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Conforming to Gender Stereotypes and Entrepreneurs' Financing Outcomes

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Recent research into the gender aspects of small business financing has shown that in crisis periods, banks actively reward female entrepreneurs with privileged access to loans because they put forward more realistic and cautious funding proposals compared to hubristic male entrepreneurs. We build on this research by considering in greater detail how broader gender differences in entrepreneurial confidence play out in the context of bank lending. Further, we also question whether banks treat overconfident female entrepreneurs differently from their overconfident male counterparts. Our findings show that on average there is no discrimination, but if a female entrepreneur dares to exhibit overconfidence then this changes.

Introduction

The topic of gender in management research tends to be biased towards certain fields such as organizational studies, leadership and human resource management, compared to research on finance, accounting, marketing, international business and production management (Broadbridge and Hearn, 2008). Previous studies have also documented gender gaps in entrepreneurship induced by social (Newman *et al.*, 2018), human (Brixiová, Kangoye and Said, 2020; Dutta and Mallick, 2018) and financial capital (Cowling, Marlow and Liu, 2019; Marlow and Patton, 2005; Minniti, 2009), as well as career choices (Haak-Saheem, Hutchings and Brewster, 2022; Mallon and Cohen, 2001).

The traditional approach to small business gender finance research has been to establish if there are gender differences in access to finance or the terms of lending (Asiedu, Freeman and Nti-Addae, 2013; Dutta and Mallick, 2022) and then set this in the context of three types of discrimination, of which taste-based might be considered the most concerning as it reflects a stereotypical view that female entrepreneurs (collectively) are less competent and hence less 'worthy' of funding (Becker, 1957; Gafni *et al.*, 2021; Johnson and Powell, 1994). Implicit discrimination is also concerning as it is a form of unconscious bias that disadvantages certain groups, to their detriment. Statistical discrimination is largely unobservable, as it refers to a situation where the average characteristics of a particular group are considered unfavourably (Phelps, 1972). In the context of this paper, if banks considered that the types of application female entrepreneurs put forward were, on average, inferior in some way to the average male entrepreneurs, then this would be reflected in reduced access to loans.

In this paper, we tackle these issues of loan demand and access to bank finance in an interesting and novel way by focusing on entrepreneurial confidence, with a particular interest in overconfidence. Our empirical investigation takes as its point of departure the recent paper by Cowling, Marlow and Liu (2019), which established two important features of gender in the context of small business finance. Firstly, female entrepreneurs had a lower demand for external finance, which was nowhere near explained away by gender differences in borrower discouragement. Secondly, they had a higher success rate when they did make funding applications and this was very explicitly attributed to the fact that their applications reflected a more realistic, well-thought-out process, and were viewed as much safer bets by cautious bankers. This effect was particularly evident in periods of financial crises (Calabrese, Cowling and Liu, 2022). In the context of discrimination, these results were consistent with statistical discrimination in favour

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of women, as the average characteristics of the 'group' are considered *more* favourably by banks.

We expand this set of findings further by first of all looking at differences in the gender distributions along the underconfident–confident–overconfident spectrum using a new measure of confidence. Then, we empirically examine how banks react to entrepreneurial confidence. Do they punish underconfidence and reward overconfidence? Or is there a 'liability of overconfidence' for women? Or are banks happier lending to entrepreneurs who conform to the average? The final piece of analysis really focuses on how banks react to overconfident female entrepreneurs compared to their male counterparts. Is it the case that they expect males to be more hubristic and hence they are conforming to expectations when they exhibit overconfidence? More importantly, if women are less hubristic in general, then an overconfident female entrepreneur might be deemed as deviating from the gender norm too much and be punished by banks. If so, this would imply a unique interpretation in that the stereotype or average female entrepreneur actually benefits from positive discrimination, but woe betide those women who do not conform to their gender stereotype.

To find the answers to these hugely important research questions, we use a large UK data set containing thousands of loan applications and outcomes and our novel measure of entrepreneurial confidence. Our key findings show that female entrepreneurs are more likely to be clustered in the middle of the confidence distribution, whereas male entrepreneurs exhibit a greater tendency to be at the overconfident extreme. In terms of how this plays out in respect of small business lending, we find very clear evidence that female entrepreneurs who deviate from the modestly confident gender norm are viewed with suspicion by banks and this restricts their access to capital.

The rest of the paper is organized as follows. We discuss the literature relating to gender and small business finance in the next section, before presenting our data and descriptive statistics for key variables in the third section. Our key empirical results on demand for loans and loan outcomes are presented and discussed in the fourth section, before we conclude.

Literature review and hypothesis development

Recent empirical evidence on gender and small business finance highlights some puzzling issues that are of particular relevance in these debates about credit rationing and gender discrimination. Firstly, female entrepreneurs have a lower demand for external finance (Cowling, Marlow and Liu, 2019; de Andrés, Gimeno and de Cabo, 2019; Mascia and Rossi, 2017; Ongena and Popov, 2016). Whilst there is evidence of slightly higher rates of female borrower discouragement (Cowling, Marlow and Liu, 2019; Ongena and Popov, 2016; Treichel and Scott, 2006), this does not explain all the differences in loan demand (Cowling and Sclip, 2022). This would be explained by pointing to the smaller scale of female businesses and lower capital requirements, reflecting their prevalence in service sectors with low barriers to entry and limited growth opportunities.

However, Cowling, Marlow and Liu (2019) highlighted some overlooked features of female small businesses that can, in part, help to explain this low general demand for finance. First, they have a higher use of their own equity – not because they are forced to use their own cash through external discrimination in capital markets, but through first preference (Brown, Linares-Zegarra and Wilson, 2019), in line with the pecking order theory (Myers and Majluf, 1984). A second, and important, piece of evidence is that a far higher proportion of female businesses experienced fast growth at the end of a cycle of increasing employment, investment and innovation (Coad *et al.*, 2014). Sales growth raises earnings and cash flow and increases the ability of a business to fund its investment activities out of retained earnings.

So, what does the evidence tell us about the outcome of funding requests if female entrepreneurs make them? On this, the overwhelming body of recent empirical evidence shows either no gender differences in access to loans or the contract terms that loans are offered at (Moro, Wisniewski and Mantovani, 2017; Ongena and Popov, 2016), or preferable access to loans (Cowling, Marlow and Liu, 2019). Again, the devil is in the details. A new Spanish study (de Andrés, Gimeno and de Cabo, 2019), which looked at sole traders from start-up through their first few trading years, confirmed the general fact that female entrepreneurs have a lower demand for loans. It also established that at start-up, banks were less willing to advance loans to female businesses but beyond that, these differences disappeared. They concluded that implicit discrimination was present, but once a business had income flowing into it, this removed all implicit discriminatory lending practices within two years.

We now consider how other gender attributes and behaviours might influence or underpin relationships between the demand for finance per se and the willingness of banks to meet the funding requirements of entrepreneurs. One consistently identified aspect of gender-based research into the way entrepreneurs and financial markets interact is relative tolerance of risk. This research has focused on women's relative risk aversion in reducing the rate at which they submit applications for external finance (Croson and Gneezy, 2009; Huang and Kisgen, 2013). Whilst this is not the only

Table 1. Variable definitions

Panel A: Dependent variables		
Group	Variable name	Definition
Demand for finance		
	APPLYAMOUNT (£000)	Amount of finance applied for
	OVERDRAFT	= 1 if firm applied for overdraft facilities
	TERMLOAN	= 1 if firm applied for term loan
Supply of finance		
	APPROVE	= 1 if firm received at least part of the finance (overdraft or term loan) applied for; 0 otherwise
	FULLRATION	= 1 if firm was rejected by the bank; 0 otherwise
	PARTRATION	= 1 if firm received only *part* of the finance applied for; 0 otherwise
	NORATION	= 1 if firm received *all* of the finance applied for; 0 otherwise

Panel B: Independent variables		
Group	Variable name	Definition
Overconfidence	OVERCONF	Difference between self-reported and implied loan approval probability
Gender	WLED	= 1 if firm is a female-led business; 0 otherwise
Firm characteristics		
Size	SALES_BAND	1 = <£25,000; 2 = £25,000–£49,999; 3 = £50,000–£74,999; 4 = £75,000–£99,999; 5 = £100,000–£499,999; 6 = £500,000–£999,999; 7 = £1m–£1.99m; 8 = £2m–£4.99m; 9 = £5m–£9.99m
Legal status	LEGAL	1 = Sole proprietor; 2 = Partnership; 3 = Limited liability partnership; 4 = Limited liability
Industry sector	SECTOR	1 = Primary; 2 = Manufacturing; 3 = Construction; 4 = Wholesale/retail; 5 = Hotels/catering; 6 = Transport and communications; 7 = Business services; 8 = Health; 9 = Other community
Age	FIRM_AGE	1 = <12 months; 2 = 1–2 years; 3 = 2–5 years; 4 = 6–9 years; 5 = 10–15 years; 6 = >15 years
Performance	PROFIT	= 1 if firm broke even or made a profit
	FAST_GROWTH	= 1 if firm grew by 30% or more; 0 otherwise
Owner characteristics		
Education	ONWER_EDUC	1 = None; 2 = GCSE; 3 = A level; 4 = HNC; 5 = BTEC; 6 = Professional; 7 = Degree; 8 = Postgraduate degree; 9 = Other
Prior experience	OWNER_EXP	1 = <12 months; 2 = 1–3 years; 3 = 4–6 years; 4 = 7–9 years; 5 = 10–15 years; 6 = >15 years
Qualification	FIN_QUAL	= 1 if owner has a financial qualification; 0 otherwise
Time indicators	WAVE1	= 1 if July 2011 survey; 0 otherwise
	WAVE2	= 1 if November 2011 survey; 0 otherwise
	WAVE3	= 1 if March 2012 survey; 0 otherwise
	WAVE4	= 1 if May 2012 survey; 0 otherwise
	WAVE5	= 1 if November 2012 survey; 0 otherwise
	WAVE6	= 1 if March 2013 survey; 0 otherwise
Risk indicators		
Experian credit rating	RISK	= 1 if minimal, 2 if low risk, 3 if average risk, 4 if above average risk
Financial delinquency		
Missed loan repayment	FD_LR	= 1 if missed loan repayment; 0 otherwise
Unauthorized overdraft	FD_OD	= 1 if had unauthorized overdraft facility; 0 otherwise
Bounced cheques	FD_BC	= 1 if bounced cheques; 0 otherwise
County court judgement	FD_CCJ	= 1 if had county court judgement; 0 otherwise
Late tax	FD_TAX	= 1 if missed tax payments; 0 otherwise
Trade credit restrictions	FD_TCR	= 1 if had trade credit restrictions; 0 otherwise
None	FD_NONE	= 1 if no financial delinquency; 0 otherwise
Additional control variables		
Source of funds	FIRST_TIME	= 1 if applied for finance for the first time; 0 otherwise
	OWN_EQUITY	= 1 if entrepreneur uses own equity; 0 otherwise
	NO_OTHER_LOAN	= 1 if firm has no other loans outstanding; 0 otherwise
Business activities	INNOVATOR	= 1 undertook innovation activities; 0 otherwise
	NEW_PROCESS	= 1 if introduced new or significantly improved process; 0 otherwise
	NEW_PRODUCTS	= 1 if introduced new or significantly improved products; 0 otherwise
	EXPORTER	= 1 if business export products or services overseas; 0 otherwise
Credit support	BUSINESS PLAN	= 1 if firm has a formal written business plan; 0 otherwise

Table 2. Variable descriptive statistics (weighted)

		Full sample (N = 3143)			(1) WLED (N = 868)	(2) MLED (N = 2275)	
Panel A: Dependent variables							
Group	Variable name	Mean	Median	SD	Mean	Mean	t-Test (1) = (2)
Demand for finance							
	APPLYAMOUNT (£000)	68.240	7.000	511.198	38.780	77.304	***
	OVERDRAFT	0.787	0	0.410	0.343	0.333	
	TERMLOAN	0.336	1	0.472	0.764	0.794	
Supply of finance							
	APPROVE	0.770	1	0.421	0.836	0.765	
	FULLRATION	0.231	0	0.422	0.172	0.249	
	PARTRATION	0.065	0	0.247	0.075	0.062	
Panel B: Independent variables							
Group	Variable name	Mean	Median	SD	Mean	Mean	t-Test (1) = (2)
Overconfidence	OVERCONF	0.044	0.110	0.485	0.020	0.052	***
Owner gender	WLED	0.232	0	0.422			
Firm characteristics							
Firm size (sales)	<£25,000	0.256	0	0.436	0.290	0.245	
	£25,000–£49,999	0.180	0	0.384	0.114	0.200	
	£50,000–£74,999	0.148	0	0.355	0.121	0.156	**
	£75,000–£99,999	0.075	0	0.264	0.088	0.072	***
	£100,000–£499,999	0.214	0	0.410	0.259	0.200	***
	£500,000–£999,999	0.058	0	0.233	0.065	0.056	
	£1m–£1.99m	0.038	0	0.191	0.034	0.039	**
	£2m–£4.9m	0.021	0	0.144	0.023	0.021	**
	£5m–£9.9m	0.006	0	0.079	0.005	0.007	***
	£10m–£14.9m	0.002	0	0.050	0.014	0.028	*
Legal form	Sole proprietorship	0.555	1	0.497	0.405	0.601	
	Partnership	0.079	0	0.270	0.176	0.050	***
	Limited liability partnership (LLP)	0.019	0	0.138	0.041	0.013	
	Limited liability (LTD)	0.346	0	0.476	0.377	0.337	***
Industry sector	Primary	0.071	0	0.256	0.051	0.076	
	Manufacturing	0.050	0	0.218	0.025	0.058	***
	Construction	0.209	0	0.407	0.092	0.245	***
	Wholesale/retail	0.158	0	0.364	0.199	0.145	
	Hotels/catering	0.044	0	0.204	0.091	0.029	***
	Transport and communications	0.069	0	0.254	0.048	0.075	
	Business services	0.253	0	0.435	0.259	0.251	***
	Health	0.041	0	0.198	0.101	0.022	***
	Other	0.106	0	0.308	0.134	0.098	
Firm age	<12 months	0.078	0	0.268	0.078	0.078	
	1–2 years	0.094	0	0.292	0.079	0.099	
	2–5 years	0.200	0	0.400	0.228	0.192	
	6–9 years	0.151	0	0.358	0.148	0.152	
	10–15 years	0.172	0	0.377	0.207	0.161	
	15+ years	0.305	0	0.460	0.260	0.319	***
Performance	PROFIT	0.637	1	0.481	0.629	0.639	
	FAST_GROWTH	0.116	0	0.321	0.140	0.109	
Owner characteristics							
Education	None	0.135	0	0.342	0.105	0.144	
	GCSE	0.175	0	0.380	0.182	0.173	
	A level	0.092	0	0.290	0.135	0.080	**
	HNC	0.073	0	0.261	0.059	0.077	
	BTEC	0.172	0	0.378	0.130	0.185	
	Professional qualification	0.111	0	0.315	0.109	0.112	
	Degree	0.141	0	0.348	0.149	0.139	
	Postgraduate degree	0.085	0	0.279	0.122	0.074	
	Other	0.014	0	0.118	0.009	0.016	

Table 2. (Continued)

Panel B: Independent variables

Group	Variable name	Mean	Median	SD	Mean	Mean	t-Test (1) = (2)
Prior experience	<12 months	0.037	0	0.188	0.009	0.045	
	1–2 years	0.135	0	0.342	0.160	0.128	
	2–5 years	0.108	0	0.310	0.100	0.110	***
	6–9 years	0.087	0	0.282	0.089	0.086	
	10–15 years	0.192	0	0.394	0.228	0.181	
	15+ years	0.441	0	0.497	0.415	0.449	***
Qualification	FIN_QUAL	0.239	0	0.427	0.314	0.217	***
Risk indicators							
Experian credit rating	Minimal risk	0.064	0	0.244	0.097	0.054	
	Low risk	0.127	0	0.333	0.121	0.129	
	Average risk	0.260	0	0.439	0.287	0.252	**
	Above average risk	0.406	0	0.491	0.387	0.412	*
	Not known	0.142	0	0.349	0.108	0.153	
Financial delinquency							
Missed loan repayment	FD_LR	0.045	0	0.208	0.017	0.054	**
Unauthorised overdraft	FD_OD	0.177	0	0.382	0.157	0.183	***
Bounced cheques	FD_BC	0.119	0	0.324	0.100	0.125	
County court judgement	FD_CCJ	0.034	0	0.182	0.006	0.043	***
Late tax	FD_TAX	0.131	0	0.337	0.121	0.134	**
Trade credit restrictions	FD_TCR	0.084	0	0.277	0.073	0.087	***
None	FD_NONE	0.644	0	0.479	0.668	0.637	
Additional controls							
Source of funds	FIRST_TIME	0.233	0	0.423	0.232	0.233	
	NO_OTHER_LOAN	0.193	0	0.395	0.164	0.202	*
	OWN_EQUITY	0.121	0	0.326	0.131	0.118	
Business activities	INNOVATOR	0.523	0	0.500	0.563	0.512	
	NEW_PROCESS	0.224	0	0.417	0.515	0.456	
	NEW_PRODUCTS	0.470	0	0.499	0.245	0.209	**
	EXPORTER	0.217	0	0.412	0.066	0.105	***
Credit support	BUSINESS PLAN	0.403	0	0.491	0.390	0.407	

*$p < 0.10$.
**$p < 0.05$.
***$p < 0.01$.

reason for lower application rates (Lim and Suh, 2019), it is a well-supported empirical truth if we look at bank loan application rates for male and female entrepreneurs (Cowling, Marlow and Liu, 2019). This observed relative risk aversion for women extends into other related domains, such as investment in financial assets (Barber and Odean, 2001; Beckmann and Menkhoff, 2008).

However, relative risk aversion has been identified in recent empirical work as a positive when dealing with risk-averse banks (Cole and Sokolyk, 2019; Isaksson and Quoreshi, 2015), particularly when (a) lending technologies are increasingly reliant on computer algorithms (Berger and Udell, 2006) and (b) there is instability and uncertainty in the macroeconomic environment (Cowling, Marlow and Liu, 2019). This creates a market opportunity for alternative providers, including fintech, who have captured groups of disadvantaged entrepreneurs who need external debt in significant numbers, including businesses subject to potential gender discrimination (Cumming and Hornuf, 2022; Cumming *et al.*, 2022). Technological change has fundamentally altered the nature of the banking sector (Frame and White, 2014), where the increasing adoption of innovative new lending technologies significantly mitigates the information asymmetry in making lending decisions (Baum, Caglayan and Ozkan, 2009; Goh and Kauffman, 2013) and has fuelled a more efficient decision process (Ciciretti, Hasan and Zazzara, 2009; Einav, Jenkins and Levin, 2013; Hernando and Nieto, 2007). Such changes may prove advantageous to women previously detrimentally affected by status bias if subjective assessments of an applicant's 'fit' with stereotypical notions of preferred borrowers are diminished, with the advent of hard information-based lending procedures and technologies.

Next, we consider how female and male entrepreneurs might react differently when faced with a common problem. If we assume that our historical starting point was in a world characterized by lower female representation in entrepreneurial activity, resource discrimination and observably lower rates of success in accessing bank

Table 3. Overconfidence and loan demand

Variable name	Model 1: ln(APPLYAMOUNT)				Model 2: Prob(TERMLOAN)				Model 3: Prob(OVERDRAFT)			
	Full sample	Full Sample	(1) WLED = 0	(2) WLED =1	Full sample	Full Sample	(1) WLED = 0	(2) WLED =1	Full sample	Full Sample	(1) WLED = 0	(2) WLED =1
OVERCONF	−0.106*	−0.146**	−0.107	−0.103	1.375***	1.327***	1.351***	1.964***	0.768***	0.835***	0.855***	0.747***
	(0.064)	(0.072)	(0.071)	(0.152)	(0.105)	(0.130)	(0.121)	(0.297)	(0.111)	(0.136)	(0.132)	(0.268)
$OVERCONF^2$	−0.239**	−0.242**	−0.168	−0.495**	−0.586***	−0.484**	−0.434**	−1.068**	−0.918***	−0.739***	−0.702***	−1.949***
	(0.100)	(0.113)	(0.114)	(0.242)	(0.162)	(0.200)	(0.183)	(0.418)	(0.145)	(0.195)	(0.163)	(0.361)
WLED	−0.155***	−0.171***			−0.022	0.072			0.065	0.276*		
	(0.054)	(0.066)			(0.110)	(0.141)			(0.108)	(0.160)		
WLED * OVERCONF		0.176				0.197				−0.274		
		(0.137)				(0.261)				(0.232)		
WLED * $OVERCONF^2$		0.070				−0.361				−0.706**		
		(0.208)				(0.404)				(0.360)		
CONSTANT	1.312***	1.312***	1.240***	1.635***	1.973***	2.005***	1.818***	3.945***	2.898***	2.859***	2.847***	4.785***
	(0.275)	(0.275)	(0.278)	(0.435)	(0.443)	(0.574)	(0.488)	(0.909)	(0.381)	(0.600)	(0.447)	(0.926)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N Obs	3143	3143	2275	868	3143	3143	2275	868	3143	3143	2275	868
Adjusted R^2	0.66	0.66										
F-statistics	77.38***	75.19***										
LR χ^2					1147.51***	3132.21***			1349.86***	2433.70***		
Log-likelihood					−501.71	−500.19			−436.69	−431.01		
χ^2: ALL Coeff (1) = (2)			98.39***				112.65***				139.80***	
χ^2: OVERCONF: (1) = (2)			0.01				3.64*				0.13	
χ^2: $OVERCONF^2$: (1) = (2)			1.50				1.94				9.92***	

*p < 0.10.
**p < 0.05.
***p < 0.01. Asymptotic robust standard errors reported.

Table 4. Probit model: Overconfidence and loan approval

	Model 1: Overdraft and/or term loan				Model 2: Term loan				Model 3: Overdraft			
Variable name	Full sample	Full Sample	(1) WLED = 0	(2) WLED =1	Full sample	Full Sample	(1) WLED = 0	(2) WLED =1	Full sample	Full Sample	(1) WLED = 0	(2) WLED =1
OVERCONF	0.593***	0.541***	0.631***	0.476***	0.166	−0.043	0.051	0.379	0.296***	0.242**	0.353***	0.152
	(0.078)	(0.084)	(0.088)	(0.185)	(0.111)	(0.126)	(0.135)	(0.280)	(0.109)	(0.116)	(0.122)	(0.260)
$OVERCONF^2$	−1.140***	−1.066***	−1.040***	−1.629***	−0.341*	−0.184	−0.066	−1.259***	−0.474***	−0.404**	−0.309	−1.190***
	(0.115)	(0.129)	(0.135)	(0.264)	(0.181)	(0.209)	(0.230)	(0.438)	(0.158)	(0.178)	(0.189)	(0.359)
WLED	0.092	0.195*			0.031	0.016			0.036	0.086		
	(0.076)	(0.105)			(0.117)	(0.151)			(0.101)	(0.123)		
WLED * OVERCONF		0.215				0.743***				0.200		
		(0.171)				(0.252)				(0.238)		
WLED * $OVERCONF^2$		−0.191				−0.304				−0.158		
		(0.261)				(0.394)				(0.349)		
CONSTANT	1.282***	1.273***	1.282***	1.702**	0.574	0.593	0.381	1.866	1.161**	1.152**	1.034**	2.919***
	(0.337)	(0.336)	(0.378)	(0.789)	(0.466)	(0.464)	(0.538)	(1.286)	(0.461)	(0.463)	(0.528)	(0.918)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N Obs	3143	3143	2275	868	1154	1154	842	312	2248	2248	1632	616
LR χ^2	696.05***	693.84***			262.12***	263.32***			566.16***	566.98***		
Log-likelihood	−1006.68	−1003.96			−483.07	−477.19			−565.57	−564.64		
χ^2: ALL Coeff (1) = (2)			112.62***				129.02***				104.600***	
χ^2: OVERCONF: (1) = (2)			0.57				1.12				0.49	
χ^2: $OVERCONF^2$: (1) = (2)			3.96**				5.81**				4.72**	

*p < 0.10.
**p < 0.05.
***p < 0.01. Asymptotic robust standard errors reported.

Table 5. Multinomial logit model: Overconfidence and quantity rationing

	Model 1: Overdraft and/or term loan								Model 2: Term loan								Model 3: Overdraft							
	Full sample			(1) WLED = 0		(2) WLED = 1			Full sample			(1) WLED = 0		(2) WLED = 1			Full sample			(1) WLED = 0		(2) WLED = 1		
Variable name	PARTR.	FULLR.	PARTR.	FULLR.	PARTR.	FULLR.	PARTR.	FULLR.	PARTR.	FULLR.	PARTR.	FULLR.	PARTR.	FULLR.	PARTR.	FULLR.	PARTR.	FULLR.	PARTR.	FULLR.	PARTR.	FULLR.	PARTR.	FULLR.
OVERCONF	−1.143***	−0.719***	−1.159***	−0.567***	−1.241***	−0.781***	−1.049***	−0.600	−0.514**	−0.367*	−0.532**	−0.028	−0.626**	−0.309	−0.046	−0.836	−0.192	−0.624***	−0.114	−0.494**	−0.132	−0.691***	−0.583	−0.540
	(0.157)	(0.167)	(0.172)	(0.180)	(0.183)	(0.192)	(0.358)	(0.392)	(0.244)	(0.209)	(0.261)	(0.233)	(0.269)	(0.268)	(2.128)	(0.709)	(0.195)	(0.213)	(0.210)	(0.225)	(0.224)	(0.245)	(0.541)	(0.527)
OVERCONF^2	0.839***	1.088***	1.071***	0.970***	1.014***	0.831***	0.249	1.823***	−0.684*	0.440	−0.382	0.207	−0.491	−0.124	−5.479**	1.939*	−0.110	0.866***	0.184	0.833**	0.145	0.647*	−1.789**	1.707**
	(0.233)	(0.244)	(0.262)	(0.275)	(0.269)	(0.291)	(0.551)	(0.558)	(0.410)	(0.338)	(0.444)	(0.386)	(0.451)	(0.431)	(2.232)	(1.041)	(0.286)	(0.307)	(0.319)	(0.346)	(0.336)	(0.382)	(0.836)	(0.724)
WLED	−0.118	−0.075	0.103	−0.137					−0.480**	−0.182	−0.279	−0.126					−0.018	−0.126	0.181	−0.169				
	(0.140)	(0.157)	(0.169)	(0.195)					(0.230)	(0.221)	(0.278)	(0.288)					(0.139)	(0.203)	(0.167)	(0.243)				
WLED * OVERCONF			0.033	−0.584							0.775	−1.219***							−0.485	−0.541				
			(0.334)	(0.360)							(0.974)	(0.468)							(0.465)	(0.470)				
WLED * OVERCONF^2			−0.905*	0.079							−2.419	0.365							−1.385**	−0.107				
			(0.506)	(0.549)							(1.560)	(0.729)							(0.676)	(0.684)				
CONSTANT	−3.020***	−2.135***	−3.060***	−2.141***	0.534***	0.124	0.374	−0.007	−1.155	−0.566	−1.242	−0.606	−1.044	0.119	−1.827	−4.698**	−1.450	−1.744*	−1.515	−1.764*	−0.122	−1.706*	−0.864	−5.523***
	(0.770)	(0.668)	(0.767)	(0.670)	(0.176)	(0.208)	(0.312)	(0.346)	(1.324)	(0.913)	(1.314)	(0.908)	(0.991)	(0.886)	(2.688)	(2.217)	(1.143)	(0.918)	(1.135)	(0.920)	(0.863)	(0.965)	(1.434)	(1.889)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N Obs	3143		3143		2275		868		1154		1154		842		312		2248		2248		1632		616	
LR χ^2	818.36***		824.08***						350.30***		350.43***						582.45***	592.99***						
Log-likelihood	−1913.85		−1907.62						−871.92		−863.73						−1509.93	−1506.47						
χ^2: ALL Coeff (1) = (2)					671.91***	341.59***							1177***	384.08***							1226***	759.83***		
χ^2: OVERCONF: (1) = (2)					0.23	0.17							0.07	0.48							0.59	0.07		
χ^2: OVERCONF^2: (1) = (2)					1.56	2.48*							4.80**	3.35*							4.61**	1.68		

*p < 0.10.
**p < 0.05.
***p < 0.01. Asymptotic robust standard errors reported.

funding, then it is likely that gendered differences in self-belief existed widely and that they were driven by the reality of the world they observed and lived in. There are some broader theories that are relevant, including social role theory, where women tend to prioritize fairness and equality because they have been socialized to be accommodating, cooperative and 'other' oriented. Other studies also stress that women tend to be less selfish and less opportunistic, and tend to exhibit greater cooperative behaviour driven by a sort of 'morality of responsibility' (e.g. Gilligan, 1982; Hartmann-Wendels, Mählmann and Versen, 2009). According to this view, by showing sympathy with others' interests (in this context, borrowers), women might be willing to relax the search for their own goals.

In more recent history, research suggests that once we take account of differences in industry sector and other key foundational differences (termed 'founder imprinting' by Siepel, Cowling and Coad, 2017) – people tend to start up businesses in industries and occupations in which they have experience – very few differences in outcomes and performance remain between female and male small businesses (Cole and Sokolyk, 2019; Gazanchyan *et al.*, 2017; Soost and Moog, 2019), leading Artz (2017: 163) to conclude that 'female and male entrepreneurial success are statistically equal after controlling for risk preferences, intelligence, start-up capital, prior industry experience and hours worked at the business'. On female representation per se, Cowling, Millán and Yue (2019) found that the *true* gender gap in Western Europe had diminished to 6% within a 20-year period. Together with the significant body of new evidence on equality (or more) in loan access for female entrepreneurs, expectancy value theory (Wigfield, 1994) and social cognition theory (Fiske and Taylor, 1991) suggest that we would expect to observe a decline in gender differences in self-belief.

In this paper, our interest lies more precisely in the deviations between confidence and underlying ability, and how that plays out in the context of entrepreneurial financing and interactions with capital markets. This leads us into the world of hubristic overconfidence, which 'incorporates three separate and potentially independent psychological processes: (1) overconfidence in knowledge, (2) overconfidence in prediction, and (3) overconfidence in personal abilities' (Hayward, Shepherd and Griffin, 2006: 162). The outcome of overconfidence, or hubris, is that the entrepreneur either commits scarce resources to activities that have no tangible effect on outcomes, or undertakes actions that adversely impact outcomes.

On the demand side of capital markets, we have a pool of entrepreneurs, some of whom have opportunities that require financing. These entrepreneurs appraise their opportunities according to their relative position on the confidence spectrum. Unconfident entrepreneurs who adopt a cautious attitude tend to underestimate the probability of a good outcome and they will have lower application rates for loans. In contrast, an overconfident entrepreneur overestimates the likelihood of a positive outcome. However, the same entrepreneur also believes that his company's equity is undervalued, and thus the Myers–Majluf agency problem applies, where firms with limited internal funds (e.g. small and medium-sized enterprises, SMEs) are reluctant to seek external finance, even if it means foregoing positive-NPV projects (Heaton, 2002; Malmendier and Tate, 2005a, 2005b). Therefore, we expect that the relationship between overconfidence and the amount of external finance sought will be negative. Moreover, at extreme levels of overconfidence, Hackbarth (2008) shows that misperception of true risk has a larger effect on debt than equity, with debt being perceived as more undervalued than equity shares, essentially creating a 'reversed' pecking order. Therefore, the joint effect of preference over internal and alternative (equity) external finance means the amount of debt finance sought may decrease by a larger amount for extremely overconfident entrepreneurs.

Once a decision to borrow from external markets is made and based on a distorted perception of credit and investment risks, an overconfident manager may misjudge the trade-off in debt issuance and choose more aggressive debt policies (Ben-David, Graham and Harvey, 2007; Hackbarth, 2008). However, we argue that this is more likely to be channelled through excessive risk-taking than the sheer volume of debt issued[1] because for small businesses, the amount of the loan sought is significantly related to firm size (cf. Cowling, Liu and Ledger, 2012) and overconfident bias is disproportionately found in small start-up businesses (Coelho, de Meza and Reyniers, 2004; de Meza, 2002; Manove and Padilla, 1999). Therefore, we expect that for firms with external finance needs, overconfident entrepreneurs are more likely to use the fund for riskier long-term investments (e.g. fixed assets or R&D), through less flexible term loans with longer maturity and thus higher interest rate risk.

On the supply side of the market for loans sits the bank, which is risk-averse and monitored by banking authorities in respect of liquidity risk. Although it does have complex algorithms to assess the financial elements of a loan proposal (cash flow forecasts, etc.), it also has the potential to incorporate softer information into its lending decisions (Berger and Black, 2011; Chen *et al.*, 2015; Ogura and Uchida, 2014). This is more common in Europe and smaller banks (Carbo-Valverde and

[1]Using a sample of US public and private companies, Ben-David, Graham and Harvey (2007) found evidence of positive effects of overconfidence on both book leverage (debt volume) and debt maturity (riskiness).

Rodriguez-Fernandez, 2016). Without this ability to use soft information (knowledge of the entrepreneur, the local market, etc.), the bank's computer would simply generate a NO for the overconfident entrepreneur as their estimate of the upside gain would not match that bank's rational forecast. At best it would offer the overconfident entrepreneur a smaller loan than they requested. However, the bank which incorporates soft information into its decision-making can be swayed by the enthusiasm of the overconfident entrepreneur who sells them a great story about why their opportunity is destined to succeed. The unconfident entrepreneur undersells their opportunity. We know from the literature that between one-third (Cole and Sokolyk, 2016) and half (Cowling *et al.*, 2016) of discouraged borrowers would have received loans had they applied. Equally, we know that banks make bad lending decisions (Cowling, 2010).

So how do all these issues play out in the context of capital markets when we overlay potential gender discrimination? Firstly, we might expect that female entrepreneurs will exhibit a more modest level of confidence than their hubristic male counterparts. Males are, on average, more confident than their ability warrants. If we assume that banks know these differences in hubris and apply a transactional process to their decision-making, hubristic males will be denied loans and modest females get loans. Of course, not all hubristic entrepreneurs get denied; it is simply that it affects proportionately more men. If we bring an element of relational banking (which allows for the transfer of soft information) into the process, then hubristic males are advanced loans in greater numbers and unconfident females are denied loans in greater numbers. Again, all unconfident entrepreneurs receive fewer loans, but proportionately more women are affected.

But this says nothing about how banks might deal with what we might call conforming to their gender stereotype. Is it the case that banks expect women to be more modest in respect of their confidence and men to be more hubristic? This might lead to the potential for what might be called *reverse taste-based discrimination*. By this we mean that if the bank is happy to reward a female who acts modestly in respect of their confidence in their idea (conforming to their female stereotype), how does it react to a female who is hubristic? Is a female whose confidence is approximating that of the average male treated the same as a male, or as an off-gender oddity? Is there a 'liability of overconfidence' for women? Further, is a male who acts in an uncharacteristically modest way treated like a female, or an unusual male?

From the above survey of the literature, we propose four empirically testable hypotheses.

H1: Relative overconfidence will result in a lower loan application amount, and the relationship is expected to be nonlinear where the loan amount decreases at an increasing rate with the level of overconfidence.

H2: Overconfidence has an inverted U-shaped relationship with loan success rate, where relative underconfidence and overconfidence will result in a lower likelihood of approval (compared to a modestly confident entrepreneur whose talents match their confidence).

H3: More overconfident entrepreneurs will have a higher demand for long-term lending.

H4: The reaction of lenders to deviations from gender stereotypes will be different and unequal if gender discrimination is present.

Data and descriptive statistics

We collected data from six waves of the SME Finance Monitor surveys conducted by BDRC Continental for UK SMEs between July 2011 and March 2013. This sample period was chosen because the information that allows us to construct the overconfidence variable was no longer available in subsequent surveys. In total, the data set contains 30,183 completed surveys with SMEs.

Defining entrepreneurial overconfidence

We adopt Puri and Robinson's (2007) approach to measuring overconfidence as a miscalibration of expectations. More specifically, let $E_s(l|x)$ be an entrepreneur's subjective expectation of the odds of getting the finance required, given his/her perception on a vector of firm and entrepreneurial characteristics of the business x; and $E_o(l|x)$ the objective (unbiased) probability of loan approval conditional on x, using information on the actual loan application outcomes. Then we define entrepreneurial overconfidence as

$$Overconfidence_i = E_s(l|x) - E_o(l|x)$$

During the four waves between July 2011 and May 2012, the SME Finance Monitor asked all loan applicants the following question: *Before you applied for your overdraft facility/loan, how confident were you that the bank would agree to your request?* Based on their perception of their creditworthiness, entrepreneurs chose one out of five options (very confident, fairly confident, neutral, not very confident, not at all confident). The question is a direct gauge of the ex-ante expectation of the loan application outcome, and the answer to this question is used to define $E_s(l|x)$, which is equal to one if the response is very or fairly confident, and zero otherwise. By construction, overconfidence is observed only for firms that actually made a finance application.

The objective probability of loan approval, $E_o(l|x)$, is estimated as the out-of-sample prediction of loan

approval probability from a probit model with selection, similar to that of Cowling *et al.* (2016). The model is estimated using data from the last two waves (November 2012 and March 2013) when the survey no longer asked about entrepreneurs' self-reported confidence level on loan application, and the explanatory variables are a series of firm and entrepreneur characteristic measures also used in our main analyses.

By construction, the value of the overconfidence measure has a range of −1 to 1. In extreme cases, the value will be −1 if the entrepreneur is unconfident but the firm will be granted the loan for sure as predicted by the conditional loan supply model, and a negative value means the entrepreneur *underestimates* the odds of loan approval. Similarly, an overconfidence level of 1 suggests a complete mismatch the other way around, and a positive value means the entrepreneur *overestimates* the chances of a successful loan application. Therefore, for entrepreneurs with unbiased expectations, their overconfidence measure should be close to zero.

The mean overconfidence level is 0.04 (see Table 2 later), implying that on average, entrepreneurs have unbiased expectations of loan application outcomes. The distribution of overconfidence is slightly left skewed (median = 0.11), suggesting that more entrepreneurs are moderately optimistic, if not pessimistic, about the availability of credit to their firms. For the whole sample, 715 (23%) entrepreneurs have negative confidence values (i.e. they are pessimistic about loan approval), with a mean of −0.59, whilst 2311 (73%) have positive confidence values, with a mean of 0.31.

Dependent variables

The dependent variables used in this study reflect different aspects of SME credit demand and supply, as discussed earlier. On the demand side, we look at the amount and the type(s) (overdraft or term loan, a firm can apply for both) of finance applied for. On the supply side, since the overconfidence variable is derived from the out-of-sample prediction of loan approval, we are able to study the effect of overconfidence on the probability of loan approval.

Explanatory variables

Independent variables in this study can be classified into four groups: firm characteristics, owner characteristics, firm-level risk indicators and financial delinquency measures, which are commonly used in previous studies on small business finance to proxy for the development stage of the firm and the degree of information opacity between the firm and its finance suppliers.

The detailed variable definitions are reported in Table 1. Firm characteristics include size, legal status, sector, firm age and performance. Owner characteristics or human capital measures consist of gender, (highest) formal educational qualification, prior business experience and whether or not the owner holds a financial qualification. We use risk scores and cases of financial delinquency to measure credit risk. We also consider additional control variables regarding the firm's source of finance, business activities and possible credit support provided for finance application.

Descriptive statistics

Table 1reports the descriptive statistics of dependent and independent variables, for the full sample and for female and male-led SMEs separately. An 'average' firm in our sample is a 10-year-old, male-led, non-exporting business with less than £500,000 annual turnover and reporting a profit in the previous year. On average, the owner holds at least one academic qualification and has 10 years of experience owning a business, and around a quarter have financial qualifications. Regarding credit risk indicators, around two-thirds (66%) of the firms have average or above average risk ratings, and more than one-third (36%) have had at least one incidence of financial delinquency. Lastly, only a minority of businesses have no other loans outstanding (19%), or use their own equity to fund the firm (12%) at the time of application, and over half (52%) were involved in innovation activities (developing new processes (47%) or products (22%)).

On measures of loan demand, the average amount of loan applied for is £68,240, for which one-third of the firms sought term loans and 79% sought overdraft facilities (the average applied amount for term loans and overdraft is £149,050 and £50,688, respectively). On the supply side, 77% of all SMEs applying for loans successfully got at least part of the finance required. This means that nearly a quarter of SMEs experienced absolute rationing. Further, around one in seven approved applicants didn't have their financing needs fully satisfied, and thus were partially credit rationed.

A univariate mean comparison shows that male entrepreneurs exhibit higher overconfidence levels. They also demand a higher amount of external finance than female entrepreneurs, but there is no gender difference regarding the outcome of loan applications. Female-owned businesses are smaller and younger, and women have less entrepreneurial experience but higher levels of finance training. Although these characteristics may explain why female-owned firms have lower credit ratings, they have a lower tendency for financial delinquency. To summarize, univariate analysis gives a mixed picture of whether or not finance demand and supply vary between genders, and doesn't allow us to separate the effects of overconfidence and business/owner characteristics should gender differences exist.

Empirical results

This section reports our findings from regressions examining the effect of gender and entrepreneurial overconfidence on credit demand and supply. For each empirical specification, we run a set of three parallel regressions. The benchmark regression concerns the nonlinear effect of overconfidence, as well as the individual effect of gender on the outcome variables. Next, we consider the interaction between gender and both the linear and quadratic overconfidence terms. However, pooled regressions with an interaction term may ignore potentially different financing behaviours (unobserved heterogeneity) across genders, which is well documented in the prior literature (Marlow and Patton, 2005). Therefore, we use a system of equations for female and male-led businesses, respectively, using the seemingly unrelated estimation (SUE) model, which considers the simultaneous (co)variance of independent variables across different gender groups. The estimator is more efficient and allows us to test the hypothesis that (a) all the coefficients are jointly the same and (b) the individual coefficient estimates on overconfidence and overconfidence-squared are the same between female and male-led businesses. It is worth noting that for all specifications, the hypothesis that the coefficient estimates for all the independent variables are jointly the same between female and male-only regressions is rejected, suggesting that entrepreneurs of different gender do follow unique patterns in both loan demand and supply functions.

Entrepreneurial overconfidence and finance demand

Entrepreneurial overconfidence affects the subjective assessment of investment risk and return during capital budgeting, and hence the financing behaviour once a demand for external finance is established. We report the findings from these demand-side analyses in Table 3.[2]

First, we run a regression on the logarithm of the loan amount an entrepreneur applies for (Model 1). In line with the pecking order theory, more profitable SMEs demand less external finance and the average difference in loan demand between profitable and unprofitable firms is over £60,000, or 10%. Entrepreneurs are also able to adjust their loan demand based on direct measures of credit risk. Here, riskier firms have significantly lower demand, as do delinquent SMEs. Entrepreneurial human capital also plays an important role, as more experienced, better educated entrepreneurs (especially those with financial qualifications) applied for larger loans.

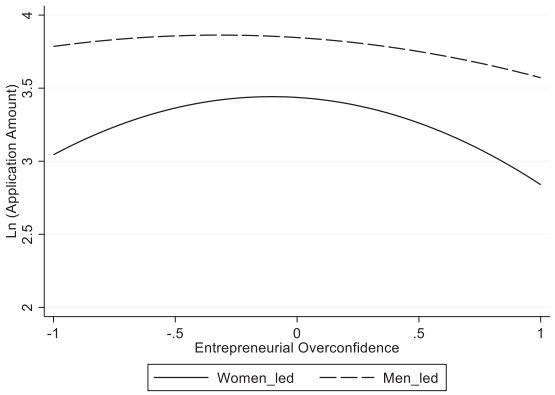

Figure 1. Overconfidence and the amount of finance sought by gender

Our key finding is that both the coefficient estimates for linear ($\beta = -0.11$, $p < 0.1$) and quadratic ($\beta = -0.24$, $p < 0.05$) overconfidence measures are negative, suggesting that overconfidence is negatively related to credit demand with an increasing effect. The findings are also consistent across different types of loan applied for (results available upon request). In terms of gender difference, female-led businesses sought lower amounts of loan ($\beta = -0.16$, $p < 0.01$), but the effect of overconfidence is not statistically significant between genders (Figure 1). The negative relationship between overconfidence and loan amount suggests that the perceived cost of extra borrowing outweighs the benefit, and the inverted U-shaped relation shows that this trade-off becomes even more in favour of cost considerations as entrepreneurial overconfidence increases.

Models 2 and 3 further examine the risk tolerance of overconfident entrepreneurs by gender, by considering the types of bank finance applied for. We find that, other than entrepreneurial overconfidence, few firm and owner-level variables are associated with the choice between term loan and overdraft. This suggests that the type of finance sought is determined by loan purpose. But we find that this 'benchmark' financing decision, based on a rational investment appraisal process, can be significantly biased by entrepreneurial overconfidence. In particular, overconfidence is positively related to term loan application[3] (Model 2), and there is clear evidence that highly overconfident entrepreneurs tend to substitute overdrafts with term loans (Model 3). There is no gender difference in the effect of overconfidence on the likelihood of term loan application. However, both the pooled and SUE regressions reveal significantly different quadratic effects of overconfidence between male and female-led businesses in overdraft applications. As shown in Figure 2, the predicted probability of over-

[2]To save space, we only report coefficient estimates related to gender and overconfidence (which is the primary focus of the paper) in the main text. Full regression tables are included in the Online Appendix.

[3]According to the coefficient estimates of linear and quadratic overconfidence variables, the likelihood of term loan application is an increasing and concave function up to the maximum value of overconfidence (+1, by definition).

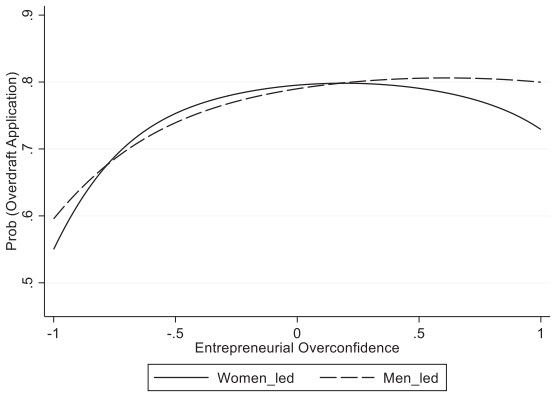

Figure 2. Overconfidence and overdraft application by gender

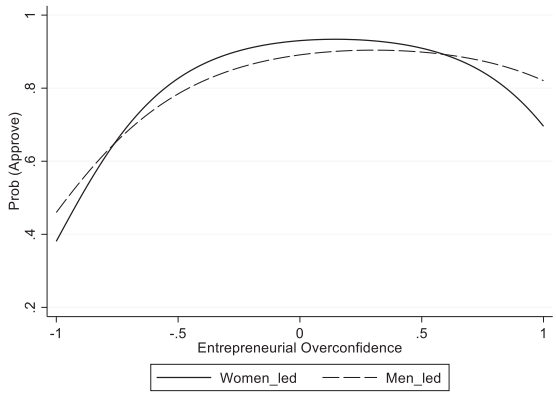

Figure 3. Overconfidence and general loan approval by gender

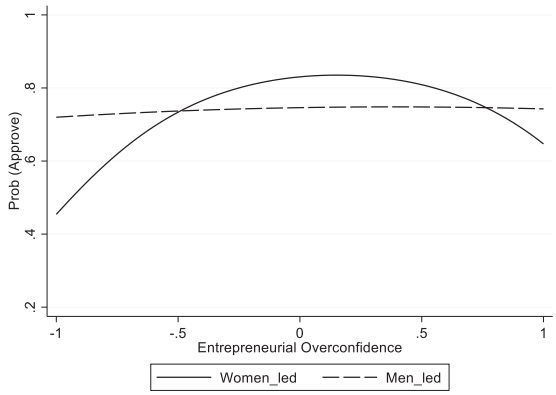

Figure 4. Overconfidence and term loan approval by gender

draft application as a function of overconfidence is more 'convex' for female-led businesses. This implies that the risk-shifting effect of overconfidence is more prominent for extremely overconfident females, and it is males that are more likely to follow a gender stereotype in risk-taking when making financing decisions.

To summarize, female entrepreneurs are *on average* more conservative in financing due to higher risk aversion. That is possibly why their financing norm is more likely to be biased by behavioural traits and become significantly more risk-taking, when they misjudge the true odds of successful finance application. However, as entrepreneurs become more overconfident in general, the perceived financing costs outweigh the systematically overestimated investment returns. Therefore, they are reluctant to raise finance externally.

The effect of entrepreneurial overconfidence on finance supply

Table 4 reports the results on the outcome of loan applications, measured as whether or not the firm got at least part of the finance applied (APPROVE), using the probit model. Model 1 concerns the general loan approval rates for both term loans and overdraft. In line with conventional wisdom, larger, older and more profitable firms are more likely to be offered loans. The existence and quality of credit history also play a key part in successful applications. Here, no credit history (first-time applicants) and poor credit history (firms with financial delinquency cases) contribute to loan rejections. The coefficient on the linear overconfidence term is significantly positive ($\beta = 0.59$, $p < 0.01$) and that on the quadratic term is significantly negative ($\beta = -1.14$, $p < 0.01$), so the relationship between overconfidence and loan approval is an inverted U-shaped curve (Figure 3). On average, mildly overconfident entrepreneurs (Overconfidence ≈ 0.3) are most likely to be successful in finance applications, whilst both extremely over- and underconfident entrepreneurs are more likely to be rejected. This is evidence that banks make lending decisions by weighing the benefits of overconfidence against its cost. A moderate level of overconfidence is all that is needed to guarantee sufficient effort from the entrepreneurs, but the benefit of increased effort will be outweighed by the distorted decision-making when overconfidence is above the optimal level.

Loan applications by female entrepreneurs are marginally more likely to be approved, consistent with previous studies (Cowling, Marlow and Liu, 2019). The coefficient on squared overconfidence is significantly different between genders ($\chi^2 = 3.96$, $p < 0.05$) using the SUE model. The difference is more intuitively illustrated in Figure 4, as the predicted loan approval likelihood function is 'flatter' for men than women. Loan approval rates are maximized for both genders at moderate overconfidence levels. However, in extreme cases, overconfident female applicants are over 10% more likely to be rejected. We attribute this finding to banks assigning gender stereotypes when considering loan applications. Female entrepreneurs are thought to be less risk-taking, making lending to them less risky in general, which is reflected in their higher approval rate. However, due to their risk aversion, banks would benefit more from the extra effort-making stimulated by moderate levels of

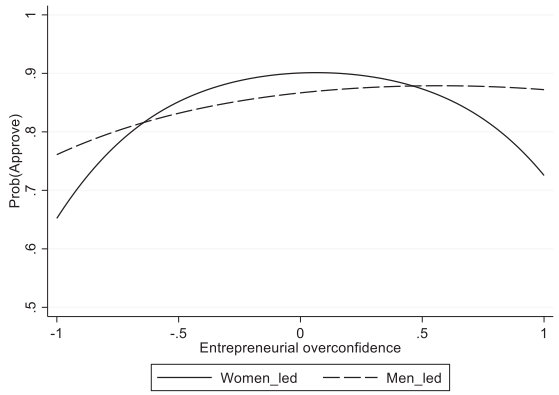

Figure 5. Overconfidence and overdraft approval by gender

overconfidence; hence the more convex loan approval curve for female-led businesses.

We further run separate loan approval regressions for term loans and overdrafts, and the results are reported in Models 2 and 3 of Table 4. Our first observation is that there is an important differentiation in banks' lending decisions based on behavioural traits. Generally, banks are more concerned about cognitive bias in the form of overconfidence on overdraft applications than term loans. One potential explanation is that short-term and low-amount credit applications do not necessarily trigger the use of a rigorous, automated risk-evaluation procedure, and thus lenders would use behavioural indicators as an extra layer of risk assessment. However, in terms of gender differences, the quadratic overconfidence terms are significantly negative for both overdrafts ($\beta = -1.26$, $p < 0.01$) and term loans ($\beta = -1.19$, $p < 0.01$) for the sample of female-led SMEs, compared to the insignificant nonlinear effect for male-led SMEs. This confirms our finding that women are subject to higher credit rationing at extreme overconfidence levels, when lenders factor in the higher deviation from their behavioural gender norms, such as risk aversion. This is illustrated in Figures 4 and 5, whereas male-led businesses are not affected, or are even positively rewarded (in the case of overdraft), by overconfidence; there is an obvious inverted U-shaped relation between overconfidence and loan approval for women-led SMEs.

Since a firm can still be rationed if it only secured part of the finance applied (partial rationing), we further test the effect of overconfidence and gender on different degrees of credit rationing using a multinomial logit model, where the base category is firms securing all the finance applied (NORATION), and the results are reported in Table 5. We find that less profitable and poorly educated entrepreneurs are more likely to be rationed. A contrast between different degrees of credit rationing is that those with poorer credit histories are more likely to experience outright rejection, while partially rationed firms are deemed to be less able to securitize their loans. Finally, it is shown that our observation from Table 4 on the different overconfidence–loan approval relationship between genders is primarily driven by full credit rationing, for general and individual types of finance. This suggests that banks tend to assign higher importance to gender stereotypes when making the approval–rejection decision, whereas lending criteria become much more consistent with respect to quantity rationing.

Robustness and additional analyses

We primarily test the robustness of our findings against alternative measures of overconfidence. Because the original question on the perceived loan application outcome has five possible responses (very confident, fairly confident, neutral, not very confident, not at all confident), instead of defining the subjective ex-ante expectation $E_s(l|x)$ as a binary variable, we redefine it by assigning one of the five values to each response, from a minimum of 0 = 'not at all confident' to a maximum of 1 = 'very confident' by assuming an equal 0.25-point gap between two adjacent responses. Such measures allow us to show more dynamics of the data set, and the regression results replicating those in Tables 3 and 4 are reported in Table A4 in the Online Appendix. With a correlation coefficient of over 0.9 with the original overconfidence measure, it is not surprising that both the signs and the magnitude of the scale-based overconfidence variable closely approximate our primary findings.

Conclusion

Using large-scale survey data on the financing activities of UK SMEs, we proposed a novel measure of entrepreneurial overconfidence. Given the well-established research evidence on gender differences in risk perception and other behavioural attributions that form the stereotypical feminine characteristics when seeking external finance, this study critically evaluates whether deviations from gender norms in terms of behavioural biases (in our case overconfidence) have any impact on the demand for bank loans and subsequently the banks' lending decisions.

On the demand side, as entrepreneurs become more overconfident, they are reluctant to seek finance externally. However, female entrepreneurs are more conservative in financing due to higher risk aversion. That is why their financing norm is more likely to be biased by behavioural traits and become significantly more risk-taking, when they misjudge the true odds of successful finance application.

On the supply side, we find an inverted U-shaped relationship between overconfidence and loan approval, implying that banks make lending decisions by weighing the benefit of overconfidence against its cost. Further,

female entrepreneurs are more likely to be 'punished' by exhibiting extreme overconfidence. Banks would benefit more from the extra effort-making stimulated by moderate levels of overconfidence, but at the same time this could also translate into higher rejection for extremely overconfident women, in which case the risk preference deviates more substantially from the benchmark risk aversion governed by female stereotype. The findings imply a unique interpretation in that the stereotype or average female entrepreneur actually benefits from their realism. The 'moral of responsibility' is relevant here, as women are less likely per se to be overconfident. So, banks expect women to exhibit this behaviour. It is then a possibility that if women do not 'conform' to these gendered expectations, and act more like men, then the higher level of 'disappointment' drives the banks' reaction to their proposals. We might consider this to be a gender 'liability of overconfidence'.

The final questions we address are does this gender effect translate into an issue of real concern in terms of the numbers of female businesses impacted? And if so, how might we address it? On the former, we calculate that 10,135 female businesses and 27,848 sole traders might suffer from underconfidence, and 7929 female businesses and 21,788 sole traders from overconfidence. This supports the contention that it is an issue of real importance and magnitude in the United Kingdom, impacting on 73,880 female entrepreneurs to their detriment. On the bank side, we suggest that their appraisal methods could go to either extreme. In a relationship sense, banks could engage more with the business and seek to understand its true potential, which would unlock capital for underconfident female entrepreneurs. In a transactional, algorithm-driven, sense, banks could pay less attention to the business 'pitch' and more to the financial fundamentals. On the firm side, our evidence suggests that informal human capital is the more relevant form, and it thus follows that professional training (particularly in financial literacy) would reduce gender bias (Bose, Arun and Arun, 2021).

However, in this study we are only able to address gender differences in the loan market from a demand-side perspective. Recent studies have also shown that higher female presence in financial institutions leads to higher financial inclusion (Strøm, D'Espallier and Mersland, 2023), and one potential channel is through the different style, or tone, of corporate communication by men and women (Falconieri and De Amicis, 2023). Therefore, an interesting avenue of future research is to examine whether or not the gender of loan officers has any effect on gender financing gaps induced by behavioural traits.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section at the end of the article.