Loan	.595+	.589+	.590+	.598*	.597*	.598*
	(.305)	(.305)	(.305)	(.304)	(.304)	(.303)
Log Pseudolikelihood	-729.61	-729.48	-729.60	-729.03	-728.62	-727.95
Wald X <sup>2</sup>	113.07***	112.44***	111.46***	113.97***	114.79***	117.53***
Degrees of freedom	61	61	61	61	61	64

N=1,097 firm-year reports of loan application outcomes

Robust Standard errors in parentheses; All models include industry and region fixed effects.

+ p<.1, \* p<.05, \*\* p<.01, \*\*\* p<.001 (two-tailed)



**Table 5. Estimated Coefficients From Random Effects Ordered Logistic Regression Models Testing Gender Differences in Interpretation of Credit Scores**

	(1)	(2)
2009 X Female X Credit Score=536-670	1.097 (1.623)	
2009 X Female X Credit Score= 493-535	1.438 (1.160)	
2009 X Female X Credit Score=423-492	1.210 (.984)	
2009 X Female X Credit Score=376-422	-.105 (2.850)	
2009 X Female X Credit Score=101-375	.285 (3.273)	
2009 X Credit Score=493-535	.756 (.968)	
2009 X Credit Score=423-492	.070 (.842)	
2009 X Credit Score=376-422	.155 (1.047)	
2009 X Credit Score=101-375	.249 (1.364)	
2010 X Female X Credit Score=536-670		1.908 (2.484)
2010 X Female X Credit Score= 493-535		1.558 (1.101)
2010 X Female X Credit Score=423-492		1.783 (1.763)
2010 X Female X Credit Score=376-422		22.194*** (1.465)
2010 X Female X Credit Score=101-375		23.907*** (1.818)
2010 X Credit Score=493-535		.601 (.972)
2010 X Credit Score=423-492		.345 (.951)
2010 X Credit Score=376-422		1.152 (1.301)
2010 X Credit Score=101-375		-1.295 (1.562)
Credit Score (Reference=536-670)		
Credit Score=493-535	.362 (.450)	.424 (.523)
Credit Score=423-492	.540 (.470)	.482 (.512)
Credit Score=376-422	.725 (.568)	.350 (.630)
Credit Score=101-375	1.672** (.611)	1.749** (.625)
Female	.082	.102

	(.628)	(.607)
2008	.345	.293
	(.366)	(.362)
2009	.454	.619
	(.793)	(.438)
2010	.610	.185
	(.492)	(.940)
2011	.180	.129
	(.552)	(.548)
Female X 2008	.431	.449
	(.693)	(.675)
Female X 2009	.000	1.422+
	(.)	(.777)
Female X 2010	2.154*	.000
	(1.048)	(.)
Female X 2011	.562	.487
	(.867)	(.850)
Minority	1.356**	1.335**
	(.455)	(.449)
Immigrant	1.298*	1.260*
	(.547)	(.537)
Education (Reference = some college)		
High School or Less	-1.002	-1.000
	(.654)	(.637)
College	-.445	-.427
	(.429)	(.417)
Some/Completed Graduate School	.098	.049
	(.420)	(.410)
Age (Reference=35-44)		
18-24	.894	.887
	(2.528)	(2.506)
25-34	.058	.060
	(.459)	(.452)
45-54	-.445	-.408
	(.386)	(.379)
55-64	-1.043*	-1.015*
	(.494)	(.483)
65-74	-1.492	-1.450
	(.935)	(.922)
Industry Experience (ln years)	-.253	-.233
	(.174)	(.169)
Prior Entrepreneurship Experience (1=yes)	.556+	.519+
	(.324)	(.315)
<b>BUSINESS CHARACTERISTICS</b>		
Ownership team (1=Yes)	-.613+	-.617+
	(.329)	(.325)
C-Corp (1=yes)	.837+	.831+
	(.455)	(.444)
Intellectual Property Holder (1=yes)	.312	.307
	(.327)	(.320)
Ln Num. Employees <sub>t-1</sub>	-.065	-.060

Profit <sub>t-1</sub> (reference=\$10,001 or more)	(.185)	(.181)
\$500 or less	.846** (.275)	.828** (.267)
\$501-10,000	1.143** (.380)	1.079** (.377)
Total Assets <sub>t-1</sub> (reference= \$100,001-\$1,000,000)		
\$25,000 or less	.010 (.469)	.098 (.457)
\$25,001-\$100,000	.538 (.346)	.503 (.337)
\$1,001,001 or more	-.909* (.440)	-.897* (.437)
Revenue <sub>t-1</sub> (reference= \$100,001-\$1,000,000)		
\$500 or less	-.115 (.571)	-.101 (.565)
\$501-100,000	-.982+ (.557)	-1.058+ (.546)
\$1,000,001 or more	-.393 (.408)	-.413 (.395)
Has Business Credit Line (1=yes)	-1.565*** (.311)	-1.572*** (.309)
Has Business Credit Card (1=yes)	-.192 (.261)	-.212 (.250)
Made Purchases Through Trade Financing (1=yes)	-.553+ (.308)	-.544+ (.303)
Previously Applied for a Business Loan	.624+ (.320)	.653* (.313)
Log Pseudolikelihood	-724.88	-722.81
Wald X <sup>2</sup>	107.90***	1681.46***
Degrees of freedom	72	72

N=1,097 firm-year reports of loan application outcome

Robust Standard errors in parentheses; All models include industry and region fixed effects.

+ p<.1, \* p<.05, \*\* p<.01, \*\*\* p<.001

**Table 6. Estimated Coefficients from Logistic Regression Models Predicting the Log Odds of Applying for a Loan**

	(1)	(2)	(3)
2008	.067 (.116)	-.332** (.114)	-.287* (.128)
2009	.025 (.123)	-.496*** (.124)	-.473*** (.137)
2010	-.250+ (.133)	-.909*** (.134)	-.831*** (.150)
2011	-.309* (.144)	-.969*** (.148)	-.991*** (.167)
Female	-.384* (.157)	.186+ (.102)	.292 (.179)
Female X 2008			-.202 (.267)
Female X 2009			-.097 (.276)
Female X 2010			-.368 (.299)
Female X 2011			.096 (.311)
Minority		.135 (.130)	.134 (.130)
Immigrant		-.232 (.143)	-.232 (.143)
Education (Reference=some college)			
High School or Less		.049 (.160)	.050 (.160)
College		.108 (.110)	.108 (.110)
Some/Completed Graduate		.186 (.121)	.186 (.121)
Age (Reference=35-44)			
18-24		-.644 (.476)	-.646 (.477)
25-34		.154 (.137)	.154 (.137)
45-54		-.005 (.108)	-.006 (.108)
55-64		-.001 (.131)	-.001 (.131)
65-74		-.568* (.282)	-.569* (.282)
Industry Experience (ln years)		-.023 (.047)	-.023 (.047)
Prior Entrepreneurship Experience (1=yes)		.013 (.086)	.012 (.086)
BUSINESS CHARACTERISTICS			
Ownership team (1=Yes)		.111	.111

		(.090)	(.090)
C-Corp (1=yes)		-.140	-.141
		(.150)	(.150)
Intellectual Property Holder (1=yes)		-.255*	-.253*
		(.109)	(.109)
Ln Num. Employees <sub>t-1</sub>		.220***	.221***
		(.054)	(.055)
Profit <sub>t-1</sub> (reference=\$10,001 or more)			
\$500 or less		.012	.012
		(.097)	(.098)
\$501-10,000		-.152	-.155
		(.125)	(.125)
Total Assets <sub>t-1</sub> (reference= \$100,001-\$1,000,000)			
\$25,000 or less		-.737***	-.739***
		(.144)	(.144)
\$25,001-\$100,000		-.362**	-.365**
		(.117)	(.117)
\$1,001,001 or more		.360*	.357*
		(.142)	(.142)
Revenue <sub>t-1</sub> (reference= \$100,001-\$1,000,000)			
\$500 or less		-.271+	-.271+
		(.145)	(.145)
\$501-100,000		-.176	-.177
		(.124)	(.124)
\$1,000,001 or more		-.011	-.011
		(.136)	(.136)
Has Business Credit Line (1=yes)		1.418***	1.417***
		(.094)	(.094)
Has Business Credit Card (1=yes)		.091	.093
		(.084)	(.084)
Made Purchases Through Trade Financing (1=yes)		.552***	.552***
		(.100)	(.100)
Credit Score (Reference = 101-375)			
Credit Score=536-670		.101	.109
		(.200)	(.201)
Credit Score=493-535		-.012	-.005
		(.177)	(.178)
Credit Score=423-492		-.261	-.253
		(.170)	(.171)
Credit Score=376-422		-.302	-.294
		(.210)	(.211)
Previously Applied for a Business Loan		1.130***	1.127***
		(.138)	(.138)
Constant	-3.090***	-1.861***	-1.893***
	(.129)	(.470)	(.472)
Wald X <sup>2</sup>	18.22***	1042.91***	1041.09***
Degrees of freedom	5	60	64
N=8,815 firm-years			

Robust standard errors in parentheses; All models include industry and region fixed effects.  
+ p<.1, \* p<.05, \*\* p<.01, \*\*\* p<.001