

# Unequal Hard Times: The Influence of the Great Recession on Gender Bias in Entrepreneurial Financing

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**Abstract:** Prior work finds mixed evidence of gender bias in lenders' willingness to approve loans to entrepreneurs during normal macroeconomic conditions. However, various theories predict that gender bias is more likely to manifest when there is greater uncertainty or when decision-makers' choices are under greater scrutiny from others. Such conditions characterized the lending market in the recent economic downturn. This article draws on an analysis of panel data from the Kauffman Firm Survey to investigate how the Great Recession affected the gender gap in entrepreneurial access to financing, net of individual and firm-level characteristics. Consistent with predictions, we find that women-led firms were significantly more likely than men-led firms to encounter difficulty in acquiring funding when small-business lending contracted in 2009 and 2010. We assess the consistency of our results with two different theories of bias or discrimination. Our findings shed light on mechanisms that may contribute to disadvantages for women entrepreneurs and, more broadly, highlight how the effects of ascribed status characteristics (e.g., gender) on economic decision-making may vary systematically with macroeconomic conditions.

**Keywords:** entrepreneurship; gender; discrimination; status; recession

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
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THE Great Recession, which arose from the financial crisis and housing market crash of 2007–2008, profoundly affected workers and firms. As consumer demand stagnated and financial markets stumbled, job creation slowed and layoffs became more common. 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 lead to heightened rates of entrepreneurial activity as 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 time frame. Furthermore, the small business investment market was particularly hard hit by the recession, with total investment contracting 18 percentage points between 2008 and 2011 (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 (Folbre 2010; Hout, Levanon and Cumberworth 2011). Casting into stark contrast the gender disparity in rates

of job loss, the popular press dubbed the economic downturn a “mancession” (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 men 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 differences 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 lending to entrepreneurs?

An investigation of the possibility that the recession differentially affected men’s and women’s access to credit is important for two key reasons. First, existing studies offer mixed evidence as to whether investors and other individuals who provide capital tend to exhibit a bias against women entrepreneurs. On the one hand, several studies that rely on survey-based data find that women-led firms tend to receive less funding 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). Recent experimental studies have also found that potential investors are systematically likely to view women entrepreneurs as less competent, credible and investment-worthy than equivalently qualified men counterparts (Bigelow et al. 2014; Brooks et al. 2014; Thébaud 2015). Yet, in contrast, a sizable number of studies have found no evidence of a net funding disadvantage for women-led firms (see, e.g., Asiedu, Freeman and Nti-Addae 2012; Blanchard, Zhao and Yinger 2008; Blanchflower, Levine and Zimmerman 2003; Carter et al. 2007; Cavalluzzo and Wolken 2005; Orser, Riding, and Manley 2006). One interpretation of these mixed results is that gender-based disadvantage in entrepreneurial investment is not a constant; rather, it may vary depending upon the conditions under which lenders and investors make decisions. Thus, an examination of how gender disparities in the ability to acquire funding vary under differing macroeconomic conditions offers an opportunity to refine our theoretical understanding of when and where gender bias in entrepreneurship is likely to emerge. Doing so 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 affected the ability of men-led vs. women-led firms to obtain financing provides an opportunity to empirically evaluate the discriminatory mechanisms that may contribute to gender disparities in entrepreneurship. In particular, we draw on statistical and status-based theories of discrimination to identify multiple reasons why investors may be more likely to rely on gender stereotypes when making decisions during recessionary circumstances. Furthermore, we investigate whether investors may have been more likely to apply different standards of

evaluation to men- and women-led firms during the recession, a possibility that is predicted by status-based, but not statistical, theories of discrimination.

To examine the effect of the Great Recession on entrepreneurs' ability to access capital, we analyze data from the Kauffman Firm Survey, a panel study that contains data on rates of financing for a sample of entrepreneurial ventures between the years 2007 and 2011. Specifically, we identify how the influence of gender on the likelihood of gaining access to bank loans changed as the small-business lending market contracted for part of this five-year time frame. Our findings suggest that, while all firms had more difficulties in gaining financing following the recession, women-led firms were disproportionately more likely to be denied funding during this period. Moreover, our analyses indicate that this result cannot be attributed to increased scrutiny to all aspects of an entrepreneur's loan application; whereas gender became a more widely used driver of funding decisions during this period, indicators of firm performance and human capital did not. We also find that in 2010 women-led firms with a low credit score were particularly likely to be penalized, which suggests that investors' tendency to apply a gender-based double standard of performance may have been one mechanism contributing to the funding disparities we observe between men- and women-led firms during this period.

Together, these findings indicate that worsening macroeconomic conditions, including widespread market uncertainty and tightening standards among lenders, may in fact exacerbate the disadvantages in financing that women entrepreneurs have been found to experience, and that such disadvantages may be motivated, at least in part, by status-driven bias. 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 men-led start-ups, firms founded by women tend to acquire less external debt and equity financing, which is often critical for the survival and success of an entrepreneurial venture (see Jennings and Brush 2013 for a review). Some of the gap can be explained by differences in human capital, firm performance and network ties. For instance, women entrepreneurs tend to operate in less lucrative industries (Loscocco et al. 1991; Marlow and McAdam 2010), run smaller businesses (Jennings and Brush 2013; Kalleberg and Leicht 1991), and 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 et al. 2002; Coleman and Robb 2009; Wu and Chua 2012). Moreover, recent studies that use the strongest research design for ruling out unmeasured differences between men and women entrepreneurs (i.e., experimentally manipulating information about the gender of an entrepreneur) document that potential

investors, lenders and technology licensing officers favor men-owned start-ups despite the lack of any underlying differences in the quality of the venture or the qualifications of the founder (Bigelow et al. 2014; Brooks et al. 2014; Shane et al. 2012; Thébaud 2015). However, a number of other studies have concluded that women-led firms are *not* disadvantaged once the background characteristics of firms and entrepreneurs are taken into account (Asiedu et al. 2012; Blanchard et al. 2008; Blanchflower et al. 2003; Haines, Orser, and Riding 1999; Orser et al. 2006). Furthermore, when gender bias is detected, the size of the penalty also tends to vary.

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 the perceived quality of the venture was held constant through random assignment, we presume that there is, at least under some conditions and for some types of funding, a tendency toward bias in favor of men entrepreneurs or against women-led firms. Second, because studies using observational data find mixed results, we believe that investors' likelihood of relying on gender stereotypes when making investment decisions may be contingent upon features of an evaluative context. Drawing on prior work in economics and sociology, we theorize about and empirically evaluate the extent to which market uncertainty and tightening lending standards constitute important contextual features that moderate the salience of gender in financing decisions.

## Mechanisms of Gender Discrimination

When divergent outcomes arise for men- versus women-led firms, what mechanisms might be responsible? According to statistical theories of discrimination (Arrow 1973; Phelps 1972), individuals are rational actors who do not have any intrinsic preference for men over women. Rather, they sometimes 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 represents a heuristic that individuals use in the face of uncertainty about any pertinent unmeasured qualities of individuals or their organizations. Applied to the setting at hand, when lenders are faced with the problem of identifying nascent firms that they believe will be reasonable credit risks (i.e., likely to be at least successful enough to repay their loan), statistical discrimination would occur if they were to view gender as an indicator of some other hard-to-measure characteristics that are associated with the likelihood of a firm's success or ability to repay the loan. For example, because women-owned businesses tend to be smaller and less profitable on average, lenders might infer that any particular women-led business would also be less likely to repay a loan.<sup>1</sup> Although variants of this theory propose differing assumptions about the way in which such unmeasured qualities are distributed (e.g., differences in means, variances, or both; see Correll and Benard 2006 or England 1992 for a discussion), they all assume that discrimination arises from an *informational* bias (i.e. evaluators' lack of information). That is, in this case, the theory predicts that if lenders had perfect information on, for example, a new firm's likelihood of re-

paying the loan, there would be no effect of gender per se on the outcome of a loan application because lenders would base their decisions on the likelihood of repayment, rather than relying on gender.

In contrast to statistical theories, status-based theories of discrimination suggest that discriminatory outcomes emerge from a *cognitive* bias on the part of individuals (see Correll and Benard 2006 for an in-depth discussion of the differences between the two theories). In this framework, lenders may rely on the widely shared cultural belief that men generally are, and ought to be, more competent in the domain of entrepreneurship than are women (Ridgeway 2011; Thébaud 2010; Thébaud 2015). For instance, it is well established that individuals culturally associate successful entrepreneurship with stereotypically masculine attributes, like competitiveness, aggressiveness, and risk-taking (Bruni, Gherardi and Poggio 2004; Buttner and Rosen 1988; Gupta et al. 2009). Not only are men believed to hold these types of traits more often than women, but these characteristics are also viewed as more desirable in men than in women (Prentice and Carranza 2002). Therefore, men entrepreneurs implicitly fulfill cultural stereotypes both about how they are and how they should be in a way that women entrepreneurs cannot. As a result, funders may be more hesitant to support women-led ventures because they are more likely to doubt that women possess the (generally ambiguous) forms of competence, traits, and skills that people typically associate with entrepreneurship, a notion which has been supported experimentally (Bigelow et al. 2014; Thébaud 2015) as well as anecdotally (Buttner and Moore 1997; Carter and Cannon 1992).

However, in addition to informing expectations of competence and ability, gender 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 than an equivalent male counterpart, a status beliefs account also predicts that women entrepreneurs may need to establish more “evidence” of ability or past performance in order to have their ventures judged to be of the same quality. Consistent with this account, experimental studies have shown that women need to demonstrate more evidence of technical knowledge or innovation in order for their ventures to be viewed as equally worthy of investment (Thébaud 2015; Tinkler et al. 2015).

Thus, although both statistical and status-based accounts predict that, all else being equal, women-led firms will garner less investment than men-led firms, the idea that status beliefs can activate the application of double standards suggests that 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 evidence of the *same* level of performance (e.g., a similar credit score or level of profitability or cash flow) more

favorably for men-led firms than for women-led ones. 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). Indeed, one implication of statistical theories of discrimination is that because gender is primarily used to overcome the problems presented by a lack of better information, the availability of more information should attenuate the observed effects of gender. For example, Altonji and Pierret (2001) posit that if statistical discrimination accounts for pay disparities, the effect of observable factors such as education or race on wages should fall over time as harder-to-observe productivity is revealed through on-the-job performance.

Overall, gender might influence the evaluation of an entrepreneur's request for funding through a variety of theoretical mechanisms. Our primary aim in this paper is to consider whether macroeconomic conditions may moderate these discriminatory processes. We also present and discuss supplemental analyses in which we are able to further evaluate the possibility that status-based discrimination in particular was at play during the recession.

## Market Uncertainty and Stricter Lending Standards: Catalysts of the Gender Gap?

How, if at all, do difficult macroeconomic conditions, such as those associated with the Great Recession, affect gender disparities in access to credit? At an abstract level, the characteristics of the macroeconomic environment during the Great Recession map conceptually onto two factors that theories predict would also affect levels of bias or discrimination: uncertainty and stricter standards. In particular, recessionary conditions lead to greater uncertainty about the likelihood that any small business owner would be successful enough to pay back his or her loan. In addition, banks tightened their lending standards during this time frame (Office of the Comptroller of the Currency 2014).

Both statistical and status-based theories of discrimination offer reasons for why these circumstances may have affected lenders' propensity to rely on gender. We first consider the predictions of statistical theories of discrimination. As noted above, these theories posit that beliefs about the statistical distribution of characteristics among women as a group (e.g., women-owned businesses are more likely to fail) are used as a proxy for unavailable information about any specific woman (e.g., this particular business is owned by a woman and therefore is more likely to fail). Although variants of this theory 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 lacking to a greater degree and, conversely, should be attenuated to the extent that better information is available. The Great Recession did not have any effect on the availability of information about factors such as creditworthiness; this leads to the prediction



that the Great Recession should not result in a shift in lenders' tendency to rely on gender in financing decisions. However, even though the recession did not affect the availability of information, statistical discrimination might still become more common for a different reason. In particular, it is possible that the recession may have resulted in lenders placing greater emphasis on unobserved characteristics that they view as predictive of failure and that they associate with gender, such as a perceived lack of commitment. If this were the case, investors would penalize women more heavily during the recession than they did either before or after it, for reasons associated with statistical discrimination.

This latter outcome, that gender gaps in entrepreneurial financing would emerge and/or widen during recessionary years, is more directly predicted by social psychological theories of discrimination. Individuals have been found to be especially likely to rely on 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). Consistent with this idea, research has shown that implicit cultural stereotypes about gender in particular tend to be applied most frequently under conditions of high uncertainty (Foschi 1996; Gorman 2006; Kanter 1977; Ridgeway and Correll 2004). For instance, experimental studies suggest that when the quality of a performance is ambiguous, women job candidates are rated as less competent than their men counterparts (Foddy and Smithson 1999; Foschi 2008; Heilman et al. 2004; Heilman, Block, and Stathatos 1997). Similarly, when the nature of work is more uncertain because selection criteria or 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; Reskin 2001; Reskin and McBrier 2000; Ridgeway 1997; 2011).

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 question of whether an entrepreneur will succeed is especially likely to have an uncertain answer. In particular, the predictors of success in such an environment may be less clear: consumer behavior is likely to change such that past predictors of success may be less helpful for determining a winning approach to attracting customers in the future.

In addition, there is emerging evidence that increased visibility and/or scrutiny from other individuals or institutional actors may exacerbate status-driven biases as actors change their behaviors in ways that align with what they think outsiders would view as acceptable. For instance, Jensen (2006) shows that firms that are

more accountable to institutional investors are more likely display characteristics of status-anxiety, quickly abandoning a high-status auditor whose reputation had been tarnished. Similarly, Correll et al. (2015) argue that status biases are likely to emerge in otherwise-meritocratic contexts when evaluators are making decisions with an eye toward the preferences of interested third-party audiences. They use an experimental study to demonstrate that, under such conditions, people tend to make decisions on the basis of “third-order inferences” about who most members of these audiences are likely to think is higher quality—which in turn prompts a preference for higher-status actors regardless of the decision-maker’s own assessment of actual quality. It is plausible that during recessionary circumstances, lenders are generally under more pressure from superiors and other lending institutions to make decisions that will be perceived as shrewd and well-reasoned, due to the difficulties faced by the banking industry as a whole. Indeed, we will present evidence later to show that banks in general dramatically tightened lending standards during this time frame. Therefore, they may also be more likely to default to higher-status options (i.e., firms led by men entrepreneurs).

Taken together, both statistical and status-based theories of discrimination suggest key reasons why women-led firms may be relatively more disadvantaged during a period of market contraction, net of performance and human capital and firm characteristics. In contrast to statistical arguments, however, status-based arguments further predict that the application of double standards of performance will be more prevalent during the recessionary period. That is, if status-based discrimination plays at least some role in explaining why women-led firms are more disadvantaged during the recession, then we should find evidence that investors were more likely to apply different performance standards to men- and women-led firms during this period. In this context, we believe that this means that women-led firms will have to demonstrate stronger evidence of their creditworthiness in order to be funded at the same rate as their men-led counterparts.

## Data and Methods

To shed light on these questions, we examine panel data on funding outcomes from a set of entrepreneurs who sought loans from banks and other formal financial institutions between 2007 and 2011. Macroeconomic conditions varied significantly over this time period due to the financial crisis, enabling a test of the prediction that the recession amplified the effect of gender on financing for entrepreneurs.

## 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’ owner(s), as well as its strategy, organization, performance, and financing in the prior calendar year.<sup>2</sup> A stratified random sample of the approximately 250,000 new businesses<sup>3</sup> listed in Dun & Bradstreet’s (D&B) database in 2004 determined the set of 32,469 firms that were invited to participate in the first wave of the survey, which was administered in



2005.<sup>4</sup> 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, business owners were asked if they had applied for any new or renewed loans or lines of credit in the prior calendar year.<sup>5</sup> Our data indicate that applying for a loan was a relatively uncommon event. In any given year, approximately 12.5% of respondents applied for a loan. Men-led businesses were significantly more likely than women-led businesses to seek out a loan or line of credit (13.2% vs. 10.4%,  $p < 0.01$ ). However, as we will show later, the data indicate that this 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 1,134 reports of loan application outcomes from 650 firms. Approximately 317 of these firms applied for loans in multiple years; we leverage this subsample in our analyses to conduct within-firm tests of how the recession impacted the gender gap in access to financing.

One point to emphasize is that the questions most relevant to our analysis were asked between 2008 and 2012 regarding lending outcomes between 2007 and 2011. Given that our sample consists of businesses that began operating in 2004, this implies that our results pertain to firms that are between three and seven years old. Because all firms in our analysis had survived for at least three years, we can think of our sample as representing businesses of higher-than-average quality relative to a pool of start-ups in their first year. Whether our results generalize to older or younger start-ups is an open question. That said, we note that most existing studies of lending outcomes for small businesses rely on data from the National Survey of Small Business Finances (NSSBF). These businesses may be small, but they are substantially older than firms in our sample. For example, Blanchflower et al.'s (2003) study of racial and gender disparities in loan outcomes uses the NSSBF sample and reports that firms are on average 13 years old. Thus, to the best of our knowledge, the analyses we present here speak to gender disparities in lending outcomes for firms that are substantially younger than those studied previously.

## Dependent Variable

The dependent variable in our analysis corresponds to the possible answers to the survey question about loan application outcomes described above. Partici-

pants 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 loan applications were never denied. In contrast, respondents said that their applications were sometimes denied 15.7 percent of the time or always denied 14.6 percent of the time, respectively. These figures are comparable to prior work in this area; Blanchflower et al. (2003), for example, report that approximately 29 percent of loan applications from small businesses were denied in 1993 and 1998. As we will discuss subsequently, these average loan application outcomes mask variation over time and by gender.

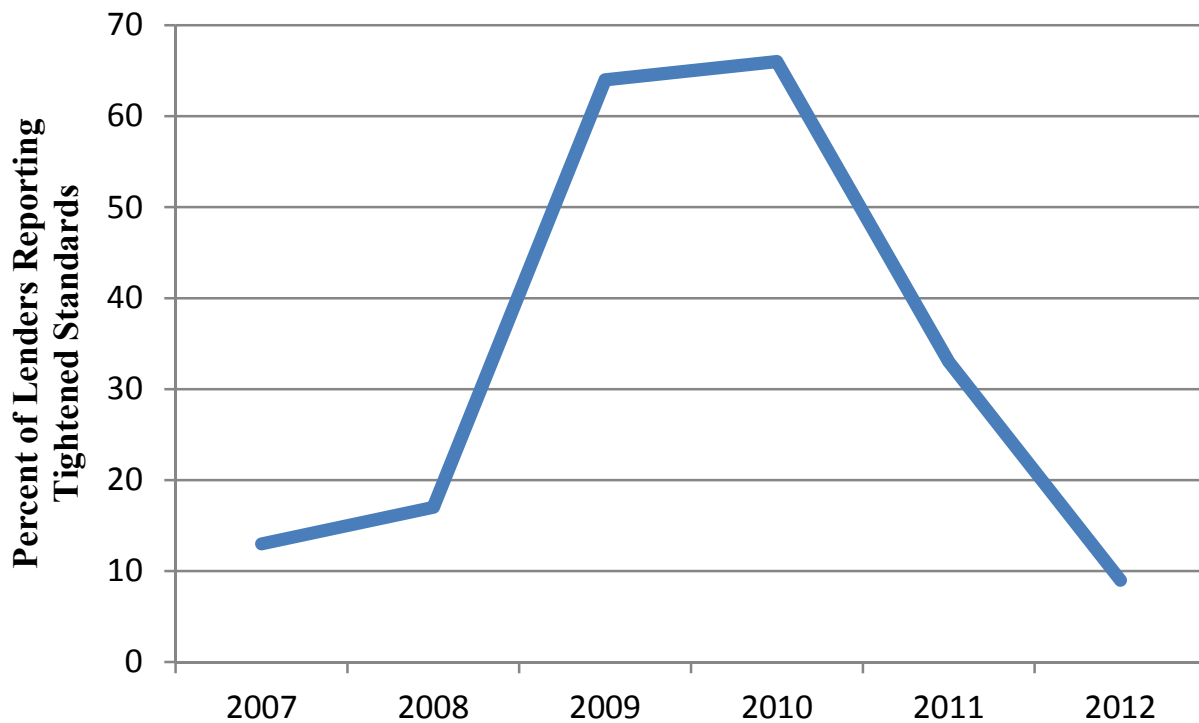
### Independent Variables

The key independent variables of interest are gender and the lending environment. Gender is a dummy variable coded “1” if the firm’s lead owner is a woman.<sup>6</sup> Women-led firms comprise about 20.2 percent of responses. Examining the effects of the Great Recession on the gender gap requires us to identify an appropriate time frame when recessionary conditions might be most likely to affect entrepreneurs. Although the recession is technically defined as starting in December 2007 and ending in June 2009, data from bank examiners indicates that the impact of the financial crisis on small business lending 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 20 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. Therefore, we coded 2009 and 2010 as the relevant recessionary period for small businesses. To examine how the effects of gender changed over time, we estimate interaction effects between the recessionary period indicator and gender.

### Control Variables

To accurately estimate the effect of gender apart from any other factors that are correlated with gender as well as loan application outcomes, we control for a series of owner and business characteristics. In terms of owner characteristics, we include an indicator variable for immigrant status, which characterizes approximately 9.0 percent of respondents.<sup>7</sup> In addition, we control for the owner’s industry experience (measured by the logged number of years the owner had previously worked in the industry of the start-up) and the number of hours the owner worked in a typical week (via a series of 6 categorical variables).

We also controlled for business characteristics, such as profitability, assets, whether the business had previously obtained a business credit line, region and industry. The credit risk measure consists of 5 categories corresponding to credit score risk classes assigned to the business by Dunn & Bradstreet, the leading provider of credit ratings. Ratings are based on information from a variety of sources, such



**Figure 1:** Tightening of Lending Standards for Small Business Loans. (From Office of the Comptroller of the Currency, “Survey of Credit Underwriting Practices” (2014:35))

as a firm’s past experiences with banks, public utility payment records, and trade experiences with other businesses. Higher scores indicate greater creditworthiness. The KFS data does not include continuous measures of profit, revenue, assets and liabilities but instead codes responses to these questions into one of nine categories. For the sake of parsimony, we experimented with various ways of collapsing the profitability and assets measures in our models (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 assets as four categories. 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 score, profit, and assets are each lagged by one year.

Table 1 includes descriptive statistics pertaining to firms in our sample. In this table, we report on a variety of measures that may be helpful in getting a descriptive sense of firms in our sample. We initially included all of these variables in our regression analyses; however, for the sake of parsimony we removed those that did not both vary meaningfully by gender and that did not predict loan outcomes (because the omission of such variables cannot bias our results). Because we restrict the control variables this way, the set of control variables included in models predicting the choice to apply for a loan and the outcome of the loan application

**Table 1:** Characteristics of Firms Reporting Loan Outcomes

	Female		Male		Difference Significant?
	Mean (S.D.)	N of Firm-Years	Mean (S.D.)	N of Firm-Years	
Outcome of Loan Application		229		905	
Never Denied (=1)	61.57		71.71		Yes
Sometimes Denied (=2)	16.16		15.58		No
Always Denied (=3)	22.27		12.71		Yes
Recession Period (2009-2010)	0.36(0.48)	229	0.38(0.49)	905	No
Minority	0.11(0.31)	229	0.12(0.32)	905	No
Immigrant	0.05(0.22)	229	0.10(0.30)	905	Yes
Owner Characteristics					
Education		229		903	
High School or Less	0.10(0.30)		0.08(0.27)		No
Some college	0.35(0.48)		0.33(0.47)		No
College	0.28(0.45)		0.28(0.45)		No
Some/Completed Graduate	0.27(0.44)		0.31(0.47)		No
Age (Reference=35-44)		229		905	
18-24	0		0.01(0.08)		No
25-34	0.20(0.40)		0.13(0.33)		Yes
35-44	0.36(0.48)		0.29(0.45)		Yes
45-54	0.28(0.45)		0.37(0.48)		Yes
55-64	0.14(0.35)		0.19(0.39)		No
65-74	0.01(0.11)		0.02(0.15)		No
Industry Experience (ln years)	1.81(1.11)	229	2.54(0.91)	905	Yes
Prior Entrepreneurship Experience (1=yes)	0.45(0.50)	229	0.49(0.50)	905	No
Total Hours Worked Per Week t-1		229		905	
< 20	0.10(0.30)		0.06(0.24)		No
20-35	0.20(0.40)		0.11(0.31)		Yes
36-45	0.21(0.41)		0.14(0.35)		Yes
46-55	0.23(0.42)		0.28(0.45)		No
56-65	0.17(0.38)		0.26(0.44)		Yes
66 or more	0.08(0.28)		0.16(0.36)		Yes
Business Characteristics					
Ownership team t-1 (1=Yes)	0.53(0.50)	229	0.54(0.50)	905	No
C-Corp t-1 (1=yes)	0.05(0.22)	229	0.12(0.32)	903	Yes
Intellectual Property Holder t-1 (1=yes)	0.14(0.35)	229	0.21(0.41)	904	Yes
Ln Num Employees t-1	1.17(1.06)	229	1.61(1.09)	903	Yes
Profit t-1		229		905	
\$500 or less	0.40(0.49)		0.32(0.47)		Yes
\$501-10,000	0.10(0.33)		0.11(0.31)		No
\$10,001 or more	0.47(0.50)		0.57(0.50)		Yes
Total Assets t-1		229		905	
\$25,000 or less	0.19(0.39)		0.11(0.32)		Yes
\$25,001-\$100,000	0.25(0.43)		0.18(0.39)		Yes

(Continued on next page)

	Female		Male		Difference Significant?
	Mean (S.D.)	N of Firm-Years	Mean (S.D.)	N of Firm-Years	
\$100,001–\$1,000,000	0.42(0.49)		0.50(0.50)		Yes
\$1,001,001 or more	0.14(0.35)		0.21(0.41)		Yes
Revenue t–1		225		890	
\$500 or less	0.13(0.34)		0.08(0.28)		Yes
\$501–100,000	0.29(0.45)		0.14(0.34)		Yes
\$100,001–\$1,000,000	0.39(0.49)		0.43(0.50)		No
\$1,000,001 or more	0.19(0.39)		0.35(0.48)		Yes
Has Business Credit Line t–1 (1=yes)	0.38(0.49)	229	0.51(0.50)	905	Yes
Made Purchases Through Trade Financing t–1 (1=yes)	0.46(0.50)	228	0.48(0.50)	902	No
Credit Score t–1		229		905	
Credit Score=536–670	0.10(0.30)		0.14(0.34)		No
Credit Score=493–535	0.41(0.49)		0.29(0.45)		Yes
Credit Score=423–492	0.37(0.48)		0.41(0.49)		No
Credit Score=376–422	0.06(0.24)		0.07(0.27)		No
Credit Score=101–375	0.06(0.23)		0.09(0.28)		No
Total Liabilities t–1		229		904	
\$500 or less	0.35(0.48)		0.27(0.44)		Yes
\$501–10,000	0.21(0.41)		0.17(0.37)		No
\$10,001–\$1,000,000	0.25(0.43)		0.29(0.46)		No
\$1,000,001 or more	0.19(0.39)		0.27(0.44)		Yes
Business Fails in Subsequent Years	0.08(0.27)	229	0.11(0.31)	905	No
Previously Received Business Loan	0.39(0.49)	229	0.44(0.50)	905	No
Home-based Business t–1	0.37(0.49)	228	0.24(0.43)	900	Yes

*Note:* Last column tests whether Female-Male difference is statistically significant at  $p < 0.05$  (two-tailed).

are slightly different. However, results are unchanged regardless of whether the full suite of controls (i.e., all variables in Table 1) is included.

## Estimation

Deciding how to model the data at hand is not straightforward for two reasons. First, the dependent variable consists of three ordered categories, which leads us to favor the ordinal logit model (Long 1997). At the same time, we wish to rule out the possibility that unobserved differences between men and women loan applicants drives our results; this inclines us toward the use of fixed effects models. However, maximum likelihood estimators for ordered logit models with fixed effects are not consistent (Greene 2004; Johnson 2004).

As a compromise, we estimated two sets of models. First, we present 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 discrete 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 unit (i.e., firm) effects are uncorrelated with the predictor variables.<sup>8</sup> We also present fixed effects linear regression models estimated by ordinary least squares. Although each of these models has its strengths and weaknesses with respect to the KFS data, we view the convergent results across the two sets of models as speaking in favor of our theoretical arguments. Finally, in order to account for the correlated structure of the panel data, all models employ robust standard errors clustered on firms.

## Results

### Gender Differences in Loan-Seeking Behavior

To the extent that men and women entrepreneurs may differ in their propensity to seek loans and that the tendency to seek a loan is associated with other individual or business characteristics that might impact loan approval, understanding the relevant predictors of loan-seeking is important for the interpretation of the results we later present regarding the effects of gender and the recession on loan denial rates. Therefore, before turning to our main analyses of loan denial rates, we first consider factors that may influence whether an entrepreneur chooses to apply for a loan. We examined this issue by running a series of 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 2.

Model 1, which includes only the 2009–2010 indicator and whether the applicant was a woman as well as industry and region dummies, indicates that women may be less likely than men to seek out bank loans ( $\beta = -0.26, p < 0.10$ ). The recession indicator in this model is negative but non-significant, suggesting that entrepreneurs were no more or less likely to apply for loans during this period than they were during more favorable macroeconomic conditions. Model 2 incorporates an interaction of gender and the 2009–2010 indicator, which is not statistically significant. Gender is also non-significant in this model. Finally, Model 3, which includes the battery of control variables that are used in our main analysis of loan denial, suggests that the observed negative effect of gender found in Model 1 can be attributed to the fact that men- and women-led businesses differ on other characteristics that predict applying for a loan; after controlling for other relevant characteristics, it appears that women may be more likely than men to apply for business loans during more normal macroeconomic conditions ( $\beta = 0.25, p < 0.10$ ). To determine whether women applied at different rates than men did during the 2009–2010 period, we tested whether the sum of the main effect of gender and the gender-period interaction was statistically different from zero. We were unable to reject the null hypothesis of this test ( $p=0.88$ ) and therefore conclude that there is no evidence that women applied for loans at different rates than men did during the recession. We interpret this overall pattern of results as relatively weak evidence of gender-based differential selection, with some indication that women may apply at higher rates than men during non-recessionary times, net of other observable characteristics, but



**Table 2:** Estimated Coefficients From Logistic Regression Models Predicting the Log Odds of Applying for a Loan

	1	2	3
Female	-0.26* (0.16)	-0.2 (0.17)	0.25* (0.14)
Recession Period (2009-2010)	-0.06 (0.08)	-0.03 (0.09)	-0.09 (0.09)
Female × Recession Period		-0.17 (0.21)	-0.23 (0.2)
Credit Score t-1 (Reference is 493-535)			
Credit Score=536-670			0.15 (0.16)
Credit Score=423-492			-0.21 <sup>†</sup> (0.11)
Credit Score=376-422			-0.30* (0.18)
Credit Score=101-375			-0.22 (0.2)
Constant	-2.48 <sup>†</sup> (0.67)	-2.49 <sup>†</sup> (0.67)	-2.39 <sup>†</sup> (0.56)
Controls	No	No	Yes
Log Pseudo-likelihood	-2944.68	-2944.31	-2667.64
Degrees of Freedom	25	26	46

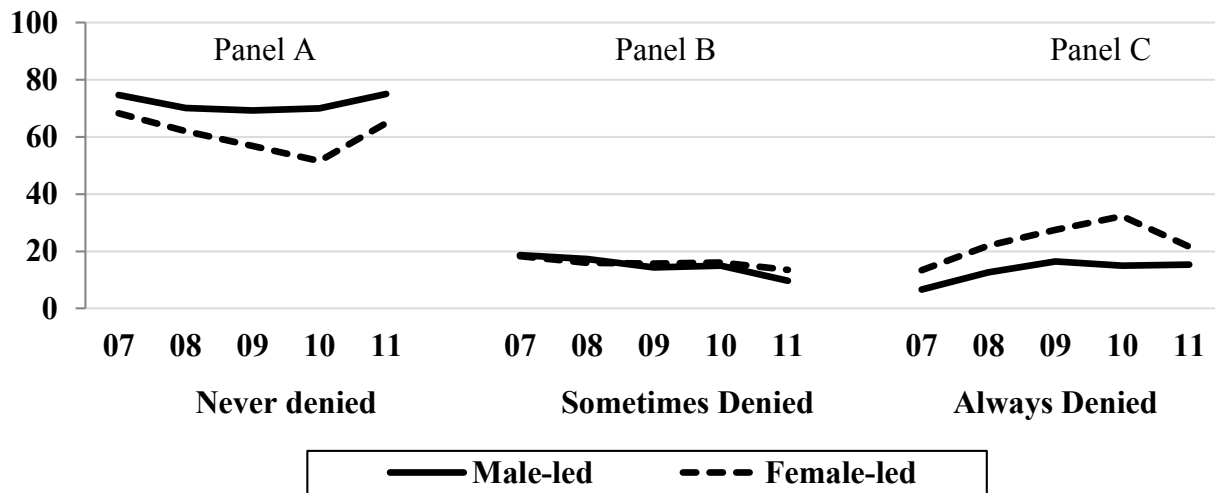
Notes: N=9,031 firm-years. Robust standard errors in parentheses. All models include fixed effects for region and industry. Controls in Model 3 are owner's immigrant status, owner's hours worked per week, whether the owner is an intellectual property holder, firm size (ln number of employees), total assets, whether the firm had a business credit line in the prior year, total liabilities and whether the firm is home-based. Complete model estimates are presented in the supplemental appendix.

\*  $p < 0.10$ ; <sup>†</sup>  $p < 0.05$ .

no evidence that gender influenced the rate of loan application during 2009–2010. We return to this point later and consider it in light of the findings of our main analyses of loan denial rates, to which we now turn.

### The Changing Effect of Gender on Loan Denial Rates

We begin our analyses of loan denial rates by outlining the basic descriptive patterns in the data before turning to more complex statistical models. 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-led firms are less likely than men-led firms to be in the “never denied” category, and Panel C shows that women-led firms are more likely than men-led firms to be in the “always denied” category. However, these gender gaps fluctuate during the period of study. For instance, 75 percent of men-led firms versus 68 percent of women-led firms fell into the “never denied” category in 2007, a difference of about 7 percentage points. By 2010, this gender gap was about three times as large, at 18 percentage



**Figure 2:** Rates of Funding Denial By Gender, 2007–2011

points (70 and 52 percent for men- and women-owned firms, respectively). The reverse pattern can be seen in the “always denied” category: there is a sharper increase in the percentage of women-led firms in this category between 2007 and 2010 than there is for men-led firms. Overall, these descriptive patterns suggest that the recession was associated with widening gender gaps in loan denial.

To examine whether these descriptive trends persist after controlling for other factors associated with gender and loan application outcomes, we estimated random effects ordered logistic regression models predicting the likelihood of loan denial. Results are presented in Table 3. Model 1, which includes only a female indicator and industry and region dummies, shows that the raw effect of being a woman on loan outcomes is to increase the likelihood of denial ( $\beta = 0.96, p < 0.05$ ). Model 2 incorporates an indicator for whether the business applied for a loan during the 2009–2010 period. The positive and significant coefficient on this variable indicates, as expected, that loans were more likely to be denied during this time frame.

In order to test our hypothesis that women-led firms faced disproportionately long odds of obtaining a loan during the recession, Model 3 incorporates an interaction between the 2009–2010 recessionary period indicator and the female dummy variable. In this model, the indicator for 2009–2010 remains positive and significant, capturing the fact that all entrepreneurs experienced greater difficulties obtaining funding during this period. The main effect of the female indicator variable, which represents the effect of being a women-led firm on loan outcomes under more normal macroeconomic conditions, is positive but not statistically significant. This indicates that firms led by women did not experience different outcomes than men-led firms when the lending environment was relatively strong. However, the interaction between the 2009–2010 indicator and female is positive and significant, indicating that women entrepreneurs encountered more difficulties obtaining financing than did their men counterparts during those years. As model 4 shows, this pattern of results holds even after we include controls for other factors associated with both the gender of the firm’s owner and the likelihood of obtaining a loan.<sup>9</sup>

In order to guard against the possibility of improper interpretation of interaction terms in non-linear models (Ai and Norton 2003), we also ran the models in Table 3 separately for men and women and obtained results similar to those reported here (results not shown but available upon request).

Overall, these results are consistent with our theoretical arguments that any gender disparities in funding for small businesses were exacerbated during the 2009–2010 recessionary period. More generally, they point to the fact that the presence of a gender gap in entrepreneurial access to financing was contingent on conditions in the lending environment. Yet, despite our extensive set of controls, it is still possible that some factor that differs systematically between men and women and that is correlated with lending outcomes may drive our results. Note, however, that for unobserved heterogeneity to account for our findings, it must be due to some factor that differs or manifests itself only during the recession, because we find no statistically significant gender gap in outcomes during non-recessionary periods once we control for other relevant predictors. This would seem to greatly narrow the set of possible confounds. Nonetheless, we formally examined the possibility that unobserved heterogeneity drives our results by estimating linear regression models with fixed effects, presented in Table 4. These analyses represent a particularly strict test of our arguments because they net out any time-invariant within-person factors that might influence our results. One downside of these models is that they can only be run on individuals who applied for loans multiple times. This has two implications. First, the number of observations falls in these analyses, meaning we have less statistical power. Second, we should be cautious in generalizing from these results because individuals who apply for loans multiple times may systematically differ from the general pool of loan applicants, which includes one-time applicants.

We focus our discussion on Model 3, which includes the same set of controls as did Model 4 of Table 3, with the exception of dropping any factors that remain fixed over time within firms (i.e., gender and immigrant status of the founder). Similar to the results presented earlier, these analyses show that all firms found it more difficult to obtain loans during the recession than in other times ( $\beta = 0.12$ ,  $p < 0.05$ ). Women-led firms, however, faced even greater barriers than men did in obtaining a loan during this period, as evidenced by the positive and significant interaction between the variables female and 2009–2010. The fact that we obtain results similar to those reported earlier, even after accounting for the possibility of unobserved time-invariant heterogeneity through the use of fixed effects, should increase confidence in our conclusion that gender became a *more* important predictor of the likelihood of being denied funding during the Great Recession. This finding is consistent with our theoretical premise that factors associated with worsening macroeconomic conditions, such as widespread uncertainty and heightened scrutiny in the lending environment, may increase lenders' reliance on stereotypes about ascribed characteristics, thereby exacerbating disadvantages for groups such as women.

We now consider explicitly how any possible differences in selection into loan-seeking would affect our results. In our view, the main possible threat to the validity of our results is that the elevated denial rates that women faced in 2009 and 2010

**Table 3:** Estimated Coefficients From Random Effects Ordered Logistic Regression Models Predicting the Frequency of Loan Denial

	1	2	3	4
Female	0.96 <sup>†</sup> (0.37)	1.06 <sup>†</sup> (0.4)	0.6 (0.47)	0.44 (0.42)
Recession Period (2009–2010)		0.91 <sup>†</sup> (0.24)	0.66 <sup>†</sup> (0.25)	0.63 <sup>†</sup> (0.25)
Female × Recession Period			1.34 <sup>†</sup> (0.66)	1.19 <sup>†</sup> (0.59)
Credit Score t–1 (Reference is 493–535)				
Credit Score=536–670				–0.66 (0.42)
Credit Score=423–492				–0.1 (0.27)
Credit Score=376–422				0.47 (0.45)
Credit Score=101–375				1.32 <sup>†</sup> (0.43)
Cutpoint 1	3.51* (1.8)	4.12 <sup>†</sup> (1.93)	4.18 <sup>†</sup> (2.01)	2.84 (1.74)
Cutpoint 2	5.32 <sup>†</sup> (1.82)	6.05 <sup>†</sup> (1.97)	6.16 <sup>†</sup> (2.05)	4.67 <sup>†</sup> (1.77)
Controls	No	No	No	Yes
Log Pseudo-likelihood	–830.72	–821.69	–818.59	–785.99
Degrees of Freedom	24	25	26	43

*Notes:* N=1,134 firm-year reports of loan application outcomes. Robust standard errors in parentheses; all models include region and industry fixed effects. Controls in model 4 are owner's immigrant status, owner's industry experience (in years), owner's hours worked per week, profit, total assets, and has a business credit line. Complete model estimates are presented in the supplemental appendix.

\*  $p < 0.10$ ; †  $p < 0.05$ .

may stem from women entrepreneurs being of lower quality on some unobservable dimensions rather than gender bias on the part of lenders. This relates to issues of selectivity in that a lower-quality applicant pool consisting solely of women could arise either if men are more reluctant than women to seek out loans and that they therefore hold themselves to higher quality standards prior to doing so, or if 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 men applicants were superior on some unobservable dimensions, this would be consistent with our pattern of 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. This second condition is essential for explaining our results because we do not observe any difference in loan denial rates in years other than 2009–2010. Recall,

**Table 4:** Estimated Coefficients From Fixed Effects Ordinary Least Squares Regression Models Predicting The Frequency of Loan Denial

	1	2	3
Recession Period (2009–2010)	0.17 <sup>†</sup> (0.04)	0.11 <sup>†</sup> (0.04)	0.12 <sup>†</sup> (0.05)
Female × Recession Period		0.32 <sup>†</sup> (0.14)	0.29 <sup>†</sup> (0.14)
Credit Score <i>t</i> –1 (Reference is 493–535)			–0.1 (0.07)
Credit Score=536–670			–0.05 (0.06)
Credit Score=423–492			0.01 (0.09)
Credit Score=376–422			0.06 (0.14)
Credit Score=101–375			
Constant	0.91 <sup>†</sup> (0.36)	1.54 <sup>†</sup> (0.18)	(0.11) (0.45)
Controls	No	No	Yes
<i>R</i> <sup>2</sup> (within)	0.05	0.07	0.1
Degrees of Freedom	7	8	24

*Notes:* N=801 firm-year reports of loan application outcomes. Robust standard errors in parentheses; all models include firm, region and industry fixed effects. Controls in Model 3 are owner's industry experience (ln years), owner's hours worked per week, profit, total assets, and whether the firm had a business credit line in the prior year. Complete model estimates are presented in the supplemental appendix.

\*  $p < 0.10$ ; †  $p < 0.05$ .

however, that this scenario is not consistent with what we reported earlier in our analyses predicting whether a business would apply for a loan. Results of that investigation indicated some possibility that women-led firms were more likely than men-led firms to apply for loans during normal macroeconomic conditions, but no evidence that men and women differed in their tendency to apply for a loan during the 2009–2010 time frame. Moreover, in analyses not shown here, we tested for any evidence of a shift in the quality of loan applications made by men-led and women-led businesses during the recession as opposed to before or after it. Results of t-tests of differences in mean industry experience and firm size show that women-led firms applying for loans were no different on these factors during the recession versus before or after it. Likewise, we used tests of proportions to check whether women-led firms were more likely, for example, to be in lower-rated credit categories, to be less profitable, or to be home-based during the recession than either before or after. We did not find any evidence of a shift in quality on these dimensions either. Based on these examinations, we conclude that differential selection into applying for a loan during the downturn is unlikely to account for the disproportionately elevated rate of denial that women-led businesses encountered in 2009–2010.

Finally, to further investigate why and how the gender disparity in access to credit arose, we ran a set of models aimed at testing for evidence of status-based

discrimination. In particular, we estimated models in which we predicted the likelihood of being denied a loan as a function of three-way interactions of gender, each of the categories of credit score, and whether the year was 2009 or 2010. These three-way interactions test whether the gender-based disparity in access to financing that emerged during the recession varied according to the credit score of the firm. As noted above, status-based theories predict that cognitive biases will cause the same information to be viewed more negatively when it is provided by women, in part because women are held to a stricter standard of evaluation. Table 5 presents the results of these analyses. Because of the challenges of interpreting interaction terms in non-linear models, we present the results of OLS regressions here, although ordered logistic regression models with random effects produce similar findings. 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, and we conclude that double standards of evaluation were unlikely to be at play during this period. In contrast, the three-way-interaction for the lowest two credit scores is positive and significant in 2010. Thus, in that year, the gender penalty manifested itself in a very targeted way such that having a low credit score was more detrimental for women entrepreneurs than for men 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.

Taken together, these analyses suggest a rather nuanced picture of the effects of gender in entrepreneurial lending markets. Gender does not appear to have had an effect on lending outcomes under more typical macroeconomic conditions, consistent with some prior work in this area (Aseidu et al. 2012, Blanchard et al. 2008, Blanchflower et al. 2003). However, when economic conditions worsened, women entrepreneurs faced greater difficulties obtaining funding than did men entrepreneurs with similar observable characteristics. We also find evidence that this disadvantage was driven, at least in 2010, by the fact that recessionary circumstances prompted investors to penalize women with low credit scores more severely than men with low credit scores, a finding which is more consistent with status-based accounts than statistical discrimination accounts. However, we do not find such evidence in 2009. Thus, we cannot fully disentangle with our data whether status beliefs or statistical discrimination are the primary mechanism driving this phenomenon; indeed, both mechanisms may simultaneously be at play.

## Robustness Checks

### Increased Scrutiny of All Aspects of Loan Applications

One alternative to our interpretation of this pattern of results is that the findings thus far are not particular to gender but rather are a manifestation of a more general pattern of increased scrutiny to every aspect of a loan application. In that case, not



**Table 5:** Estimated Coefficients from Ordinary Least Squares Regression Models Testing Gender Differences in Interpretation of Credit Scores

	(1)	(2)
Female	0.01 (0.21)	0.13 (0.22)
Year		
2008	0.13† (0.06)	0.13† (0.06)
2009	0.02 (0.12)	0.19† (0.07)
2010	0.17 (0.07)	0.11 (0.12)
2011	0.16† (0.08)	0.16† (0.08)
Female × 2008	0.15 (0.15)	0.14 (0.15)
Female × 2009	0.41 (0.6)	0.23 (0.16)
Female × 2010	0.43† (0.2)	0.22 (0.41)
Female × 2011	0.15 (0.17)	0.12 (0.17)
Female × Credit Score = 493–535	–0.14 (0.21)	–0.19 (0.22)
Female × Credit Score = 423–492	0.01 (0.22)	–0.1 (0.22)
Female × Credit Score = 376–422	0.34 (0.33)	0.05 (0.35)
Female × Credit Score = 101–375	0.05 (0.31)	–0.24 (0.32)
2009 × Credit Score = 493–535	0.26 (0.16)	
2009 × Credit Score = 423–492	0.16 (0.14)	
2009 × Credit Score = 376–422	0.34 (0.31)	
2009 × Credit Score = 101–375	0.27 (0.25)	
Female × 2009 × Credit Score = 493–535	–0.14 (0.62)	
Female × 2009 × Credit Score = 423–492	–0.23 (0.62)	
Female × 2009 × Credit Score = 376–422	–0.75 (1.00)	
Female × 2009 × Credit Score = 101–375	–0.61	

(Continued on next page)

	(1)	(2)
	(0.91)	
Credit Score=493-535	0.06	0.09
	(0.08)	(0.08)
Credit Score=423-492	0.03	0.07
	(0.08)	(0.07)
Credit Score=376-422	0.09	0.13
	(0.1)	(0.1)
Credit Score=101-375	0.33†	0.45†
	(0.12)	(0.12)
2010 × Credit Score=493-535		0.18
		(0.16)
2010 × Credit Score=423-492		0.04
		(0.16)
2010 × Credit Score=376-422		0.12
		(0.25)
2010 × Credit Score=101-375		-0.50*
		(0.28)
Female × 2010 × Credit Score=493-535		0.03
		(0.47)
Female X 2010 × Credit Score=423-492		0.04
		(0.59)
Female × 2010 × Credit Score=376-422		0.95*
		(0.54)
Female × 2010 × Credit Score=101-375		1.58†
		(0.54)
Constant	1.22†	1.26†
	(0.14)	(0.14)
$R^2$	0.18	0.19
Degrees of Freedom	61	60

Notes: N=1,134 firm-year reports of loan application outcomes. Robust standard errors in parentheses; all models include region and industry fixed effects. Controls for owner's immigrant status, owner's industry experience, owner's work hours, profits, assets, and received credit line previously are included but not reported.

\*  $p < 0.10$ ; †  $p < 0.05$ .

only gender but also other characteristics of loan applicants, such as credit score or industry experience, would become stronger predictors of loan outcomes during the recession. To determine whether this is the case, we ran a series of models paralleling those presented earlier that examined the changing effects of gender during 2009–2010. Instead of interacting gender with year indicators, however, we interacted characteristics such as credit score, industry experience, profitability, total assets, and having previously obtained a business credit line with the 2009–2010 recessionary period indicator to determine whether the effects of these more “objective” characteristics of firms and their owners also increased in importance

when the small-business lending market tightened. We entered each of these interactions into the models separately. Of the 11 different variables we interacted with the uncertainty period and entered into models, only one—the interaction that included the second-best credit score category—was statistically significant. Overall, then, the empirical evidence suggests that the observed increase in the importance of gender during the Great Recession was not part of a pattern of overall increased scrutiny that similarly affected how lenders made use of all types of information found on a loan application.

## Discussion and Conclusion

In this paper, we investigated the possibility that macroeconomic conditions moderate the probability of gender-based discrimination in entrepreneurship. Our finding that women-led firms were significantly more likely than men-led firms 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 perceived 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 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 women-owned firms face in terms of funding, a critical outcome that may ultimately influence firm survival and contribute to the aggregate gender imbalance in the rate of small-business ownership. Our findings are consistent with lab-based studies which suggest that status-driven cognitive biases may be one mechanism that contributes to gender gaps in the financial and social support that entrepreneurs are likely to receive (Thébaud 2015; Tinkler et al. 2015), although our results cannot rule out the possibility that statistical discrimination may also be at play. 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, in practice, become salient enough in the minds of lenders that they exert a systematic effect on their decision-making.

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 may vary across different types of funding. For instance, existing work suggests that women have a particularly difficult time obtaining venture capital funds (see e.g., Brush et al. 2014) while several studies find no evidence of a gender gap in the ability of women entrepreneurs to obtain loans from banks (see e.g., Asiedu et al. 2012; Blanchard et al. 2008; Blanchflower et al. 2003). Our study suggests that gender bias in the small-business lending arena is of a contingent

nature: whereas a gender gap emerged during periods of greater uncertainty and heightened scrutiny of lenders, it 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, the uncertainty in outcomes for the funder varies substantially between venture capital and bank loans: compared to banks, venture capitalists are more likely to invest at an early stage, which makes it harder to predict which firms will survive versus which will fail. 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. Future work should investigate this possibility directly.

Next, 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. This leads us to conclude that the credit gap we observe is largely driven by the behavior of investors rather than the possible self-defeating behaviors of women entrepreneurs. In general, this result is inconsistent with the argument that “women don’t ask” (Babcock and Lashever 2003). Rather, it seems that women entrepreneurs ask for funding at rates equal to or greater than men, when other relevant factors are taken into account, but that conditional on asking, women are denied at higher rates than men during hard times. This is informative in that it points more clearly to the locus of disparities in entrepreneurs’ access to capital.

More broadly, our findings speak to theoretical debates about why gender bias persists in modern economic settings that are otherwise premised on meritocratic ideals. Although our findings are generally consistent with the predictions of a status-based account of discrimination, we cannot rule out the possibility that statistical discrimination also contributes to the financing disadvantages women entrepreneurs face. Yet, we think it plausible that status-driven gender discrimination could become increasingly relevant in the future when we consider that key features of our empirical setting—the small business lending market—increasingly characterize other market and organizational settings. For instance, in our setting, explicit discrimination on the basis of gender (or race, for that matter) is not only legally barred, but it is also inconsistent with the types of meritocratic organizational cultures that many firms ostensibly seek to promote. Moreover, lenders have increasing amounts of information at their fingertips (Petersen and Rajan 2000). While there will always be some uncertainty in the outcome of any loan, the availability of objective information and lenders’ power to analyze it is only likely to increase. If gender discrimination continues to persist in these settings, its locus is thus increasingly likely to be rooted in the ways that decision-makers rely on cultural beliefs about gender to interpret such information than in the way that the absence of such information prompts them to rely on gendered statistical inferences.

Finally, our paper contributes to the literature on the intersection of status and gender in economic outcomes more generally. Specifically, our findings 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 uncertainty and scrutiny. 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 2010), 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 be viewed as more relevant during times of market uncertainty.

A final question regarding the findings presented here may be whether the gender discrimination that arose during the recession is in any sense rational.<sup>10</sup> More specifically, is there any evidence that, net of other factors affecting repayment, women entrepreneurs are any less likely to repay their loans, which could inform lenders' beliefs about women entrepreneurs as a group and lead them to avoid lending to them? Our data do not include ex-post loan repayment measures, and we are not aware of any studies that address this question with respect to young U.S.-based businesses. However, the case of microfinance provides an interesting counterpoint to the findings presented here. Several prominent microfinance institutions explicitly target women, under the theory that women borrowers are less risky and are more likely to repay their loans (see, e.g., World Bank 2007). Recent studies examining loan outcomes from microfinance institutions to borrowers in more than 50 countries conclude that women borrowers are associated with lower portfolio risk and fewer loan write-offs (Brenner 2012; D'Espallier, Guerin and Mersland 2011). In a related vein, some studies of peer-to-peer lending marketplaces that are able to assess default rates show no statistically significant difference among men and women in the propensity to repay a loan (Pope and Snyder 2011). Overall, while we hesitate to overgeneralize from these contexts to the one studied here, we can find little in the way of a solid basis for the belief that it would in fact be more risky to lend to women. Rather, it seems more plausible that, when recession strikes, widely shared cultural beliefs about what kinds of people are, and should be, successful entrepreneurs subtly enter into lenders' minds, affecting their sense of which ventures appear to be most worthy of financing.

## Notes

- 1 We do not know of any empirical research suggesting that women-led businesses are any less likely to repay loans than men-led businesses are.
- 2 Thus, the data pertain to information on firms' activities during calendar years 2004–2011.
- 3 New businesses include not only start-ups but also purchases of existing businesses by a new ownership team and purchases of franchises.
- 4 Of the 32,469 firms invited to participate, approximately 16,156 completed the baseline survey. The screening criteria in the baseline survey indicated that 11,228 firms were ineligible, which resulted in 4,928 firms in the final sample of eligible businesses (Farhat and Robb 2014).
- 5 The specific question was: "Did [BUSINESS NAME] make any applications for new or renewed loans or lines of credit in calendar year [ ]?"
- 6 If a firm has multiple owners, the primary owner is designated as the one with the largest equity share. If more than two owners had equal shares, the primary owner was identified based on the number of hours worked (Farhat and Robb 2014).
- 7 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.
- 8 While we cannot estimate fixed effects ordered logit models and run a Hausman test to determine whether this assumption holds, we have run the Hausman test for OLS models. The test indicates that fixed effects are preferable to random effects in this setting.
- 9 Although the reported models only control for factors whose omission could bias our results (i.e., variables correlated with both gender and the likelihood of loan denial), we ran preliminary models that included a wide range of variables that could plausibly be related to gender or loan denial. These include, for example, minority status, education, age, prior entrepreneurship experience, whether the firm had an ownership team (as opposed to a solo founder), whether the firm was a C-corporation, whether the firm had intellectual property, firm size (measured as the log number of employees including the founder), revenue level, whether the firm had trade financing, total liabilities, whether the firm had ever received a loan before and whether the firm failed prior to the end of data collection in 2011 (as an indicator of unobserved quality). Results are robust to the inclusion of these control variables.
- 10 We note that even if such biases are rational, they are also illegal.

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