UK Credit and Discouragement during the GFC

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Abstract

The availability of credit to entrepreneurs with good investment opportunities is an important facilitator of economic growth. Under normal economic conditions most entrepreneurs who requested loans receive them. In a global financial crisis, popular opinion is that banks are severely restricting lending to smaller businesses. This assumes that low levels of investment are caused by supply-side restrictions in the credit market. Little is said about potential changes in the demand for credit and how it is influenced by entrepreneurs' perceptions about supply-side restrictions. One particularly interesting, and under-researched, group of small businesses are those who have potentially good investment opportunities, but are discouraged from applying for external funding as they fear rejection. In this study, we question whether these entrepreneurs were correct in their assumptions. We find that levels of discouragement are quite low in general at 2.7% of the total smaller business population. Further analysis implies that 55.6% of discouraged borrowers would have got loans had they applied.

1. Introduction

"Small firms are vital to the U.S. economy. According to the U.S. Small Business Administration, they account for half of all U.S. private-sector employment and produced more than 60% of net job growth in the U.S. between 1993 and 2008. Therefore, a better understanding of who needs credit and who gets credit can help policymakers to take actions that will lead to more jobs and faster economic growth."

Cole, R and Sokolyk, T (2015)

The availability of credit to entrepreneurs with good investment opportunities is an important facilitator of economic growth and firm-level competition (Beck and Demirguc-Kunt, 2006; Marlow and Patton, 2005). In a severe global financial crisis, with its roots in the banking sector, popular opinion is that banks are severely restricting lending to viable smaller businesses and that this is increasing their probability of failure and decreasing their potential to invest in future growth. This assumes that low levels of investment are caused by supply-side restrictions in the credit market, and this focus is mirrored in formal theories of credit rationing (Stiglitz and Weiss, 1981; Blinder, 1987) and in government responses to perceived credit rationing in alternative form of supporting schemes such as direct public subsidies (Colombo et al., 2011), loan guarantee programmes (Cowling, 2010) and government-co-sponsored or managed venture capital funds (Cumming et al., 2014; Grilli and Murtinu, 2014, 2015). However, little is said about potential changes in the demand for credit when a global financial crisis occurs, in this case from September 2008.

One particularly interesting, and under-researched, group of small businesses are those who have potentially good investment opportunities, but are discouraged from applying for external funding as they fear rejection – so called "discouraged borrowers". Discouraged borrower estimates, expressed as a share of the total small business stock, range from 0.51% in Canada (Chandler, 2010), 8.75-14.04% in the US (Cole, 2009; Han et al., 2009), 8.1% in

the UK (Freel et al, 2012), 22.3% in France (Cieply and Dejardin, 2009), to 44.36% in Pakistan (Chakravarty and Xiang, 2013). To put these numbers in context, and using the US as an example, there are 25 million sole proprietors and partnerships. The median loan size (using figures from the 1998 US survey of small business finance) is $50,000. This would suggest that potentially $109-$176bn of loans could have been made. Of course not all discouraged entrepreneurs would have a viable investment proposal, but even if just 10% of discouraged borrowers in the US had good investment potential, the absolute dollar numbers are substantial. On this basis, discouraged borrowers merit further research attention, particularly in the context of an economic recession when we might, *a priori*, expect discouragement to be at its highest. But our contribution to developing our understanding of this discouraged borrower phenomenon is wider than this as we explore the potential explanations for entrepreneurs becoming discouraged and how their expectations about banks' willingness to supply credit are formed and shape their decisions not to apply. This provides the empirical context and basis for our work. Next we focus on our theoretical contribution.

It is widely accepted that small firms usually have to rely on the external credit market to fund potentially viable investment opportunities (Gelos and Werner, 2002; Laeven, 2003; Love, 2003) when internal funds are insufficient to meet the firm's investment needs (Vanacker and Manigart, 2010) and the most common source of external funding is commercial (high street) banks (Colombo and Grilli, 2007; de Bettignies and Brander, 2007; La Rocca et al, 2011). Although most large businesses that apply for external credit are successful as they benefit from their sheer size and longevity, this is not the case for many small businesses (Cosh et al, 2009; Fraser, 2014; Fairlie and Robb, 2007; Levenson and Willard, 2000; Shen, 2002). Lack of assets to place as security against lending is a significant problem for many small businesses (Cowling, 1999; Coco, 2000), and this is related to a

wider lack of information transparency and the potential for moral hazard and adverse selection to be present in the market. Further, incomplete ownership and management teams and a resultant inability to identify high quality projects from a pool of potential investments all add risk and uncertainty to the banks lending decision. It is also the case that small businesses are more vulnerable to unanticipated exogenous factors such as a Global Financial Crisis (GFC).

Scholars and governments have been concerned for decades that there is a significant minority of smaller business that are unable to access bank loans for reasons unrelated to their quality. This is central to the original work of Stiglitz and Weiss (1981), which inspired a voluminous empirical literature that sought to establish whether genuine credit rationing of high quality investment proposals was a real-world issue in the smaller business credit market (Cowling and Mitchell, 2003; Fraser, 2009). This empirical evidence was then used to establish a rationale for subsequent government intervention in credit markets typically through partial credit (loan) guarantee programmes (Cowling and Clay, 1994; Cowling, 2010; Riding, 1997). However, despite their credit-worthiness, some firms with a latent demand for credit choose not to apply for credit because the cost of application is too high (Kon and Storey, 2003). Here we can relate application costs to the time and money spent by the entrepreneur in preparing their financial accounts, revenue forecasts and generally assembling the relevant information to assist in developing their business plans. And, particularly for young and relatively inexperienced entrepreneurs, these are not trivial investments in time and money.

This unwillingness of some entrepreneurs to even apply for credit has implications for banks (suppliers of credit) and entrepreneurs (demanders of credit), and for the wider economy. In line with classic credit rationing theories, when loans are not forthcoming to entrepreneurs with viable investment opportunities then lending is at a sub-optimal level and

banks suffer from lower profit, some of which could be used for future lending. But on the demand-side, when entrepreneurs with viable investment opportunities do not apply for loans which they would have received, then there is a sub-optimal level of investment (under-investment) from the entrepreneurial sector (Vermoesen et al, 2013), and this can result in lower returns to entrepreneurial ability (human capital) at the micro level and lower rates of innovation, fewer jobs created, and generally lower levels of economic growth at the macro level. Moreover, banks would use debt as a monitoring device which effectively adds disciplane to the managers of the firm, and thus influence firm performance in a indirect (but positive) way (Jensen, 1986; Colombo et al., 2014).

As the GFC was a unique, and unanticipated, economic shock, and impacted on the entire global banking system, it provides us with an equally unique context in which we can examine how the market for small business credit reacted when the UK economy entered the GFC since September 2008. Previous research (Lown and Morgan, 2006) established that changes in banks credit standards (non-price loan contract features) played a key role in shaping the willingness of banks to advance credit in the future. Specifically, they found that there was an inverse relationship between the credit cycle and the business cycle in terms of the willingness of banks to supply of loans. Other research (Hanousek and Filer, 2004) suggested that the way in which banks determine their credit allocation (supply of loans) is the main reason why credit rationing will always be a feature of small business credit markets. They argued that banks effectively take strategic decisions to allocate loan funds to industries (rather than firms) where expected future investment returns are highest. Implicitly, a good small business in the 'wrong' industry will be unfairly credit rationed.

We are drawn to conclude that whilst there is a considerable volume of theoretical and empirical literature which considers many aspects of credit rationing, there is much less focus, and evidence, on the unique context of a GFC. This latter issue is perhaps not

surprising as they occur at this magnitude very infrequently. We hope to contribute to this relative gap in our knowledge by establishing empirically what did happen to UK small business credit markets in the GFC. And we are able to review outcomes from the supply side in respect of banks willingness to advance credit and who to, and from the demand side of the market. The demand-side is relatively ignored by public policy-makers, but we are able to identify what types of smaller businesses continue to request credit and who is deterred from making a credit application. Both of these issues are potentially important, as the preparation of a funding application is not trivial either in time or cash. By focusing on the demand for credit from entrepreneurs to banks we allow their decisions to be impacted upon by their perceptions about the willingness of banks to advance credit which is a noisy and imperfect signal. This is beyond traditional credit rationing theories which have at their heart information-based problems which prevent banks from assigning the true risk to each potential small business application for funding.

To investigate the importance of this discouraged borrower phenomenon, we begin by quantifying the level of discouragement amongst UK small businesses. We then question whether these discouraged entrepreneurs were correct in their assumptions about being rejected for loans and draw out the potential implications of this for the UK economy or whether they are misreading the extent to which banks are reducing credit availability. We use a unique set of data drawn from the Department for Business Innovation and Skills (BIS) 7 SME Business Barometer Surveys. The surveys were carried out from December 2008 to February 2010 at 2-3 monthly intervals over the course of the current recession, which officially began in September 2008, amongst small businesses in the UK. To benchmark our recession based analysis, we estimate an identical set of models using the UK SME Financing Survey for 2004 (a period of modest economic growth and general macroeconomic stability).

We estimate a sequential set of conditional probit regression models where a firm with financing needs first decides whether or not to apply for a loan, and then considers the outcome of the application conditional on a firm applying for a loan. As this is the first study to examine this phenomenon using UK data covering the entire economic recession and benchmarking this against the evidence from a year of stable and modest economic growth, our results will complement previous empirical work in this area as well as provide important evidence to support UK policy-making regarding small business financing. It will also help banks in developing their lending processes.

Our findings are that levels of discouragement in a stable economy are very low and rise during an economic recession. Even during recession they are quite low in general, but higher amongst experienced entrepreneurs. However, failure rates for loan requests are high with between 30 and 40% of total loan requests being turned down. This suggests that more experienced entrepreneurs are making rational decisions given the prevailing economic climate. Further analysis implies that 55.6% of discouraged borrowers would have got loans had they applied. Regarding credit supply, the key finding is that the financial crisis added noise and uncertainty to the lending market and banks responded by placing much more emphasis on relationships when making their loan decisions. But entrepreneurs also appear to have over-estimated the extent to which banks' willingness to advance loans had contracted. Rough estimates suggest that the scale of under-investment could be in the region of £1.5bn per annum over the recessionary cycle.

The paper proceeds as follows. We discuss the theoretical background and previous empirical evidence from which we formulate the main hypotheses. Section 3 presents the dataset and the variables, in particular our measure of credit discouragement. Section 4 reports the results from the empirical analyses. Finally, Section 5 discusses our findinds and concludes the paper.

2. Loan applications and discouragement: theories and empirical evidence

The subject of credit rationing itself has been the focus of a considerable body of theoretical work for a long period of time (Keeton, 1979; Thakor, 1989). The notion of credit rationing stems from the puzzle that in a competitive market, banks would refuse to lend to some firms rather than raise loan price (the interest rate) when there is an excess demand for bank funds (Cowling,1997; Fairlie and Robb, 2007; Fraser, 2009; Levenson and Willard, 2000; Shen, 2002). The common thread that ties much of the literature together is the role that information plays in the small firm-bank relationship (Behr and Guttler, 2007; Berger and Udell, 1998; Petersen and Rajan, 1994). Adverse selection and moral hazard resulted from asymmetric information between firms and banks lead to a supply of investment capital below the social optimum (de Meza and Southey, 1996; Stiglitz and Weiss, 1981 and 1983).

However, as previously identified, the issue of discouraged borrowers has only recently become a focus of research attention amongst academics and policy-makers since the formal theory of discouraged borrowers set out by Kon and Storey (2003). Building on the general credit rationing theories, Kon and Storey (2003) develop a theory explicitly to explain why discouraged borrowers exist. At the heart of their theory, as with general credit rationing theory's, is unobservable borrower quality (asymmetric information). Extended from a standard adverse selection model, the model of discouraged borrowers suggests that a firm, regardless of its quality, will apply for a loan only if an investment project yields a return greater than the 'effective borrowing cost'. The most important determinants of the effective borrowing cost are the monetary cost of the application and the bank's screening error (the probability that a good firm is mistakenly perceived as a bad firm by the bank or vice versa), both arising from information asymmetries.

Under perfect information (i.e. no screening error), every (good) firm would apply and get the loan successfully so there will be no discouragement. However, under imperfect

information, some firms may incur such a high *effective* application cost that the return is no longer sufficient to cover the cost of borrowing. Here, screening error plays an important role in determining discouragement in the sense that it increases (decreases) discouragement by good (bad) firms. Therefore, an effective screening device would be the case where only bad firms are discouraged from applying for loans.

The source of variation in loan application cost can be both physical and psychological. The former is fundamentally associated with lenders' response to risk, or information transparency. For example, size of firm is often taken to be a good proxy for firm risk and resource availability (Beck and Demirguc-Kunt, 2006), as is age of firm (Cowling, 1999; Chua et al., 2011). Indeed, Serrasqueiro and Nunes (2011) show that age of firm is particularly relevant in determining the capital structure decisions of small- and medium-sized enterprises (SMEs). Empirical evidence from a study of 47,115 Finnish firms reported by Hyytinnen and Pajarinen (2007) finds that when a small business ages one year, its' cost of debt decreases by 1-2 basis points.

Information transparency reduces screening error and can be improved by the use of business credit lines (Cole, 2009; Han et al., 2009; Peterson and Rajan, 2002) or longer/better firm-bank relationships (Berger and Udell, 1995; Peterson and Rajan, 1995). Both measures could improve the availability of information thus lower the cost of application. Entrepreneurial experience is also helpful in reducing information opacity between lenders and borrowers (Kon and Storey, 2003), thus may *a priori* lead to lower discouragement. However, from a demand-side perspective, such measures could also help borrowers identify the negative shock in the credit supply compared to non-recessionary periods. For example, a borrower with previous experience in economic downturns would adjust her *ex ante* perceptions on loan rejection rates upward, and therefore become more discouraged during

the financial crisis. In accordance with this discussion and if discouragement is an efficient self-rationing mechanism, we have the following two hypotheses:

H1: Discouragement is more likely to be concentrated in smaller and younger firms.

H2: Measures that facilitate bilateral information flows between firms and banks reduce the likelihood of discouragement.

Whilst the outcome of loan applications is generally dependent on risk indicators used by banks such as size, age and entrepreneur human capital (e.g. Cassar, 2004; Cosh et al, 2009; Cowling et al., 2011; Colombo and Grill, 2010), we predict that during an economic recession these relationships will become less apparent or even disappear. With credit rationing at the heart of the recession, firms that are able to successfully secure finance will have to perform better than would be the case in a more stable economic environment. In a recessionary environment, when the flow of potential opportunities diminishes and the supply of loan contracts, only the best firms are able to take advantage of any remaining business opportunities (Acs and Storey, 2004; Grilli, 2010) and apply for external finance. Therefore lending institutions are more likely to use measures that reduce information opacity, such as longer/better firm-bank relationships, when examining loan applications.

H3: Banks will increasingly defer to using a smaller set of borrower risk indicators that improve information transparency, such as longer/better firm-bank relationships in a recessionary environment.

Whilst the evidence is not directly comparable in many cases, levels of discouragement are clearly not insignificant and appear of a broadly similar magnitude to actual loan rejection rates. The economic importance of discouragement is that it leads to direct financial constraints on smaller businesses, and this can lead to a postponement or abandonment of planned investment activities. However it should be noted that discouragement will not *a priori* lead to financial constraints. Informed financiers screening firms that are not

commercially attractive out of the loan market may actually be a rational behaviour indicating an efficient market (Kon and Storey, 2003; Revest and Sapio, 2012).

Empirically, researchers have sought to find suitable proxies which capture aspects of information flows and transparency. For example, Han et al. (2009) and Cole (2013) followed the Petersen and Rajan (2002) methodology in using lines of credit (commitment loans) and use of business credit cards as measures of bilateral information flows between firms and their banks. In both cases banks *a priori* assess the 'creditworthiness' of potential borrowers to set the upper limit on available credit. Le and Nguyen (2009) argue that networking and social capital increase the use of bank loans. Chua et al. (2011) find that being able to 'borrow' social capital from family involvement improves a new venture's access to debt financing. Developing their work on (reducing) information asymmetries, Petersen and Rajan (2002) also bring length of the firms relationship with their bank into the equation. This variable was adopted by Han et al. (2009), Chakravarty and Xiang (2010), Chandler (2010), Cieply and Dejardin (2010) and Cole (2013) in their respective empirical studies. Developments in information technology, specifically online banking, have also changed the physical and psychological distance in the firm-bank relationship (Rao, 2004). And this development has facilitated, if not necessitated, the use of standardised means of evaluating credit applications which, as was the case with commitment lending and credit cards, improved the flow of information between firms and their banks, and reduced the marginal cost of processing loan applications. In line with this, studies using the US Surveys of Small Business Finance data sets incorporate a variable indicating whether or not a firm uses internet banking facilities. This standardisation of loan evaluation processes also appears to have reduced the relative effect of gender as a factor in determining (a) loan application rates (Alsos et al., 2006), and (b) loan approval rates (Carter et al., 2007; Orser et al., 2006). Freel

et al (2012) include firm strategy variables as risk indicators in their study of credit discouragement in the UK but the results are far from conclusive.

"Insert Table 1 Here"

From Table 1 we observe that there is not a great deal of empirical support for many of the key predictions from theory in our unique context of the GFC. The most consistent relationships are the negative effect of firm size and length of relationship on levels of discouragement. Here smaller firms are the most likely to be discouraged, as are those with the shortest relationships with their financiers. This evidence lends support to the theory that relationships with financiers reduce information asymmetries and lead to lower levels of discouragement.

3. Method

3.1. Data

This study is intended to analyse existing data from seven 'Business Barometer' surveys conducted by BIS which cover information of small businesses during the latest recession.

The firms interviewed in the 'Business Barometer' surveys are a sub-sample of the 2007/08 UK Annual Small Business Survey (ASBS). The ASBS survey is a large-scale telephone-based survey conducted to monitor key trends in the characteristics and perceptions of UK small business owners and managers among all industry sectors and regions. It has been conducted on an annual basis since 2003. 3,506 out of the 19,188 2007/08 ASBS sample firms were re-contacted to determine how well or badly they have performed in the previous year, and to assess their levels of business confidence going forward. On average 500 SMEs were re-surveyed using questions similar to the 2007/08 ASBS in each of the seven 'Business Barometer' waves (no firm participated in multiple surveys), starting from December 2008 to February 2010 with intervals of two to three months. The survey period coincides with the latest financial crisis therefore gives us the

opportunity to investigate how business attitudes and access to finance by UK SMEs change during the recession.

We undertook a one-to-one merge of the 'Business Barometer' data with the ASBS 07/08 data, which result in a data set of 3,506 SMEs with no loss of data from the merge. After eliminating missing data, we have 3,089 firm-level observations in our sample. Whilst the weighting system allows for the sample in each wave to be representative of the UK business population, it is not able to fully address the issue of firm exit per se on an individual basis and this introduces the potential for survivorship bias in our sample. Statistics for the UK suggest that in the region of 2.5% of the stock of firms will exit through various means on a quarterly basis.

3.2. Dependent variables

Four classifications of small business borrowers are identified to examine the determinants of discouragement and the difference between discouraged and other borrowers. The classifications are illustrated in Figure 1.

"Insert Figure 1 Here"

The 'Business Barometer' asked (i) whether a firm applied for finance during the last 12 months and (ii) if not, the reason(s) why. A '*non-borrower*' is the firm who did not apply for a loan because the firm did not need credit (no demand). For all borrowers, a *discouraged* borrower is defined as one with demand for but not applying for any finance either because the firm feared rejection, or the owner thought the finance was too expensive. Those that applied for finance (*applicants*) either succeeded (*approved*) or not (*denied*).

3.3. Explanatory variables

Independent variables in this study can be classified into four groups: firm characteristics, owner/entrepreneur characteristics, information and market related variables

and recessionary time indicators. Table 2 defines the explanatory variables by these four groups.

The main firm characteristics include size, age, sector, region and performance. Firm size is measured by employee numbers (*EMP*). Age is given by 'Business Barometer' surveys as banded variables (up to 10 years, 11 to 20 years and more than 20 years). Performance is measured banded sales change over the past 12 months (increased, same or decreased) and whether or not the firm has made a profit over the period (*PROFIT*). Further, the sample covers small firms across the UK (in 12 regions) and 8 industry sectors. Further we control for firm innovation (*INNOVATION*) and whether or not the firm is in a high-technology sector (*HIGH-TECH*). Both types of firms are subject to higher agency cost and information asymmetry given their reliance on intangible assets (Mina et al., 2013) and the higher uncertainty associated with innovation (Coad and Rao, 2008; Mazzucato,2013).

Owner/entrepreneur characteristics measure the firm's human and social capital including gender (*WLED*), prior experiences (*EXP*) and education (*UNIVERSITY*) and measures on entrepreneurial orientation. An experienced employer is defined as having previously set up a business, charity or been self-employed. The entrepreneurial orientation of firm owners is used as the exclusion restrictions in our conditional analyses as they are obviously unobservable by banks but found to be significant in explaining the demand for finance (Michaelas et al., 1999; Psillaki and Daskalakis, 2008). Here we define entrepreneur orientation as a dummy variable (*AIMGROW*) equal to 1 if the owner aims to grow the business in the next two to three years and 0 otherwise.

Information and market related variables proxy for the information transparency between firms and financiers, as well as entrepreneurs' perception on market conditions. Use of internet banking (*IBANKING*) is an indicator of loan application costs (Han et al., 2009). Firm-lender (bank) relationship plays a crucial role in both credit demand and supply, which

is negatively related to the information asymmetry between informationally opaque small business borrowers and lenders. Here, firm-bank relationship is measured as either bad (*RELATION_0*), neutral (*RELATION_1*), or good (*RELATION_2*) according to survey respondents. Besides the above direct measures of information transparency, we also use variables that are indirectly linked to information opacity, i.e. a firm's credit history (*MISS_1*, *MISS_2*, *MISS_3* and *NOMISS*), defined as the number of times a credit payment has been delayed; and previous finance-seeking activities (*PSF*), defined as a dummy variable equal to 1 if a firm has previously sought external finance and 0 otherwise.

4. Results

This section first reports the descriptive statistics for the dependent and independent variables, followed by the results from regression analyses. To take into account the obvious conditionality of credit demand and supply (as shown in Figure 1), probit models with selection (Van de Ven and Van Pragg, 1981) are used in all our regressions. In this way, entrepreneurs in need of finance first decide whether or not to apply for a loan and, if yes, their applications may be subsequently approved or rejected. Standard model diagnostics are reported for each specification. Further, we also conducted additional tests on the exclusion restrictions to verify their exogeneity, i.e. validity, and that they are not weakly correlated to the first-stage selection equations (weak instruments). The details of the additional test and model diagnostics are reported in the Appendix.

4.1. Descriptive statistics

Table 2 presents the variable definitions and descriptive statistics for discouraged borrowers, all applicants, approved and denied applicants, as well as univariate mean-comparison test results between these 4 groups of small businesses. We have identified 82 discouraged borrowers between December 2008 and February 2010, along with 721

applicants, from which 503 firms (70%) were granted finance and 218 firms were denied (30%) finance. Discouraged borrowers represent 2.65% of the total small business population, which is higher than Canada (0.51%), Chandler, 2010), but lower than other countries (8.75-14.04% in the US by Cole, 2009 and Han et al., 2009; 22.3% in France by Cieply and Dejardin, 2009; 44.36% in Pakistan by Chakravarty and Xiang, 2010). In a similar study in the UK using data from a survey in 2005 (Freel et al, 2012), the level of discouragement is much higher at 8.1%.

For the whole sample of 3,089 SMEs (Results not reported but available from the authors upon request), an 'typical' firm is an urban-located, family-owned business, and experienced falling sales during the last year. The average firm is owned by a white male entrepreneur who has no prior experience in running a business. Small business requiring funds (discouraged borrowers plus applicants) consist of 26% of all SMEs (803 firms), and compared to the non-borrowing firms, are larger (37 employees) but younger, slightly less likely to be in an urban area but more likely to be family-owned.

Univariate testing allows a preliminary comparison of different types of borrowers. On average, discouraged borrowers are younger, smaller and poorer performing, even compared to firms that were denied finance. Here, the average difference in employment is 24 employees between discouraged borrowers and applicants. Regarding owner characteristics, discouraged borrowers tend to be more experienced than denied applicants.

In terms of borrower risk indicators, discouraged borrowers are more likely to have previously sought finance. On average, discouraged borrowers are more likely to have better relationships with lenders than those being denied finance, but their firm-bank relationship is generally worse than approved applicants. The unfavorable firm-bank relationship for discouraged borrowers is closely related to their poor credit history as discouraged firms are

most likely to have missed loan/overdraft payments multiple times (*MISS_3*) compared to the other 3 groups.

The last column of Table 2 compares firms that were eventually approved and denied finance by banks. It can be seen that firms that were denied finance are similar to discouraged borrowers in terms of firm characteristics, implying that discouragement is an efficient self-rationing mechanism to screen riskier borrowers from the loan market. However, the differences are much smaller than those between discouraged and approved applicants. The most prominent difference between approved and denied applicants lies within firm-bank relationships (as well as credit history). Firms that were denied finance have much poorer relationships with banks.

"Insert Table 2 Here"

We also look at the distribution of discouragement over time during the recent financial crisis and this time dynamic of credit demand and supply is shown in Figure 2. No discouragement happened for firms surveyed in February and June 2009 and only 1% of SMEs reported discouragement in April 2009. In order to increase our sample size, these three groups of firms are aggregated using a single dummy variable (*WAVE2/3/4*). It can be seen that discouragement was more likely to happen at the very beginning (December 2008) and towards the end of the recession especially in December 2009, when 35% of all discouragement during the recession occurred.

“Insert Figure 2 Here”

4.2. Benchmark regressions

As benchmark analyses, non-recessionary demand for and supply of finance are examined using the 2004 Survey of SME Financing and variables are defined in similar ways as in the within-recession ASBS analyses. In sharp contrast with the recessionary figures, of the 2,254 sample small businesses only 0.6% (13 SMEs) of total sample are identified as

discouraged borrowers, and the majority (95%) of loan applications were approved. Table 3 reports the regression results for non-recessionary conditional credit demand and supply. In both cases, the χ^2 tests of independent equations are rejected at 1% level, justifying the presence of selection bias in an unconditional model.

Model 1 looks at the decision of a firm with financing need whether to apply for the finance or not. Firm owner's perception on the severity of financing problems (scaled from 1 (no problem) to 10 (critical problem)) is used as the exclusion restriction for the selection equation, given the expectation that more severe financing problem would increase the demand for finance but the application decision is based on the firm's perception on credit supply. Consistent with our prediction, larger and older firms are significantly less likely to be discouraged. Here a one person increase in employment reduces the probability of discouragement by 0.05% ($p < .01$) and firms more than 20 year's old are on average 2.7% ($p < .10$) less likely to be discouraged.

Regarding owner/entrepreneur characteristics, entrepreneurs with university degrees are 1.8% ($p < .05$) less likely to be discouraged. However, experienced entrepreneurs and firms with a good relationship with lending banks are just as likely as others to be discouraged in a non-recessionary environment. These findings indicate that in 'normal' times when economic conditions are in general favourable and there are fewer restrictions on credit supply, information transparency does not play an important role in screening good from bad firms before they apply for any finance.

Model 2 reports the coefficient estimates for the conditional supply of finance in a non-recessionary period. In addition to the exclusive restritions used in Model 1, entrepreneurial experience is used as an additional restriction as it is not easily observable by finance providers. It is found that applications by larger and thus less risky firms are significantly less likely to be turned down. Information transparency is a particularly important determinant of

credit supply in non-recessionary periods. Firms that managed to fill the information gaps with banks through relationship-building are significantly less likely to be denied finance. Therefore, during non-recessionary periods, banks tend to use a wider range of criteria and seem to have made a more detailed screening based on both the riskiness of the firm and the knowledge gained from past business relationships with the applicants. An interesting finding was that geographic region did not appear to be associated with different outcomes. This might imply that the four dominant UK banks operated a national policy regarding small business lending and this was well understood by firms across the UK.

"Insert Table 3 Here"

4.3. Conditional credit discouragement during the recession

Model 1 of Table 4 reports the coefficient estimates for the probability of a firm applying for finance conditional on the firm demanding external fund. Sector, entrepreneurs growth orientations and previous finance seeking activities are used as the exclusion restrictions for the regressions, because they are found to be significantly associated with credit demand but not discouragement (in single-equation probit models). Intuitively, growth orientations are unobservable by banks and found to be significant in explaining the demand for finance (Michaelas et al., 1999; Psillaki and Daskalakis, 2008). The χ^2 test of independent equations is rejected at 1% level so the model is appropriately specified.

Similar to the non-recessionary results, smaller and younger firms are more likely to be discouraged. On average, a one person increase in employment increases the probability of applying by 0.1% ($p < .05$), and firms more than 20 years old are 5.6% ($p < .1$)more likely to apply for finance than younger firms. All these findings are consistent with our conjecture that safer (i.e. larger, older) firms appear to have lower applications costs thus are less likely to be discouraged.

Compared to non-recessionary periods, we predict that in a financial crisis information transparency plays a more important role in firm's loan application decision making. More experienced and better educated entrepreneurs are 25% ($p < .1$) and 5.5% ($p < .01$) less likely to apply for finance, respectively, even if they need it. This indicates informational disadvantage is indeed on the demand-side, that more experienced hence more 'realistic' entrepreneurs (Cavalluzzo, et al., 2002) have realised the difficulties in access to finance during recessionary periods, so they voluntarily impose self-control on their borrowing activities. This is unlikely to be a result of experienced entrepreneurs having access to alternative sources of finance (e.g. equity) as only 1.3% of experienced entrepreneurs sought equity finance and none of them issued shares to new investors (1.7% of all firms sought equity finance).

Riskier firms in terms of poor credit history are also more likely to be discouraged. Here, firms that have missed loan/overdraft payments for over 3 times are 6% more likely to be discouraged ($p < .01$). Variables associated with the magnitude of information gap between firms and banks, such as good borrower-bank relationships are also more important as compared to non-recessionary periods. Here the probability of applying finance increases by 3% ($p < .01$) if the firm has a good relationship with the banks. Discouragement is most likely to be observed at the beginning of the crisis. Compared to SMEs surveyed in December 2008, those interviewed one year later were 25% ($p < .01$) more likely to apply for finance.

"Insert Table 4 Here"

4.4. Conditional supply of funds during the recession

The comparison between the conditional loan application and approval functions shows important differences regarding the types of firms that are likely to be discouraged and denied (Models 2 and 3, Table 4). Model 2 uses the same probit model with selections as Model 1, where the probability of a loan being denied is conditional on a firm applying for finance.

The model is properly identified as the χ^2 test of independent equations is rejected at 10% level. Entrepreneurial experience and growth-orientation are used as exclusive restrictions because they are more difficult to be quantified by the banks when making lending decisions. As shown in the Appendix, the null hypothesis that all the exclusion restrictions are weak instruments cannot be rejected, although the validity of the instruments is verified by the Sargan test statistic, which calls on further analyses as robustness checks.

As shown in Model 2, almost all the firm characteristics that are significant in determining discouragement have lost their explanatory powers to predict loan approval, including firm size. Compared to pre-recession results, it appears that banks in recessionary periods tend to base their lending decisions exclusively on firm-bank relationships and business credit history. On average and compare to firms with poor firm-bank relationships, neutral and good relationships decrease the odds of loan denial by 15.8% ($p < .01$) and 38.7% ($p < .01$), respectively.

Since further tests cast questions on the inference and relevance of the exclusion restrictions, unconditional model is used as robustness checks to compare the riskiness of different types of firms in our context. Model 3 reports the results for the multinomial logit regression for discouraged, approved and denied borrowers using discouraged borrower as the base case. In terms of riskiness, discouraged borrowers are the riskiest even compared to denied borrowers, where denied borrowers are of larger size ($\beta = 0.02$, $p < .01$). However, in terms of entrepreneurial education, and thus the perceptions on the degree of credit rationing, both approved ($\beta = -0.70$, $p < .05$) and denied ($\beta = -0.57$, $p < .1$) applicants are significantly less educated than discouraged borrowers. Consistent with the findings from Model 2, denied borrowers have the worst firm-bank relationships, where they are least likely to have a good relationship with the banks ($\beta = -0.75$, $p < .05$). As a robustness check, we also considered alternative exclusion restrictions in both the conditional credit application and denial

equations. Whilst they do not materially affect the results reported in Table 4, alternative specifications are available upon request.

5. Discussion and conclusion

5.1. Implications of Research Findings

Our starting point was that certain types of entrepreneurs perceived that their chances of successfully securing a bank loan were so low that the costs of making an application were not worthwhile. This group of entrepreneurs are called 'discouraged borrowers' and previous work suggested that they were a quantifiably important subset of the small business sector. We predicted that this phenomenon would be even more prevalent during the worlds' deepest financial crisis for seventy years. Using a unique UK data set covering the entire economic recession, our results show that discouraged borrowers are a relatively small subset of the smaller business sector, and even in a deep economic recession represent only 2.65% of the total stock, which equates to 30,000 firms out of a total stock of 1.2 million smaller businesses. However the percentage of discouraged borrowers is still significantly larger than non-recessionary periods (0.6% versus 2.65%).

We then sought to establish whether discouraged borrowers were different from entrepreneurs willing to apply for loans. Our results are in line with previous empirical evidence from the US (Han et al., 2009) and Canada (Chandler, 2010) that discouragement is an efficient self-rationing mechanism even during an economic recession. Discouraged borrowers are generally smaller and younger which is consistent with informational theories of credit rationing. However contrary to the traditional credit discouragement theory based on supply-side information asymmetry (Kon & Storey, 2003), we found that more experienced entrepreneurs are more likely to be discouraged holding other factors constant. This suggests that entrepreneurs who have experienced previous economic recessions have learnt about bank lending behaviour when the market demand is falling, and anticipate that credit

rationing will increase thus reducing the availability of credit in general. In this sense experienced entrepreneurs are acting in a rational manner by self-adjusting their borrowing activities. We also argue that information transparency can be proxied by better firm-bank relationships and predict that discouragement will be lower for firms with good relationships with banks. We find strong empirical support for this conjecture, suggesting that a good firm-bank relationship does substantially facilitate the information flows between borrowers and lenders.

If discouragement is an efficient self-rationing mechanism through which low-quality firms voluntarily choose not to enter the loan market, discouraged borrowers should be as risky as, or even riskier than, denied borrowers but should be better informed of firm quality and credit supply in the loan market. We find strong support for this hypothesis through our empirical analyses. When comparing discouraged, approved and denied borrowers, discouraged borrowers have the smallest firm size and poorest growth performance, yet they are the most experienced even compared to firms that have successfully secured finance.

Our findings also suggest that the degree of information asymmetry also exits in the banking sector in terms of credit supply in the financial crisis. On the supply-side and especially during an economic downturn, when the information flow on the small business sector is further hampered by market turbulence, banks have found themselves unable to distinguish high and low quality firms through common risk indicators such as size, age or performance. The only source of information banks can rely on is from previous relationships and they tend to provide finance to whomever with a good relationship with the banks.

The policy implications of our results are twofold. First, small business policy should not be targeted at discouraged borrowers. They are, in many cases, lower quality firms well informed of their riskiness and have anticipated their low likelihood of acceptance. Second, whilst relationship lending helps to bridge the information gap between lenders and

borrowers, future policies should aim at the financing difficulties of credit-worthy but young firms yet to establish good firm-bank relationships or other forms of social capital. In this sense, loan guarantee programmes (such as the UK Enterprise Finance Guarantee, EFG, scheme) remain an essential tool to increase the supply of funds to small firms.

There was also an important time dynamic in terms of general patterns in demand and discouragement over the recessionary period. Discouragement was higher towards the end of the recession, suggesting that initially entrepreneurs anticipated that the supply of loans would not diminish too much, and only when it became clear that banks were rationing credit persistently did entrepreneurs become disillusioned about applying for loans. An interesting feature was that overall loan approval rates were at their lowest between February and June 2009. This implies that entrepreneurs, particularly inexperienced ones, become discouraged too late on in the recession, and fail to make applications at precisely the point when banks are relaxing their lending criteria.

The final piece of the jigsaw was to answer the question of whether or not discouraged borrowers would have been able to secure a loan if they had actually applied for one. Clearly the stock of discouraged borrowers might include both low quality and high quality entrepreneurs and firms. If banks can deter low quality borrowers from applying, then this reduces both entrepreneur and bank costs of application. But if high quality borrowers are deterred from applying, then this represents a loss of value to the bank and the entrepreneur, and ultimately the economy. On this question, a prediction for discouraged borrowers that fits into a probit model for firms that were approved/denied loans suggests that 55.6% of discouraged borrowers would have received a loan had they applied for one. This represents around 17,000 loans in total that could have been made.

5.2. Study Limitations and Future Research

Whilst this study is unique in that it covered a whole financial crisis and economic recession in the UK and benchmarked events against pre-recession year, this presents a research opportunity going forward as the economy gradually comes out of recession over the next few years to assess the speed at which demand and supply of credit move back into some sort of stable equilibrium. It would also add to our knowledge about how commercial banks change (tighten or loosen) their lending criteria in response to prevailing economic conditions and the process by which this changes entrepreneurs' perceptions about the willingness of banks to lend.

A further avenue of future research would involve understanding how banks become aware of discouraged borrowers and how they seek to address this missing market of potentially profitable lending. This strand of research could involve detailed case study interviews with bank lending officers and senior strategists and a more qualitative, survey-based approach. Both would add to our understanding of the supply-side dynamics of bank lending to the entrepreneurial sector. Another issue is whether the specific context of the UK credit market, which is characterised by a highly concentrated banking oligopoly, means that our findings have wider resonance. Given the disparity in the level of discouragement across countries, we might suggest that there are some common characteristics of the UK and Canadian credit market that lead to generally lower levels of discouragement, which are not present in the US, France or many less developed countries. Further research into the structure of credit markets may help us to understand what these key differences are. Our research could also benefit from a richer data set including information such balance sheet data (e.g. Cosh et al, 2009). Last but not least, this study addresses government policy incentives mainly in the form of debt finance, future research that tests the complementarities/trade-offs among different sources of capital and/or government

interventions (e.g. direct subsidies, public co-invested venture capital funds) would complete the picture.

5.3. Conclusion

In conclusion, we have found that discouraged borrowers represent a particularly interesting, and under-researched, yet quantifiably important subset of small businesses. We investigated whether or not discouragement is an efficient self-rationing mechanism to screen riskier borrowers from the loan market especially during a severe economic downturn, and sought to draw out the potential implications for the UK economy. We find that discouraged borrowers appear riskier than businesses that choose to apply for bank loans, but they are also more informed about their riskiness, hence for many their reluctance to incur loan application costs are rational. Our empirical analysis also shows that the financial crisis added noise and uncertainty to the lending market and banks responded by placing much more emphases on relationships when making their loan decisions. But entrepreneurs also misread the extent of the reduction in the supply of credit and this potentially led to under-investment in the region of £1.5bn per annum over the recessionary cycle from the entrepreneurial sector. It is likely that this has resulted in fewer jobs created, lower economic growth and lower profits for banks and entrepreneurs. Our findings have important implications on governments' small business policies. However, future studies on this phenomenon are warranted particularly in a non-recessionary environment.

Appendix: Testing for Over- and Weak-identifying Instruments in the Conditional Probit Models

In order for the Heckman selection model to be properly identified, the selection equation must contain at least one variable (exclusion restriction, or instrument) that is not in the outcome (main) equation. Ideally in instrumental variable (IV) estimations, a valid

instrument must be uncorrelated with the regression's disturbances, i.e. exogenous. Moreover, a good instrument needs to be strongly correlated with the endogenous explanatory variable. If the partial correlations between the instruments and the endogenous variable are weak, the coefficient estimates can be biased and hypothesis tests distorted even with a very large sample size (Murray, 2006).

In this study, the model we adopt is in essence a two-stage regression model taking into consideration the conditionality, or endogeneity of credit demand and application (prob(*DEMAND*) and prob(*APPLY*) in the conditional credit application/discouragement and credit denial eqation, respectively) using exclusion restrictions in the selection equations as instruments. However, testing instrument validity and that they are not weakly identified are not so straightforward. In a linear IV regression, Sargan test of over-identifying restrictions is usually used to assess the validity of instruments (Sargan, 1958), and Stock and Yogo (2005) propose a hypothesis test of weak instruments based on the Cragg-Donald (1993) F-statistic. In order to serve our purpose, we follow Grilli and Murtinu (2014) and run the following pseudo-two-stage IV regressions (2SLS) for pre- and within-recession credit application (discouragement in the pre-recession specification):

$$\text{Second stage: } APPLY \text{ (or } DISCOURAGED) = \beta_0^A + \beta_1^A DEMAND + \beta_2^A X_i^A + \varepsilon_i^A$$

$$\text{First stage: } DEMAND = \alpha_0^D + \alpha_1^D Z_i^D + \alpha_i^D X_i^A + \mu_i^D$$

and credit supply (denial), respectively:

$$\text{Second stage: } DENIED = \beta_0^S + \beta_1^S APPLY + \beta_3^S X_i^S + \varepsilon_i^S$$

$$\text{First stage: } APPLY = \alpha_0^A + \alpha_1^A Z_i^A + \alpha_i^A X_i^S + \mu_i^A$$

In the peudo-2SLS regressions, Z_i^D and Z_i^A are vectors of exclusion restrictions used in the selection equations in Model 1 and Model 2, respectively, in Tables 3 and 4. In turn, X_i^A and X_i^S are vectors of exogenous variable used in the outcome (main) equations in Model 1 and

Model 2, respectively, in Tables 3 and 4. By definition, Z_i^D and Z_i^A are the instruments chosen in the pseudo-2SLS regressions.

Table A reports the model diagnostics of the pseudo-two-stage IV regressions for *APPLY/DISCOURAGED* and *DEMAND*, respectively. For all four models, the sargan tests of overidentifying restrictions for the null hypothesis that the instruments are valid cannot be rejected. However, if all the instruments share a common rationale so that one invalid instrument would invalidate all the others, the Sargan statistics could be biased and inconsistent (Murray, 2006; Bascle, 2008). Therefore, we also perform the difference-in-Sargan test for the specifications on the exogeneity of individual instruments, and all the tests are passed[1]. The Cragg-Donald *F*-statistics show that for all but the within-recession pseudo credit denial model the null hypothesis that all of the instruments are weak is rejected, where the *F*-statistics exceed the critical value of 10 (Staiger and Stock, 1997; Stock and Yogo, 2005). Since the weak instrument test for the within-recession pseudo credit denial function is not passed, we undertake further analyses by running an unconditional, multinomial logit model to check the robustness of our main results (Model 3, Table 4).

"Insert Table A Here"

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Table 1

Theory predictions and empirical results for discouraged borrowers

Study	Predicted Relationship	Freel et al (2012)	Cole (2010)	Han et al. (2009)	Bonnet et al. (2009)	Chandler (2010)	Chakravarty and Xiang (2010)
Country(s)		UK	US	US	France	Canada	Brazil, China, Eritrea, Ethiopia, Honduras, India, Kenya, Pakistan, Tanzania, Uganda
Data		Federation of Small Businesses Survey	US Survey of Small Business Financing	US Survey of Small Business Financing	SINE	SME Financing Data Initiative	World Bank, Investment Climate Surveys
Years		2005	1993, 1998, 2003	1998	1997	2004	1997-2001
Firm Demographic Variables							
Firm Age	-ve	0	0/-ve	+ve	.	0	0
Firm Size	-ve	-ve	-ve	-ve	.	-ve	-ve
Firm Growth	-ve	0	.	0	.	.	-ve[2]

[2] This study uses country growth rates instead of firm growth rates.

Incorporated	-ve	+ve	.	0	.	.	.
Entrepreneur Variables							
Experience	-ve	-ve	0/+ve	0	.	0	0
Family owned	?	-ve	.	+ve	.	.	.
Women owned	-ve	0	0	0	.	.	-ve
Ethnic owned	-ve	-	+ve/0	0	.	0	.
Creditor Relationship Variables							
Length of relationship	-ve	-ve	0/-ve	-ve	-ve	0	0
Credit Card	-ve	.	-ve/0	.	.	.	.
Internet Banking	-ve	.	.	0	.	.	.
Line of Credit	+ve	.	.	.	-ve	.	.

Table 2

Variable Definition and Sample Descriptive Statistics

		(1) Discouraged (N = 82)		(2) Applicants (N = 721)		(3) Denied (N = 218)		(4) Approved (N = 503)		(1) vs. (2)	(1) vs. (3)	(1) vs. (4)	(3) vs. (4)
Variable	**Definition**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Mean**	**Mean**	**Mean**
Firm characteristics													
FAMOWN	Family-owned business (0, 1)	0.71	0.46	0.64	0.48	0.72	0.45	0.61	0.49				**
CORP	Firm incorporated (0, 1)	0.72	0.45	0.89	0.31	0.86	0.35	0.90	0.30	***	***	***	
EMP	Number of employees	14.55	28.39	38.95	48.25	30.66	43.10	42.60	49.96	***	***	***	***
AGE_11TO20	Firm between 11 and 20 years old (0, 1)	0.42	0.50	0.41	0.49	0.49	0.50	0.38	0.49				**
AGE_20UP	Firm more than 20 years old (0, 1)	0.42	0.50	0.51	0.50	0.41	0.49	0.56	0.50	*		***	***
SALE_INCREASE	Sales over the past 12 months same increased (0, 1)	0.20	0.40	0.30	0.46	0.28	0.45	0.31	0.46	**		**	
SALE_SAME	Sales over the past 12 months same as before (0, 1)	0.32	0.50	0.22	0.41	0.21	0.41	0.22	0.42	*	*	*	
SALE_DECREASE	Sales over the past 12 months same decreased (0, 1)	0.49	0.50	0.48	0.50	0.51	0.50	0.46	0.50				
PROFIT	Firm generating profit over the past 12 months (0, 1)	0.22	0.42	0.25	0.43	0.21	0.41	0.27	0.44				
INNOVATION	New product/process innovative to the market (0, 1)	0.20	0.40	0.21	0.41	0.24	0.43	0.20	0.40				
HIGH-TECH	High-tech industries defined by Butchard, 1987 (0, 1)	0.01	0.11	0.05	0.22	0.06	0.24	0.04	0.20		*		
Owner/Entrepreneur characteristics													
WLED	Women-led business (0, 1)	0.15	0.36	0.08	0.27	0.09	0.29	0.07	0.26	**	*	***	
EXP	Owner with prior experience (0, 1)	0.20	0.41	0.17	0.38	0.14	0.23	0.18	0.39		*		
UNIVERSITY	Owner with university degree (0, 1)	0.50	0.50	0.47	0.50	0.46	0.50	0.48	0.50				
AIMGROW	Owner aiming to grow business (0, 1)	0.73	0.45	0.77	0.42	0.76	0.43	0.78	0.42				
Borrower risk indicators													
SOUGHTBEFORE	Firm previously sought finance (0, 1)	0.60	0.49	0.40	0.49	0.35	0.48	0.42	0.50	***	***	***	**
IBANKING	Firm using internet banking (0, 1)	0.01	0.12	0.03	0.18	0.02	0.13	0.04	0.19				*
RELATION_0	Poor firm-bank relationship (0, 1)	0.34	0.46	0.22	0.41	0.44	0.50	0.12	0.33	*	**	***	***
RELATION_1	Firm-bank relationship neither good or poor (0, 1)	0.22	0.42	0.16	0.36	0.22	0.42	0.13	0.34	*		**	***
RELATION_2	Good firm-bank relationship (0, 1)	0.48	0.50	0.63	0.48	0.34	0.48	0.75	0.43	***	**	***	***
MISS_1	Missed overdraft/loan payment once (0, 1)	0.03	0.18	0.08	0.28	0.09	0.28	0.08	0.28	*			
MISS_2	Missed overdraft/loan payment 2-3 times (0, 1)	0.11	0.32	0.09	0.29	0.12	0.33	0.08	0.27				**
MISS_3	Missed overdraft/loan payment >3 times (0, 1)	0.20	0.41	0.10	0.29	0.15	0.36	0.07	0.26	***		***	***
NOMISS	Never missed overdraft/loan payment (0, 1)	0.65	0.48	0.73	0.44	0.64	0.48	0.77	0.42			***	***
Recessionary time indicators													
WAVE1	Dec-08 Barometer Survey firm (0, 1)	0.20	0.41	0.17	0.38	0.13	0.34	0.19	0.39		*		
WAVE2/3/4	Feb-/Apr-/Jun-09 Barometer Survey firm (0, 1)	0.01	0.12	0.43	0.50	0.49	0.50	0.41	0.49	***	***	***	**
WAVE5	Sep-09 Barometer Survey firm (0, 1)	0.28	0.45	0.14	0.35	0.16	0.37	0.14	0.34	***	**	***	
WAVE6	Dec-09 Barometer Survey firm (0, 1)	0.35	0.48	0.12	0.33	0.10	0.30	0.13	0.34	***	***	***	**
WAVE7	Feb-10 Barometer Survey firm (0, 1)	0.16	0.37	0.13	0.34	0.12	0.33	0.14	0.35				

* $p < .10$; ** $p < .05$; *** $p < .01$ for univariate comparison test (two-tail test) of difference in means.

Table 3

Conditional probit regressions: pre-recession results

	Model 1			Model 2		
	Demand	**DISCOURAGED**		**Applied**	**Denied**	
Variables	Coeff.	Coeff.	dy/dx	Coeff.	Coeff.	dy/dx
Firm characteristics						
FAMOWN	0.239***	-0.222**	-0.774%	0.220***	-0.152*	-0.293%
	(0.086)	(0.124)		(0.081)	(0.087)	
CORP	-0.047	0.052	0.214%	-0.004	0.001	0.059%
	(0.095)	(0.140)		(0.090)	(0.097)	
EMP	0.022***	-0.017***	-0.046%	0.019***	-0.014***	-0.043%
	(0.003)	(0.005)		(0.003)	(0.003)	
EMP ^{2} ('000)	-0.093***	0.064**	0.141%	-0.077***	0.062***	0.230%
	(0.018)	(0.030)		(0.017)	(0.016)	
AGE_11TO20	-0.081	-0.196	-1.730%	-0.043	0.077	0.780%
	(0.116)	(0.151)		(0.108)	(0.107)	
AGE_20UP	-0.194**	-0.273**	-2.705%	-0.134	0.035	0.701%
	(0.097)	(0.141)		(0.089)	(0.093)	
Construction	0.057	0.025	0.386%	0.049	0.201	3.528%
	(0.142)	(0.241)		(0.139)	(0.197)	
Health&Social Work	0.059	0.263	2.150%	0.054	0.170	3.098%
	(0.176)	(0.270)		(0.170)	(0.225)	
Hotels& Restaurants	0.169	-0.075	-0.046%	0.200	0.263	5.863%
	(0.172)	(0.275)		(0.166)	(0.215)	
Manufacturing	0.008	0.029	0.245%	-0.094	0.120	0.973%
	(0.170)	(0.276)		(0.162)	(0.222)	
Other Services	0.090	0.157	1.473%	0.020	0.026	0.580%
	(0.159)	(0.254)		(0.154)	(0.218)	
Real Estate	0.146	-0.023	-0.353%	0.148	0.102	2.925%
	(0.149)	(0.247)		(0.149)	(0.202)	
Transportation&	0.258	-0.117	-0.064%	0.245	0.068	3.310%
Communication	(0.167)	(0.272)		(0.161)	(0.219)	
Whole Sale/Retail	0.170	-0.372	-2.130%	0.081	0.068	1.785%
	(0.147)	(0.278)		(0.142)	(0.202)	
South East	0.255	0.039	1.203%	0.162	0.009	1.638%
	(0.168)	(0.244)		(0.153)	(0.168)	
South West	0.014	0.371	2.777%	-0.014	0.173	2.519%
	(0.165)	(0.234)		(0.155)	(0.166)	
East	0.081	-0.127	-0.646%	0.117	-0.248	-2.716%
	(0.169)	(0.285)		(0.161)	(0.195)	
East Midlands	0.332*	-0.189	-0.196%	0.482**	-0.409*	-1.822%
	(0.200)	(0.298)		(0.193)	(0.215)	
North East	-0.120	0.322	1.941%	-0.101	0.152	1.392%
	(0.158)	(0.241)		(0.149)	(0.167)	
North West	0.115	0.185	1.771%	0.218	-0.059	1.100%
	(0.167)	(0.250)		(0.162)	(0.181)	
West Midlands	0.127	-0.001	0.444%	0.136	-0.082	-0.002%
	(0.165)	(0.252)		(0.154)	(0.171)	
Yorkshire & Humber	-0.073	-0.007	-0.310%	0.011	0.074	1.243%
	(0.155)	(0.270)		(0.148)	(0.166)	
Scotland	0.159	0.059	1.003%	0.115	0.018	1.343%
	(0.168)	(0.262)		(0.157)	(0.175)	
Wales	-0.123	0.313	1.861%	-0.121	0.174	1.554%
	(0.157)	(0.242)		(0.148)	(0.167)	
Northern Ireland	-0.045	-0.307	2.424%	0.011	-0.097	-1.380%
	(0.160)	(0.340)		(0.152)	(0.188)	
Owner/Entrepreneur characteristics						
WLED	-0.256***	0.016	0.797%	0.243***	-0.105	-0.641
	(0.089)	(0.144)		(0.084)	(0.093)	
EXP	0.001	0.005	0.031%	0.004		

	(0.004)	(0.005)		(0.003)		
UNIVERSITY	0.061	-0.276**	-1.811%	0.043	-0.013	0.199%
	(0.076)	(0.118)		(0.072)	(0.078)	
Borrower risk indicators						
LENGTHRELATION	-0.001	-0.004	-0.028%	0.001	-0.013***	-0.211%
	(0.003)	(0.005)		(0.003)	(0.005)	
Region Effect		Yes			Yes	
N		2,254			1,917	
Censored N		351			13	
Wald χ^2		61.890***			81.680***	
Log likelihood		-1,042.146			-1,222.074	
χ^2 ($\rho = 0$)		18.280***			67.210***	

* $p < .10$; ** $p < .05$; *** $p < .01$. The firm owner's perception of the severity of financing problems is used as the exclusion restrictions for the regressions but coefficient estimates are not reported to be comparible with the within-recession results (the entrepreneur orientation variables are not available in this data set). Robust standard errors reported in the parentheses. The base category for sector dummies is Agriculture and for region dummies London.

Table 4

Within-recession regression results

	Model 1 (Probit with selection)			Model 2 (Probit with selection)			Model 3 (mLogit, Base = DISCOURAGED)	
	Prob(DEMAND)	**Prob(APPLY|DEMAND)**		**Prob(APPLY)**	**Prob(DENIED|APPLY)**		**APPROVED**	**DENIED**
Variables	Coeff.	Coeff.	dy/dx	Coeff.	Coeff.	dy/dx	Coeff.	Coeff.
Firm characteristics								
FAMOWN	0.137**	-0.149	-1.136%	-0.067	0.137	4.284%	-0.229	0.160
	(0.058)	(0.112)		(0.179)	(0.127)		(0.338)	(0.360)
CORP	0.030	0.377***	7.942%	0.454**	0.028	0.904%	0.866**	0.857**
	(0.080)	(0.130)		(0.214)	(0.175)		(0.392)	(0.414)
EMP	0.003***	0.005**	0.141%	0.020***	-0.002	-0.141%	0.021***	0.016**
	(0.001)	(0.002)		(0.006)	(0.001)		(0.006)	(0.006)
AGE_11TO20	0.042	0.283	6.991%	0.347	-0.098	-4.710%	0.903*	0.609
	(0.101)	(0.173)		(0.262)	(0.201)		(0.489)	(0.496)
AGE_20UP	-0.096	0.302*	5.560%	0.337	-0.353*	-12.206%	0.920*	0.208
	(0.101)	(0.180)		(0.270)	(0.204)		(0.511)	(0.521)
SALE_DECREASE	0.029	-0.059	-0.693%	0.094	-0.182	-5.066%	0.012	-0.304
	(0.064)	(0.141)		(0.215)	(0.132)		(0.391)	(0.408)
SALE_SAME	-0.110	-0.228	-6.457%	-0.227	-0.076	-1.324%	-0.578	-0.707
	(0.072)	(0.157)		(0.238)	(0.155)		(0.425)	(0.450)
PROFIT	-0.003	0.294*	5.823%	0.490**	-0.147	-6.181%	1.159***	0.747*
	(0.096)	(0.158)		(0.228)	(0.204)		(0.430)	(0.454)
INNVOATION	0.088	-0.111	-1.044%	-0.079	0.044	1.599%	-0.247	-0.142
	(0.066)	(0.139)		(0.195)	(0.131)		(0.366)	(0.377)
HIGH-TECH	-0.091	0.620	11.150%	0.829	0.099	0.270%	1.578	1.695
	(0.130)	(0.493)		(0.647)	(0.249)		(1.175)	(1.173)
Metals	-0.198*			0.111	0.417*	11.324%	0.216	0.945
Manufacturing	(0.117)			(0.419)	(0.251)		(0.796)	(0.861)
Other	-0.285**			-0.521	0.264	9.080%	-0.930	-0.378
Manufacturing	(0.123)			(0.397)	(0.275)		(0.743)	(0.819)
Construction	-0.252**			-0.397	0.484*	15.281%	-0.881	0.166
	(0.113)			(0.371)	(0.248)		(0.702)	(0.771)
Retail & Wholesale	-0.012			0.267	0.188	4.301%	0.450	0.760
	(0.138)			(0.474)	(0.295)		(0.900)	(0.960)
Transport &	-0.265**			-0.407	0.171	5.897%	-0.734	-0.292
Communication	(0.119)			(0.383)	(0.262)		(0.723)	(0.800)
Business Services	-0.413**			-0.501	-0.140	-1.844%	-0.932	-0.975
	(0.164)			(0.559)	(0.421)		(1.008)	(1.182)
Other Services	-0.196			-0.119	0.270	7.648%	-0.149	0.411
	(0.153)			(0.551)	(0.339)		(1.073)	(1.138)
East	0.125	0.188	3.917%	0.207	-0.018	-1.115%	0.446	0.404
	(0.121)	(0.242)		(0.374)	(0.251)		(0.736)	(0.756)
London	-0.012	-0.343	-8.393%	-0.633*	0.416	16.007%	-1.326*	-0.524
	(0.132)	(0.232)		(0.371)	(0.282)		(0.706)	(0.719)
North East	0.182	-0.038	-1.357%	0.030	0.315	9.547%	0.003	0.483
	(0.149)	(0.320)		(0.467)	(0.296)		(0.890)	(0.910)
North West	0.063	0.110	2.466%	0.230	0.008	-0.442%	0.423	0.342
	(0.123)	(0.267)		(0.402)	(0.261)		(0.770)	(0.799)
South East	0.149	-0.206	-2.115%	-0.227	-0.061	-0.934%	-0.171	-0.317
	(0.122)	(0.227)		(0.352)	(0.253)		(0.674)	(0.702)
South West	0.131	-0.367	-6.197%	-0.432	0.023	2.417%	-0.597	-0.541
	(0.120)	(0.236)		(0.355)	(0.244)		(0.682)	(0.712)
West Midlands	0.015	-0.171	-3.349%	-0.340	-0.309	-7.123%	-0.393	-1.055
	(0.146)	(0.250)		(0.416)	(0.332)		(0.773)	(0.851)
York & Humber	0.199	-0.051	-1.320%	-0.211	0.112	4.110%	-0.125	-0.064
	(0.137)	(0.287)		(0.419)	(0.275)		(0.789)	(0.817)
Wales	0.090	-0.120	-1.142%	-0.157	0.083	3.007%	-0.153	-0.011
	(0.122)	(0.216)		(0.379)	(0.253)		(0.742)	(0.764)
Scotland	0.102	-0.444	-8.884%	-0.272	-0.083	-1.374%	-0.305	-0.481
	(0.162)	(0.279)		(0.424)	(0.342)		(0.796)	(0.866)
Owner/Entrepreneur characteristics								
WLED	-0.101	0.104	0.727%	0.028	-0.003	-0.209%	0.008	0.036
	(0.090)	(0.165)		(0.249)	(0.193)		(0.454)	(0.479)
EXP	-0.171	-1.147**	-25.207%	-1.852**			-3.620*	-2.986
	(0.201)	(0.530)		(0.786)			(1.976)	(2.034)
UNIVERSITY	0.086	-0.335***	-5.539%	-0.345**	0.034	2.314%	-0.689**	-0.562*
	(0.055)	(0.116)		(0.172)	(0.114)		(0.322)	(0.338)
AIMGROW	0.239***			0.193			0.286	0.121
	(0.057)			(0.187)			(0.353)	(0.373)
Borrower risk indicators								
SOUGHTBEFORE	-0.521***							
	(0.051)							
IBANKING	0.200	-0.205	-1.401%	-0.158	-0.643*	-18.266%	-0.054	-1.036
	(0.157)	(0.486)		(0.634)	(0.379)		(1.152)	(1.276)
RELATIO_1	-0.465***	0.362**	1.460%	-0.055	-0.423***	-15.756%	0.332	-0.353
	(0.091)	(0.153)		(0.223)	(0.161)		(0.425)	(0.421)
RELATIO_2	-0.609***	0.543***	3.134%	0.229	-1.104***	-38.655%	1.249***	-0.702*

	(0.075)	(0.131)		(0.195)	(0.141)		(0.365)	(0.371)
MISS_1	0.591***	0.167	6.858%					
	(0.116)	(0.316)						
MISS_2	0.510***	-0.390**	-1.236%					
	(0.108)	(0.197)						
MISS_3	0.795***	-0.779***	-6.297%	-0.626***	0.230	9.167%	-1.263***	-0.723
	(0.111)	(0.170)		(0.230)	(0.177)		(0.439)	(0.440)
Recessionary time indicators								
WAVE2/3/4	-0.289***	1.981***	21.869%	2.417***	0.259	0.203%	4.458***	4.601***
	(0.104)	(0.431)		(0.539)	(0.227)		(1.130)	(1.143)
WAVE5	-0.085	-0.139	-7.185%	-0.341	0.296	11.862%	-0.931**	-0.238
	(0.094)	(0.173)		(0.234)	(0.196)		(0.452)	(0.481)
WAVE6	-0.160	0.003	-3.797%	-0.157	-0.214	-4.886%	-0.220	-0.482
	(0.117)	(0.194)		(0.278)	(0.249)		(0.516)	(0.561)
WAVE7	0.007	1.214**	22.308%	1.880**	-0.137	-10.297%	3.865*	2.911
	(0.228)	(0.534)		(0.814)	(0.245)		(2.007)	(2.080)
N		3089			803		803	
Censored N		2286			82		-	
Wald χ^2		122.60***			120.31***		337.13***	
Log likelihood		-1,738.634			-535.301		-538.058	
χ^2 ($\rho = 0$)		14.27***			2.80*		-	

* $p < .10$; ** $p < .05$; *** $p < .01$. Robust standard errors reported in the parentheses. The base category for sector dummies is Agriculture and for region dummies East Midlands.

Table A

Pseudo-two-stage IV Regression Model Diagnostics

	Pre-recession		Within-recession	
	DISCOURAGED	*DENIED*	*APPLY*	*DENIED*
Sargan χ^2 (p-value)	1.563 (0.211)	2.408 (0.121)	11.796 (0.161)	1.648 (0.949)
Cragg-Donald F-statistics	44.488	32.946	14.511	3.285

Alternative Specifications with REGION as identifying restrictions for Table 4:

	Prob(DEMAND)	**Prob(APPLY|DEMAND)**	**Prob(APPLY)**	**Prob(DENIED|APPLY)**
Variables	Coeff.	Coeff.	Coeff.	Coeff.
Firm characteristics				
FAMOWN	0.134**	-0.153	-0.156	0.101
	(0.058)	(0.117)	(0.178)	(0.124)
CORP	0.024	0.302**	0.561***	0.069
	(0.080)	(0.134)	(0.212)	(0.174)
EMP	0.003***	0.006**	0.009***	-0.002
	(0.001)	(0.002)	(0.003)	(0.001)
AGE_11TO20	0.040	0.190	0.350	-0.087
	(0.101)	(0.171)	(0.261)	(0.205)
AGE_20UP	-0.096	0.226	0.359	-0.357*
	(0.101)	(0.180)	(0.268)	(0.210)
SALE_DECREASE	0.032	-0.112	0.074	-0.165
	(0.064)	(0.146)	(0.222)	(0.132)
SALE_SAME	-0.109	-0.228	-0.242	-0.057
	(0.072)	(0.158)	(0.245)	(0.157)
PROFIT	-0.006	0.371**	0.463**	-0.092
	(0.096)	(0.164)	(0.231)	(0.203)
Metals Manufacturing	-0.218*	0.187	0.196	0.423*
	(0.119)	(0.318)	(0.413)	(0.243)
Other Manufacturing	-0.252**	-0.290	-0.462	0.200
	(0.127)	(0.304)	(0.397)	(0.272)
Construction	-0.225*	-0.238	-0.313	0.487**
	(0.117)	(0.288)	(0.373)	(0.245)
Retail & Wholesale	-0.036	0.085	0.327	0.199
	(0.143)	(0.359)	(0.470)	(0.289)
Transport & Communication	-0.252**	-0.206	-0.284	0.181
	(0.122)	(0.295)	(0.378)	(0.255)
Business Services	-0.383**	-0.320	-0.444	-0.119
	(0.170)	(0.374)	(0.563)	(0.420)
Other Services	-0.219	0.271	-0.005	0.284
	(0.162)	(0.397)	(0.551)	(0.337)
INNOVATION	0.082	-0.140	-0.075	0.038
	(0.066)	(0.141)	(0.193)	(0.129)
East	0.128		0.184	
	(0.117)		(0.366)	
London	-0.073		-0.746**	
	(0.128)		(0.371)	
North East	0.167		-0.081	
	(0.144)		(0.474)	
North West	0.070		0.141	
	(0.119)		(0.388)	
South East	0.128		-0.217	
	(0.117)		(0.343)	
South West	0.090		-0.476	
	(0.117)		(0.347)	
West Midlands	0.009		-0.309	
	(0.141)		(0.400)	
York & Humber	0.197		-0.263	
	(0.132)		(0.410)	
Wales	0.069		-0.131	
	(0.117)		(0.372)	
Scotland	0.041		-0.232	
	(0.159)		(0.414)	
Owner/Entrepreneur characteristics				
WLED	-0.100	0.110	0.022	0.019
	(0.090)	(0.157)	(0.247)	(0.191)
EXP	-0.169	-0.908*	-1.941**	0.284
	(0.200)	(0.498)	(0.788)	(0.436)
UNIVERSITY	0.086	-0.323***	-0.345**	0.044
	(0.055)	(0.124)	(0.170)	(0.113)
AIMGROW	0.248***	-0.038	0.165	-0.095
	(0.061)	(0.128)	(0.188)	(0.133)
Borrower risk indicators				
SOUGHTBEFORE	-0.524***	0.004		
	(0.053)	(0.108)		
IBANKING	0.197	-0.239	-0.242	-0.644*
	(0.157)	(0.465)	(0.607)	(0.366)
RELATIO_1	-0.477***	0.313**	-0.074	-0.383**
	(0.091)	(0.147)	(0.226)	(0.160)
RELATIO_2	-0.617***	0.491***	0.181	-1.084***
	(0.075)	(0.129)	(0.198)	(0.143)
MISS_1	0.590***	0.213	0.546	0.126
	(0.116)	(0.325)	(0.397)	(0.200)
MISS_2	0.502***	-0.364*	0.011	0.126

	(0.108)	(0.198)	(0.275)	(0.180)
MISS_3	0.775***	-0.764***	-0.573**	0.244
	(0.111)	(0.179)	(0.231)	(0.176)
Recessionary time indicators				
WAVE2/3/4	-0.294***	1.918***	2.394***	0.290
	(0.104)	(0.392)	(0.551)	(0.227)
WAVE5	-0.088	-0.155	-0.373	0.257
	(0.093)	(0.168)	(0.232)	(0.192)
WAVE6	-0.165	0.054	-0.163	-0.168
	(0.118)	(0.200)	(0.273)	(0.243)
WAVE7	-0.007	1.072**	1.953**	-0.385
	(0.227)	(0.506)	(0.830)	(0.507)
N		3089		803
Censored N		2286		82
Wald χ^2		114.42***		114.91***
Log likelihood		-1,740.231		-541.255
χ^2 ($\rho = 0$)		5.17**		3.15*