

SMEs, banks and the spatial differentiation of access to finance

Abstract:

By utilizing the SME Finance Monitor and a unique dataset on the geographical location of all bank branches in the UK, this paper examines the relevance of spatial differentiation on SMEs' access to bank finance during the period of economic weakness following the 2007 financial crisis. We find evidence suggesting the presence of a regional-specific effect on SMEs' access to bank finance. Our findings show that greater functional distance between bank headquarters and branches exacerbates the credit constraints faced by local SMEs although the impact of a smaller operational distance between branches and local SMEs is inconclusive, *ceteris paribus*. Our finding holds over a battery of robustness tests.

Keywords: financial crisis, credit supply, small business financing, bank organization

JEL-codes: G21, G32, G290, L140

1. Introduction

Despite the contesting views of some scholars (Storey, 1994; Vos et al., 2007), the predominant empirical evidence within the small business literature suggests that asymmetric information, agency problems and increased uncertainty have made access to external finance from institutions more problematic for small and medium-sized enterprises (SMEs) than larger firms (Pollard, 2003; Beck and Demirguc-Kunt, 2006). In particular, limited capital market financing and a heavy reliance on bank lending have made SMEs vulnerable to banking system dynamics, with constrained access to lending arising in times of financial stress (OECD, 2015). This difficulty in obtaining bank finance has resulted in the creation of a ‘funding gap’ that can impose barriers on the growth of SMEs (Bell and Young, 2010; Fraser et al., 2015). Various studies have shown that one of the principal effects of the 2008-10 global financial crisis was a reduction in the availability of bank debt to SMEs and an increase in costs for both loans and overdrafts (Fraser, 2012; Popov and Udell, 2012; BIS, 2013a; Lee et al., 2015). The negative impact of this brake on lending to SMEs appears to have persisted and despite government efforts implemented in the post-financial crisis period, the average net monthly flow of lending to SMEs remained negative by the beginning of 2014 (Bank of England, 2014). Whilst the bank credit constraints faced by SMEs has received greater attention in the aftermath of the global financial crisis (Harrison and Baldock, 2015), little is known as to whether these are geographically homogeneous or heterogeneous (Sokol, 2013). In particular, more research is needed on the important question of which types of finance are unevenly available geographically, particularly in the context of the UK where the potential creation of regional banks has become a political issue (Lee and Drever, 2014).

Theoretical and empirical evidence on the relevance of geography for SMEs’ access to bank finance appears to be mixed (Klagge and Martin, 2005; Pollard, 2003). For example, theories advocating the extraordinary geographical mobility and fungibility of money and its ability to seek out lending opportunities predict little relevance for place in SMEs’ access to bank credit (Gertler, 1984). The replacement of unit banking with a branch banking system and the wide utilization of technology-based mechanic underwriting techniques in the provision of bank credit have compounded this issue. The branch banking system enables investment in any given location to be independent of local savings with the result that local demand for bank credit can access funds from anywhere in the national system (Dow, 1987; Petersen and Rajan, 2000). Moreover, the adoption of statistical techniques in underwriting

bank credit reduces the costs associated with information gathering and processing for the risk evaluation of loan applicants (Berger and Udell, 2007). Therefore, the need for a local or regional presence to improve the informational efficiency of banking transactions is diminishing (Chakravarty, 2006) and fewer national banks are able to offer standardized products in many different locations at the same time without suffering competitive disadvantage in SME lending (Alessandrini et al., 2009a). This means that the viability of a business, rather than the physical proximity of a bank to the firm, may be the key factor determining access to bank credit (Klagge and Martin, 2005).

The counter-argument to this line of reasoning points to the fundamental role of distance for banks to engage in social interaction with SMEs in handling the problems of asymmetric information, agency and uncertainty in relation to lending (Dow and Rodrigues-Fuentes, 1997). Financial knowledge, practices and networks for SMEs are typically socially situated, relational and often soft in their very nature (Berger and Udell, 2002; Pollard, 2007) and, in contrast to hard information, cannot be easily stored, transmitted over long distances or be easily verified by anyone else other than the person who produces it (Udell, 2009). Two types of “closeness” are hypothesized to be important for delineating the financial space of SMEs, namely (a) the proximity between bank branches and borrowers (operational distance) and (b) the proximity between the bank’s headquarters and its branches (functional distance) (Alessandrini et al., 2009a, 2009b; Alessandrini et al., 2010). While the importance of operational distance depends on the reduction of the principal-agent problem between local branch officers and SMEs, that of functional distance is based on the mitigation of the principal-agent problem between local branch officers and senior bank officials within the bank’s organization. While it is indisputable that the development of information technology reduces the cost of processing information, it would not change the nature of soft information on borrowers or make its collection and collaboration easier at a distance. The branch banking system is inherently spatial on both dimensions of closeness and the branching infrastructure and SMEs located in different locations with similar characteristics will face different bank finance premiums, bank credit rationing thresholds and bank lending standards (Zazzaro, 1997; Dow and Rodrigues-Fuentes, 1997). If the severity of the principal-agent problem involved in lending is an increased function of distance between banks and SMEs, the credit allocated by banks would be biased towards SMEs in those regions with a higher density of branches and a closer proximity to where the headquarters of banks are located (Klagge and Martin, 2005). It is also expected that the impact of the closer proximity to

banks' headquarters would be more pronounced at times of financial crisis. For example, De Haas and Van Horen (2013) show that multi-market banks withdraw less from markets that are relatively close geographically or in terms of lending relationship. Indeed, if the closeness bears important implications for the intrinsic capacity of banks in handling principal-agent problems in lending, the prioritization toward markets which are closer would be an effective way to overcome increased information asymmetries and uncertainty at times of crises (Cetorelli and Goldberg, 2012). Moreover, as the intrinsic capacity of banks in handling principal-agent problems has direct implications for the sustainability of the bank-borrower relationship, such prioritization would also reflect banks' effort to minimize the negative impact of deleveraging via preserving the franchise value of future business in core markets.

In this paper, we hypothesise that geographical location mattered for SMEs in accessing bank finance during the period following the financial crisis of 2007 and that the relevance of geographical location is attributable to the difference in operational distance and functional distance of the banking system across geographical space. We empirically test for our hypotheses with respect to the British branch banking system by using data from the SME Finance Monitor, a quarterly survey of SMEs located in the UK over Q4 2011-Q1 2014. Our definition of the constraints faced by SMEs in accessing bank finance includes both "type I rationing" - where applicants have a similar credit quality and some or all of the applicants receive a smaller loan than they request at the interest rate quoted by the bank - and "type II rationing" - where within a group of observationally indistinguishable applicants, some obtain credit while others do not (and will not receive credit even if they are willing to pay a higher interest rate). This definition closely corresponds to the presence of a 'funding gap' for SMEs arising from the failure of possible mechanism to bring about equilibrium in the market (Stiglitz and Weiss, 1981; Storey, 1994). If the variation of bank credit constraints faced by SMEs across geographical locations is purely random then, on average, SMEs should have the same probability of experiencing bank credit constraints regardless of where they are located.

A large proportion of SMEs have always been reliant on the domestic banking system for debt funding despite the common assertion that the UK financial system is market-led¹. Traditionally, the underwriting of bank credit towards SMEs had been based on personal contacts and the development of local knowledge through extensive regional branch

¹ For example, BMG research showed that 86% of all SMEs seeking finance sought bank loans, overdrafts or mortgages (BMG Research, 2013) whilst the BIS Small Business Survey indicated that most SME employers seek debt finance (BIS, 2012a).

networks. Driven by the inter-related process of deregulation, technological innovation, and consolidation, branches have changed into retail outlets for centrally branded, designed and controlled products over the last two decades. Discretionary authority regarding business lending has been removed from local branch officers and replaced by a centralization of underwriting via some form of credit scoring (Marthon, 2014). As a result, the importance of the tacit knowledge of branch officers on the local market for underwriting and originating business lending is diminishing. Lending decisions have been shifted to the centralised and distant management of banking organisations (Pratt, 1998; French et al., 2008). While it can be claimed that these changes are a natural outcome of competition between financial institutions, the concern over the potential negative impact on the access to bank finance for SMEs located in peripheral areas remains widespread (Pratt, 1998; Sidaway and Pryke, 2000; Dow and Montagnoli, 2007). This issue has been highlighted even further by the publication of data by the British Bankers Association (BBA) in 2013 which, for the first time, disclosed information on spatial dispersion of SME lending across Britain's postcode areas.

Our research contributes to recent empirical evidence on the presence of differentiation in the likelihood of obtaining a loan/overdraft facility across standard economic regions in the UK in the period after 2008 (Armstrong et al., 2013; Fraser et al., 2013). As far as we are aware, this paper is the first empirical test for the impact of the characteristics of a local credit market where SMEs are located, encompassing the direct measurements of two dimensions of closeness on SMEs' access to bank finance in the UK context. The investigations by Lee and Drever (2014) and Lee and Brown (2016) on the impact of geographical variation in the supply of bank finance in the UK are based on the same theoretical framework regarding the functionality of the local credit market. However, the classification of a peripheral area by Lee and Drever (2014) is based on a composited poverty index while that for Lee and Brown (2016) is derived from a multimodal accessibility index. In essence, the former is a measurement of deprivation while the latter is a measurement of the ease of access to the geographical place via different kinds of transport. While the study of the impact of geographical dichotomy in terms of deprivation and accessibility are interesting in their own right, the hypotheses related to the "closeness" of local credit market has not been tested in either of those two papers.

To preview our empirical results, we find evidence suggesting that the geographical location where an SME is located matters for the likelihood that it will experience bank credit constraints. The variation across the credit markets in different economic regions in terms of both operational distance and functional distance seems to play a role regarding the relevance

of the effect of geographical location. In particular, our findings show that greater functional distance increased financing constraints while smaller operational distance did not always enhance credit availability, *ceteris paribus*. Our findings hold over a battery of robustness tests.

The rest of the paper is structured as follows. We review the relevant literature in section 2, present the datasets in section 3, show the specification of our empirical model in section 4 and describe the construction of variables in section 5. The empirical results and the robustness tests are presented in section 6 whilst we conclude in section 7.

2. Literature review

Research has shown that banks are specialised in overcoming informational problems and other frictions in credit markets (Freixas and Rochet, 2008). Since a crucial part of information about SMEs is soft and socially embedded, they tend to be substantially dependent on bank credit as the source of external finance (Degryse et al., 2015). In a perfect geographical integrated credit market, an agent should be able to obtain the amount of credit requested, at a certain cost, irrespective of location (Alessandrini et al., 2003). Yet the empirical literature in regional finance documents strong evidence that retail banking markets are local in nature (Degryse and Ongena, 2005; Cohen and Mazzeo, 2007; Brevoort and Wolken, 2009). Banks operating at a local or regional level are the main channel through which the financial needs of SMEs are met. Moreover, the geographical segmentation of the credit market for SMEs is not only a unique feature for unit banking but is also relevant for branch banking systems (Dow and Rodrigues-Fuentes, 1997). The branch banking system reduces the sensitivity of the regional availability of credit to the regional-deposit base. It also alters the main component of the inter-regional capital flows from inter-bank flows between the local financial institutions and the national market to ones between bank branches and their headquarters. However, this by no means suggests a perfectly elastic regional supply of funds (Dow and Rodrigues-Fuentes, 1997).

The importance of physical proximity for facilitating social interaction and mitigating information costs in financial services to SMEs have been well documented in economic literature (Brevoort and Wolken, 2009). The close physical distance between the branch loan officer and local businesses enables the transfer of a high level of private information and the promotion of distinctive governance mechanisms through embedded relational ties, allowing integrative solutions to the financing problems of SMEs that are beyond those available through market means (Uzzi, 1999). The physical presence of bank

branches in the vicinity of SMEs enables loan officers to collect soft information about their borrowers at a lower cost (Brevoort and Wolken, 2009); facilitates loan officers to use their knowledge of the local community and personal characteristics of entrepreneurs to better evaluate managerial skills, integrity, and strategic decision making (Udell, 2009); eases agency problems via stepping up on-site monitoring and relationship building (Pirinsky and Wang, 2010); increases the utilisation of non-price terms and conditions to firewall the emergence of default risk (Prilmeier, 2011); and allows the use of various non-contractual levers to enforce contracts (Rajan and Zingales, 2003). However, closer operational proximity could also result in negative consequences for SMEs, such as additional market power for the lending bank to charge higher interest rates to closer borrowers (Alessandrini et al., 2009b). It may also trigger a “winner’s curse” phenomena (Hoff and Stiglitz, 1997). In the presence of information asymmetries and opaqueness in screening criteria, each bank would take account of the fact that the probability of the same application being correctly rejected by its competitors increases with the growth in the number of lenders within a local “information market” (Broecker, 1990; Shaffer, 1998). Therefore, the available lenders as a group might be more conservative towards the provision of credit in order to reduce the likelihood of making loans to borrowers who have been rejected by lenders with superior information (Broecker, 1990; Shaffer, 1998).

The functionality of a local physical presence in smoothly channelling credit to SMEs is subject to within-bank information and agency cost. The presence of informational diseconomies of scale makes it difficult to transmit soft information to others over long distances or within large and complex banking organizations (Williamson, 1988; Stein 2002). Actors typically share private knowledge with those they trust to accept it at face value and guard it from misuse (Uzzi and Lancaster, 2003). Closer physical proximity between bank branches (where the soft information could be gathered) and the headquarters of branches (where the centre of decision-making on funds resides) could result in higher level of shared value and relational capital, strengthening trust, improving the quality of the communication of soft information between local branch officers and officials at headquarters and potentially leading to an easier review of loan activities of local branch officers. This closeness could also enable branch loan officers to leverage aspects of their social capital to influence the expectations of decision-makers within the bank regarding a firm’s creditworthiness (Uzzi and Lancaster, 2003) and improving the capacity of senior officials to properly act on soft information in the provision of credit to SMEs (Liberti, 2004; Degryse et al., 2009; Alessandrini et al., 2010). As a result, branch officers that are located closer to the

headquarters are more likely to invest in gathering and supplying soft information in relation to SME lending (Canales and Nanda, 2012; Agarwal and Hauswald, 2010).

Technological changes have allowed banks to interact with customers more efficiently and to more accurately measure and manage risk. However, the extent to which technological changes have altered the value of proximity for mitigating the principal-agent problem in SMEs lending has been controversial. The use of credit scoring in the underwriting process quantifies subjective assessment and also hardens objective assessment for the credit risk analysis. Each credit score is present as a statistic of the bank's credit screening, summarizing both publicly available hard information and the proprietary soft information. The hardening of soft information in credit scoring does not fundamentally make the collection of, and the collaboration on, soft information easier at a distance (Petersen, 2004). Using a unique data set of all loan applications by small firms to a large bank in the USA, Agarwal and Hauswald (2010) show that the impact of the soft information component (extracted from the internal credit score) on the likelihood of obtaining a loan decreases with the increase in firm-bank distance. Therefore, proximity seems to be important for the reliability of soft information production. The empirical evidence regarding the change in the bank-borrower distance in small business lending markets (under the backdrop of the development of information technology) appears to be mixed. Whilst Petersen and Rajan (2000) suggest that physical proximity is becoming a less important factor, Brevoort and Hannan (2006) report that the increase in distance between banks and SMEs affects a small proportion of bank-borrower relationships. In fact, the observation of the increase in the distance between banks and borrowers might indicate only a trend towards a geographical extension of the field of action of bank branches rather than the presence of single national retail market and the disappearance of local or regional credit markets (Alessandrini, et al., 2003).

In terms of the selective deleveraging of bank lending across markets in reaction to an external negative shock, empirical analysis indicates that multi-market banks are more likely to buffet those markets where they do not have effective mechanisms in place to deal with informational asymmetry and uncertainty ex ante. In contrast, they will withdraw less from markets that are relatively close in a geographic sense (De Haas and Van Horen, 2013). Performing more intensive screening and monitoring becomes increasingly necessary in the operational environment characterised by higher degree of uncertainty. Prioritizing lending to the markets where the bank has a stronger intrinsic capacity in handling principal-agent problems would achieve a better trade-off between the cost and the quality of information production (Ruckes, 2004). While it is plausible to argue the impact of informational

advantage and familiarity considerations (such as those based on physical proximity or social affinity) on the allocation of credit would be quite stable over time, its relevance may increase given the higher levels of risk awareness and effective risk aversion banks develop in the aftermath of the financial crisis (Giannetti and Laeven, 2012).

3. Data

The main data source for this paper is taken from the SME Finance Monitor. This is a quarterly survey that, since 2011, has questioned 5,000 different SMEs quarterly about their borrowing events in the past 12 months as well as their future borrowing intentions. More than 65,000 interviews have now been conducted, building into a considerable dataset on the past and future finance needs of SMEs in the UK. The data has been used by banks, government, the Bank of England, and industry bodies to inform the debate on key issues regarding SMEs' access to finance in the post-financial crisis. In order to qualify for an interview, SMEs had to meet the following criteria: 1) not 50%+ owned by another company; 2) not run as a social enterprise or as a not-for-profit organisation; and 3) having a turnover of less than £25m. Overall quotas were set by size of business (as measured by the number of employees), sector and the twelve economic regions across the UK. In order to ensure a balanced sample, the overall region and sector quotas were then allocated within each employee size band to ensure that SMEs of all sizes were interviewed in each sector and region. The interview respondent was the person identified as the main financial decision-maker at the business. The results were weighted to be representative of SMEs with up to 250 employees in each of twelve UK standard economic regions. This paper will examine the data from Q4 2011-Q1 2014 (i.e. the 3rd to the 12nd wave). The SME Finance Monitor contains information of two types of spatial unit namely economic region and postcode area. In our econometric analysis, we choose UK economic region (i.e. NUTS 1) as the definition of the geographical location. This choice is dictated by the way the SME Finance Monitor sets the quotas by sector and region which means that any examination at a much more disaggregated spatial level, although appealing, will come at the cost of the robustness of analysis resulting from a carefully constructed sample design². We exclude Northern Ireland due to the lack of

² The weighting regime of SME Finance Monitor ensures each SME is assigned a probability sampling weight corresponding to its representativeness in the population, which is SMEs in each size category in each sector in each standard economic region rather than SMEs in each postcode area. Sampling weights of the survey (the inverse probabilities of selection for each observation) allow us to reconfigure the sample *as if it was a simple random draw* of the *total population*, make the analysis sample representative of the target population and hence yield accurate population estimates for the main parameters of interest (Solon et al., 2015). Omitting weights

available indicators for operational distance and functional distance. We also exclude the missing values and use sampling weights in our analysis.

4. The specification of empirical model

The modelling basis is the probit model which evaluates the contribution of explanatory variables to the probability of being credit constrained¹. The probit model assumes that while we only observe the presence of a particular state (i.e. the values of the state variable y taking value of 1 for the presence of credit constraints and 0 otherwise), there is a latent, unobserved continuous variable y^* that determines the value of y . Probit model analytically represents the binomial probabilities $Pr(y = 1)$ and $Pr(y = 0)$ in terms of the standard cumulative normal distribution function $\Phi(\bullet)$ as follows:

$$Pr(y = 1|Z) = Pr(y^* \geq 0) = \Phi(Z'\beta)$$

where Z is the vector of explanatory variables that generates y^* and β is the vector of response parameters of Z .

Using maximum likelihood techniques, we can compute estimates of the coefficients (β s) and their corresponding standard errors that are asymptotically efficient. However, these coefficients give the impact of the explanatory variables on the latent variable y^* . The marginal effect of the explanatory variables on the probabilities of the occurrence of $y=1$ can be derived via the transformation from the coefficient to a probability.

derived from the survey design from the analysis results in biased point estimates and leads to inconsistent standard errors (Gelman, 2007a; Gelman, 2007b). In a design-based perspective (DB), weighted estimates are both design consistent and can provide robustness to model misspecification (Gelman, 2007b).

¹ It could be argued that the linear probability model (LPM) would be an alternative to the probit model but several disadvantages are associated with LPM, including the unboundedness problem (LPM would create probabilities of greater than one or smaller than zero.), the conditional heteroskedasticity (the variance of error term depends on the values of independent variables and the estimated coefficients on the independent variable, and therefore LPM is heteroskedastic by construction.), non-normal errors (the errors can only take on two values, and cannot be normally distributed causing problems for hypothesis testing.) and the constant marginal impact of an independent variable (LPM does not allow for the possibility that marginal impact of an independent variable would exhibit diminishing impact on the probabilities of the value of the dependent variable). Therefore, the probit regression, a non-linear estimation technique, is a more suitable approach to deal with binary dependent variables. Horace and Oaxaca (2006) show that the LPM will usually generate biased and inconsistent estimates. Giles (2012) conclude that one should use probit or logit to estimate a binary dependent variable model unless there are endogenous dummies as independent variables or with panel data. The preference toward non-linear probit over LPM is not free of opponents. Angrist and Pischke (2009) argue that LPM could give a good approximation for non-linear Conditional Expectation Function (CEF) and given the lack of knowledge ex-ante regarding the data generation process, using a linear LPM would be a better choice since it is more transparent.

We hypothesise that the geographical place where SMEs are located will affect the bank credit constraints faced by SMEs. We specify the latent representation of our empirical model:

$$y_{ir}^* = \alpha + \alpha_1' region_{ir} + \alpha_2' CONTROL_i + \alpha_q' WAVE_t + \varepsilon_i \quad (1)$$

where y_{ir} indicates the experience of SME i , in region r over the past 12 months in the access to bank credit $region_{ir}$ is a vector of dummies indicating the physical location of SME i . $CONTROL_i$ is a vector of firm-specific characteristics encompassing variables that hypothetically influence SME i 's demand for and its access to bank finance. $WAVE_t$ is a vectors of dummies denoting the sequence number of the survey. ε_i is an idiosyncratic normally distributed error term.

We further hypothesise that the impact of physical location on bank credit constraints faced by SMEs is attributable to the operational distance and the functional distance of the local credit market in the vicinity of SMEs. We specify the latent representation of our empirical model:

$$y_{ir}^* = \alpha + \alpha_{op} OPDIS_{ir} + \alpha_{fun} FUNDIS_{ir} + \alpha_2' CONTROL_i + \alpha_q' WAVE_t + \varepsilon_i \quad (2)$$

In equation (2) we replace $region_{ir}$ in equation (1) with region-specific indicators for operational proximity (i.e. $OPDIS_{ir}$) and region-specific functional distance (i.e. $FUNDIS_{ir}$). All other variables remain the same as equation (1).

5. Variables

5.1. Dependent variable

Bank credit constrained SMEs are grouped as those that have applied for a bank credit facility over the past 12 months (i.e. either applied for a new facility or gone through an annual review process for an existing facility with a bank) and the bank's initial response to the application was either turning it down or offering a smaller amount of facility than applied. While the outcome of being turned down embodies Type II credit rationing, the outcome of being offered a smaller amount than requested embodies Type I credit rationing

(Matthews and Thompson, 2008). Our measurement of bank credit constraints for SMEs therefore captures both types of credit rationing. The SME Finance Monitor surveys the experience of respondents in the application for bank overdraft and bank loan/commercial mortgage separately. Accordingly, we specify two different dependent variables in both equations (1) and (2): one is overdraft constraints (*overconstraint*) and the other is bank loan constraints² (*loanconstraint*).

5.2. Independent variables

5.2.1. Main explanatory variables of interest

Our main variable of interest in equation (1) is $region_{it}$ i.e. we utilize the information in the survey regarding the economic region in which each firm operates. The estimated probabilities of the occurrence of bank credit constraints associated with $region_{it}$ allow us to compare how access to bank finance varies across the various regions. Our main variables of interest in equation (2) are $OPDIS_{it}$ and $FUNDIS_{it}$ which are region-specific variables. The former is used as an inverse measurement for the operational distance between SMEs and bank branches in each economic region. The latter is used to denote the functional distance between the branches of banks that are located in the same economic region as the SME and the headquarters of branches. Our strategy to construct $OPDIS_{it}$ and $FUNDIS_{it}$ is as follows. The choice of the 160 banks included in our analysis is guided by the list of banks incorporated in the UK annually published by Financial Service Authority (FSA). For domestic banks that have headquarters in the UK, we use the registered address of the headquarters (from UK Companies House³) as the physical location of the headquarters; for subsidiaries of foreign banks, we use the registered address in the UK as the physical location of the headquarters in the UK. The location of branches of major British banks (MBB) is extracted from the Annual UK Clearings Directory (2008-2011) which contains information

² More formally, Q26 asks: “over the past 12 months, have you done any of the following (i.e. either applied for a new overdraft facility (bank loan or commercial mortgage), regardless whether agreed or not, or gone through an annual review process for an existing overdraft facility (loans or commercial mortgage) with a bank) for your business? For firms that answered “yes” to Q26, Q63 asks: “which of these best summarises the bank’s initial response to the overdraft application that you made?”, and Q158 asks: “which of these best summarises the bank’s initial response to the loan application that you made?”. We group the responses that the bank’s initial response to the application was turning it down and offering a smaller amount of overdraft (loan) than applied as bank overdraft (loan) constrained SMEs.

³ Companies House is the United Kingdom’s registrar of companies and is an executive agency and trading fund of Her Majesty’s Government.

provided by clearing banks on the lists of offices that participate in the UK clearing system³. We compute the locality-specific operational proximity of the credit market by the total number of branches of individual banks in a given locality divided by the surface area of the locality, in line with the approach adopted by Alessandrini et al. (2009b). To construct the locality-specific functional distance, we first calculate the average travelling mile of branches held by each bank in a given locality r to the headquarters of each bank and used its natural logarithm. We then use the number of branches of each bank in r as percentage of total number of branches of all banks in r as the weight to compute the weighted average of functional distance of the credit market in each locality⁴. We match the SMEs and $OPDIS_{ir}$ and $FUNDIS_{ir}$ in each economic region. Both $OPDIS_{ir}$ and $FUNDIS_{ir}$ are measured on an annual basis for each of the economic regions over 2008-2011 and the average value is calculated for the econometric analysis in equation (2). The regional distribution of operational proximity (OPDIS) and functional distance (FUNDIS) is presented in Chart 1⁴.

5.2.2. Firm-level controls

We control for a set of firm-level characteristics to tease out factors that are hypothetically associated with banks' industrial practices regarding risk evaluation in the provision of bank credit. The vector of firm-specific controls would also serve to mitigate the concerns over the endogenous selection bias of borrowers. As mentioned above, we rely on the outcome of the application to measure bank credit constraints. By definition, the outcome of the application is only observable if the firm actually sought bank finance. As a result,

³ This includes the geographical area of the branch, the sort code of the branch, the title of the branch, and the postal address of branches. The combination of the four pieces of information is sufficient to identify the physical location of branches. We perform a cross-check by comparing the yearly total number of branches of each clearing bank identified with the statistics on the aggregated number of UK branch network published by the BBA. We further cross-checked the physical location of branches with the branch locator service in the website of each clearing bank and information on the location of branches of MBB provided by SNL financial. While the two sources only provide the information in 2011, they confirm the validity of our method in locating MBB branches. Where there is a merger, we classified the branches of the target bank as that of the acquiring bank and also adjusted the location of the headquarters from the merger onwards accordingly. For banks that are not in the category of MBB, we assume the bank has one branch which is located at the same location as its registered address. While the identification of the location of branches of non-MBB banks is less precise, Experian's Shop*Point data (verified in 2013) indicates that 97.5% of all banks' branches in England, Scotland and Wales are branches of MBB.

⁴ Specifically, the functional distance of locality r is measured via

$$\sum_{b=1}^B \frac{branches_{br} * \ln\left(\frac{\sum \text{distance of each branch of bank } b \text{ at locality } r \text{ to the headquarters}_b}{branches_{br}}\right)}{\sum_{b=1}^B branches_{br}}. \text{ } branches_{br} \text{ is the total number of branches of bank } b \text{ at locality } r. B \text{ is the number of banks who have branches at locality } r.$$

⁴ The distribution of the headquarters of banks in each economic region, the name of the MBB, their headquarters and the registered address of the headquarters are presented in tables contained in the online supplementary file.

applicant SMEs may be a systematically truncated sub-sample of all SMEs rather than a random sample. For example, if firms exhibiting lower credit riskiness also have stronger demand for bank credit and account for a larger share of all firms in a given region, we may overestimate the regional effect for this particular region⁵.

The firm-level risk indicators included in our analysis can be categorised into three groups, namely (1) characteristics reflecting the observable riskiness of the firm; (2) characteristics banks would rely on to assess the riskiness of the firm; and (3) characteristics that are perceived by banks as carrying higher risk *ex ante*. With respect to category (1), we included *risk_i* that denotes four dummy variables derived by Dun & Bradstreet indicating the risk rating groups of the respondents and which are constructed using information regarding the nature of business, negative actions such as court actions or the failure to pay debts, and data on individual company directors. The risk rating is related to the predictive scores on the likelihood of financial distress in the forthcoming twelve months. We also included *profit_i*, an index variable that determines the net profit (or loss) of the SME during last financial period. It is reasonable to argue banks would perceive firms who are able to generate profit as being stronger capacity to honour periodic repayment obligation. Finally, we included *delinq* a dummy variable that takes value 1 if the respondent has missed a loan repayment and went into unauthorised overdraft on the account in the last twelve months and 0 otherwise. Banks may not be willing to extend further credit to firms that have failed to honour their obligation and overdrawn available credit lines as this may signal financial difficulties (Gobbi and Sette, 2014).

With respect to category (2), we included *industry_i* representing nine dummy variables that indicate the principal activity of the respondents. As argued by Rajan and Zingales (1998), industry-specific technological features such as the initial project scale, the gestation

⁵ Adding controls for the demand for bank credit would be a suitable solution to address the selection-bias if the selection takes place according to the observable variables. Indeed, there is no selection problem if every variable influencing selection is controlled in the outcome equation since selection bias is equivalent to an omitted variable bias (Heckman, 1979). In the case where sample selection is dependent of the unobservables and when the unobservables in the selection equation is correlated with the unobservables in the outcome equation, the common practice for correcting is incorporating information on non-applicant firms in a standard 2-step Heckman procedure. Exclusion restrictions which are included in the demand for external finance model in the first step, but are excluded from the model of the presence of credit constraint in the second step, are imposed for identification. One of reasons why we decided to handle the problem via adding controls for the demand for bank credit is because we include the status of the application and the amount of application as controls (as detailed below). Those questions are asked in the survey if the firm actually sought bank finance. Nevertheless, we run the 2-step Heckman procedure as the robustness test. The details of the 2-step Heckman procedure can be found in Section 6.

period, the cash harvest period, and the requirement for continuing investment are very important determinations of firms' demand for external financing and signal the affordability of debt obligations for SMEs. We also included *growth_i*, representing an index variable that represents SMEs' expansion plans over the next year. To achieve a range of expansion plans, the investment made by growth-oriented SMEs normally need to be long term finance as it would also take substantial time for growth-oriented SMEs to transform the investment into the generation of stable cash flow. Overdrafts are repayable on demand whilst term loans are usually less than ten years. Servicing loan repayments has to be made on a regular short-term basis which requires even periodic revenue streams to support. Therefore, growth-oriented SMEs might be less likely to acquire bank credit approval to fund growth opportunities. Further, we included three dummy variables (i.e. *genderowner_i*) that indicate the gender of the owner/managing or leading partner/shareholder of the SME as studies have indicated that human elements can be as important as financial attributes in quantifying SMEs' propensities to obtain funds from external parties (Vos et al., 2007). Finally, we included *ageowner_i*, denoting an index variable recognising the age of the owner/managing or leading partner/shareholder of the SME. As suggested by Mester (1997), banks treat the characteristics of the business owners as predictors of commercial business loan performance with the accumulation of experience (both personally and professionally) as well as the owner's level of loss aversion being important (Vos et al., 2007).

With respect to the category (3), we follow Ongena et al., (2013) and argue that information opacity is a reasonable proxy for ex-ante riskiness of SMEs since lending based on information opacity is directly related to credit risk banks get involved in lending. We first included *size_i* that categorise the SME according to the number of employees. As size is closely linked with the visibility of the firm, it has been widely used in literature to proxy for the degree of informational opaqueness of the firm. Size is the main contributor to the different degree of access to bank credit for firms in the UK during the recent period of economic recession (Cowling et al., 2012). We also included *legalform_i*, denoting the legal form of the SME as it carries an important implication for the quantity and the quality of information that interested parties could derive from firms' financial statement. In the UK, many of the International Financial Reporting Standards (IFRS) for recognising and measuring assets, liabilities, income and expenses for SMEs are simplified. Moreover, significantly fewer disclosures are required. Also, the stringency of regulation of financial

reporting differs across different legal statuses. While there is no need for a sole trader to register or file accounts and returns with Companies House, the Limited Company form and Limited Liability Partnership (LLPs) are required to register and file accounts and annual returns at Companies House. In the absence of transparent disclosure, SMEs are less able to send credible signals to banks. Moreover, unaudited statements have a much higher risk of material misstatement (Allee and Yohn, 2009; Ongena et al., 2013). Finally, we included *applicstatus_i* denoting four dummy variables that indicate the status of the application to the bank. Cole (1998) has shown that banks are more likely to extend credit to SMEs with whom they have had pre-existing transactions since “learning by lending” helps to convey private information about SMEs’ near-term financial performance and banks would perceive further loans to be less risky, conditional on past experiences with viable and trustworthy small businesses (Diamond, 1991). The definition of the variables used for the econometric analysis are summarised in Table 1. We test for collinearity among the independent variables, calculating the variance inflation factor (VIF) for each of independent variables of our empirical model⁵. None of our independent variables has a VIF value higher than the threshold of 10 suggesting the correlation among the independent variables is not an issue (Nachtsheim et al., 2004).⁶

6. Empirical results

The average marginal effects of the independent variables of the probit regression for equation (1) are reported in Table 2. Since all independent variables in equation (1) are categorical variables, the average marginal effects indicate the change in probability when the independent variable switches from the reference category to the category in question⁷.

We begin our discussion on the estimated results of firm-specific controls. While there are variations in the estimated effects on the constraints between bank overdraft and bank loan, a reasonably consistent picture is emerging. We find that the higher likelihood of financial distress in the forthcoming 12 months (i.e. *risk_t*) leads to a higher probability of

⁵ For the sake of space, the test is available on request.

⁶ As suggested by Wooldridge (2009, p.99), a simpler and more straightforward test for diagnosing whether one should concern the correlation among independent variables is to check whether the independent variables in general and the key variables of interest in particular exhibit sensible standard errors. This is because high level of multi-collinearity would make the calculation of variance matrix become unstable. The empirical results in Table 2 and 3 indicate that none of the coefficients on our independent variables displays unreasonable standard error. This, again, suggests that the multi-collinearity is not a problem for our econometric analysis.

⁷ For continuous variables, the average marginal effects show the instantaneous change in probability when the independent variable increases by one unit, leaving all other independent variable values as it is.

there being bank loan constraints (column 2). However, it does not seem to be important for the probability of bank overdraft constraints (column 1), presumably resulting from the role that the short-term maturity of bank overdraft play in strengthening banks' power of a repayment call. It is shown that being profitable in the last financial year (i.e. *profit_t*) is associated with a lower probability of bank credit constraints in the last 12 months especially compared to those SMEs that had incurred a loss during the last financial period. SMEs that have missed a loan repayment and had an unauthorised overdraft on their account in the last 12 months (i.e. *delinq*) have a higher probability of bank credit constraints. The results related to *profit_t* and *delinq* are held for both bank overdraft and loan constraints (column 1 and column 2). With respect to industry classification of the SME (i.e. *industry_i*), SMEs in "Construction" and "Hotels and Restaurants" would face a higher probability of having bank credit constraints whilst SMEs in "Transport, Storage and Communication" and "Health and Social Work" appear to be more likely to be constrained for bank overdraft(column 1). Regarding the growth-orientation of SMEs (i.e. *growth_i*), those that exhibit a very conservative business plan (i.e. stay the same size over the next year) are less likely to face bank loan constraints as compared to SMEs who are planning to grow substantially (column 2). As far as the characteristics of the owner/managing or leading partner/shareholder is concerned, the results indicate that the participation of women (i.e. *genderowner_t*) and more experienced key people (i.e. *ageowner_i*) seem to be associated with a lower probability of being bank loan constrained (column 2). We find that larger SMEs (i.e. *size_t*) are less likely to face both bank overdraft and bank loan constraints (column 1 and column 2) whilst those with limited partnership and limited liability partnership (i.e. *legalform_i*) have a lower probability of bank overdraft constraints as compared to a sole proprietorship (column 1). Finally, SMEs that applied bank credit for the first time (i.e. *applicstatus_t*) face a higher probability of being bank credit constrained (column 1 and column 2).

Turning to the main variables of interest (i.e. *region_r*), we find evidence suggesting the presence of the regional-specific effect on bank credit constraints, *ceteris paribus*. In the case of bank overdraft constraints (column 1), we find that despite having the exact same values as other independent variables in the model, SMEs would face a 17.8% higher probability of being constrained if they are located in East Midlands as compared to the reference region (i.e. East Anglia). Furthermore, SMEs located in Wales, North East England, North West

England and London face a 16.6%, 15.7%, 11.4% and 11.1% higher probability of being constrained as compared to SMEs located in East Anglia. As far as SMEs located in other economic regions are concerned, they do not seem to face a statistically significant different probability of being constrained relative to SMEs in East Anglia. Regarding bank loan constraints (column 2), SMEs would face a 22.6% higher probability of being constrained if they are located in Wales as compared to those in East Anglia. Further, SMEs located in Yorkshire/Humberside, in the East Midlands, and London face 16.3%, 13.3%, and 7.6% higher probability of being constrained compared to SMEs located in East Anglia. Finally, SMEs located in other economic regions do not seem to face statistically significantly different probability of bank loan constraints as compared to SMEs in East Anglia. The comparison between the regional-specific effect on bank credit constraints in Table 2 and the regional-specific distance in Chart 1 suggests that the longer functional distance seems to go hand in hand with a higher likelihood of bank credit constraints, especially in term of getting access to overdraft. However, London stands as an exceptional case: although London has the shortest functional distance among all regions in question, SMEs in London appear to encounter a higher probability of bank credit constraints relative to those in regions with longer functional distance, *ceteris paribus*. Given the core position of London in the topological structure of the UK financial system, the finding that SMEs located in London suffer from a higher probability of bank credit constraints is a puzzle although this paper is not the first to discover this i.e. Armstrong et al., (2013) also reported that SMEs located in London had a 22.5% higher probability of being rejected in their application for bank overdraft compared to SMEs located in East Anglia.

The presence of regional-specific impact in equation (1) indicates that the location where the SME operates influences its probability of experiencing bank credit constraints, implying the presence of a geographical segmentation of the SME credit market. The regional-specific impact, however, is a composite indicator which is formed by the multi-dimensional underlying functionality of the local credit market in supplying SMEs lending. We next investigate whether and how this regional-specific impact revealed in Table 2 is attributable to operational distance and functional distance of the regional banking market where SMEs are located. The average marginal effects of the independent variables of the probit regression for equation (2) are reported in the column 1 and column 2 in Table 3.

We start our discussion on the estimated results of our main variables of interest since the average marginal effects of firm-specific controls on the probability of bank credit

constraints remain similar as that in Table 2. As seen, both the average marginal effect on the operational proximity (i.e. $OPDIS_{it}$) and that on the functional distance (i.e. $FUNDIS_{it}$) are positive and statistically significant. These results suggest that a larger number of branches per square kilometre (i.e. a shorter operational distance) and the longer distance between the branches of banks and the headquarters of branches (i.e. a longer functional distance) at a regional level lead to a higher probability of bank credit being constrained for SMEs located in the same region, *ceteris paribus*. Together, the result on operational proximity indicates that the negative impact of the close proximity of bank branches to borrowers on producing the additional market power and/or a more serious ‘winner’s curse’ behavior offsets its positive impact on alleviating the principal-agent problem between bank branches and borrowers. The result on functional distance suggests that the friction in the communication of soft information within the bank organization imposes constraints on banks’ involvement in SME lending in the regional market distant from the branches’ headquarters. The finding is consistent with the “flight home” bias of banks in the post-crisis period suggested by Presbitero et al. (2014) which show that the longer functional distance of local credit market leads to higher likelihood of local firms being credit rationed (and which exists exclusively in the post Lehman Brothers period). London has the shortest operational proximity and the shortest functional distance among the eleven economic regions being analyzed (Chart 1). The unexpected finding that SMEs located in London encounter a higher probability of bank credit constraints as revealed in Table 2 seems to reflect the net outcome of the negative impact of operational proximity and the positive impact of functional distance on bank credit constraints. However, given the diversified nature of external finance providers and the highly liquid financial market in London, the argument that the higher market power owned by banks (because of closer operational proximity) drives the unexpected finding that SMEs located in London encounter a higher probability of bank credit constraints does not seem to be convincing. A conjectural explanation for the result would reflect the joint outcome of three underlying forces, namely: 1). the highly competitive market conditions in London might have induced loan officers to compete more aggressively for new credit and therefore result in more serious over-lending in the pre-crisis period; 2) significantly worsened “winner’s curse” problem due to the deterioration of the average quality of borrowers in an economic downturn and which could, in the extreme case, become so severe that banks will simply turn away borrowers without screening (Berlin, 2009); and 3) the retrenchment of the business activities of overseas banks which, in the post-financial crisis period, reduced

sharply their exposure to the UK market and redirected funds to another part of banking group (Hoggarth et al., 2013). Whilst we cannot empirically examine our conjecture due to the absence of data, a testable hypothesis is that the impact of the operational proximity on bank credit constraints in Table 3 is simply driven by the abnormality of London. We therefore exclude SMEs located in London and re-estimate equation (2) with the results being presented in columns 3 and 4 in Table 3. This shows that the close operational proximity between bank branches and borrowers becomes negatively associated with the probability of bank credit constraints, although the result is not statistically significant. However, the positive impact of functional distance on the probability of being bank credit constrained remains and its magnitude appears to be similar as before. Therefore, the inclusion of SMEs in London plays a crucial role in the finding that closer operational proximity leads to a higher probability of bank credit constraints.

To sum up our analysis, we find that the economic region where SMEs are located was important for the probability of facing bank credit constraints in the period of economic weakness following the financial crisis of 2007. The importance of the regional-specific impact appears to be related to the variation of the banking market across economic regions in terms of the closeness between banks and SMEs. SMEs seem to be less likely to encounter bank credit constraints if they are located in credit markets with branches less distant from their headquarters. The result is consistent with findings that banks had rebalanced their loan portfolio across different local markets in the post-crisis period (De Haas and Van Horen, 2013; Degresy et al., 2015). The result also suggests disadvantages due to the complicated organizational structure of banks in producing and communicating soft information internally. Finally, there is evidence suggesting that the geographical proximity between local branches and SMEs appears to bring in a higher likelihood of bank credit constraints although this seems to be driven by the experience of SMEs in London.

We conduct additional robustness tests to confirm our main results. First, we consider the possibility that an application for a larger amount of bank credit might be associated with higher likelihood of failing to receive the full amount requested, i.e. because of the operational losses incurred by banks during the financial crisis, the capacity of banks to supply finance worsened in the post-crisis period and the propensity to reject larger size of application might have been more pronounced. In our empirical analysis, we treat the circumstance that the bank's initial response to the application was either outright rejection or an offer for a smaller amount of facility than applied for. If SMEs located in certain

economic regions also demonstrate higher likelihood of applying for larger (or smaller) amount of bank credit, the estimated coefficients on our main variables of interest would be biased. To handle this concern, we augment equations (1) and (2) with the amount of bank credit initially applied for. The estimated results for equation (1) are presented in Table 4 and the estimated results for equation (2) are presented in Table 5.

Secondly, we re-estimate equation (1) and equation (2) via the 2-step Heckman procedure. To construct whether firms exhibit demands for external finance or not, we utilize the responses in the SME Finance Monitor as to whether the business used any form of external finance (bank overdraft, credit cards, bank loan/commercial mortgage, leasing or hire purchase, loans/equity from directors, loans/equity from family and friends, invoice finance, grants, loans from other 3rd parties, export/import finance) in the past five years. We group those that have used external finance as a strictly positive demand for bank credit and used two dummy variables to impose the exclusion restriction in the demand for external finance equation for identification. We rely on the responses in the survey regarding whether the owner/any of the partners/the majority shareholder belong to any business groups or industry bodies. We generate a bilateral dummy variable, SOCIAL, which takes a value of one in the case where the response is “yes” and zero otherwise. This is motivated by prior studies on the role of social capital in entrepreneurship that recognize that entrepreneurs embed their business decisions in social structures (Greve and Salaff, 2003). Particularly, social networks can assist entrepreneurs to formulate the optimal choice of financial policy and obtain crucial information about, and access to, potential sources of finance (Uzzi 1999; Bauernschuster et al., 2010). The social network includes not only location-specific market-oriented institutions such as mainstream banking branches but also social ties which cross the boundaries of location (Ter Wal and Boschma, 2009). We also utilize the response toward the survey question which asks whether the person in charge of the financial management of the business has a finance qualification or has undertaken financial training. We generated a bilateral dummy variable, LITERACY, which takes value of one in the case where the response is “yes” and zero otherwise. Arguably, a low number of loan applicants for a given price and income level would be demand-originated due to self-exclusion arising from non-economic reasons such as financial illiteracy (Beck and De La Torre, 2007). The results with Heckman selection are presented in Panel A in Table 6 for equation (1) and Panel B for equation (2).

Thirdly, we allow for the impact of regional competitiveness condition on any bank credit constraints faced by SMEs. Its relevance relies on the implication of competition for the rent that can be extracted by the bank from the production of soft information during the bank-borrower relationship. There is disagreement in the existing literature on the impact of competition in the market place on banks' incentive to produce proprietary soft information of informational opaque borrowers. Theory emphasizing the investment nature of soft information production claims that the increase in competition would reduce the power of banks to extract rent from the informational production and is therefore detrimental for soft information production (Rajan, 1992). By contrast, theory focusing on the strategic nature of soft information production underlines the heterogeneous capacity of banks in its production and argues competition would incentivize soft information production in competition (Boot and Thakor, 2000). We also augment equation (2) with a regional Herfindahl–Hirschman Index (HHI) computed by the share of branches held by individual banks in each economic region⁸.

We further augment equation (2) with the rate of change at a regional level in both house prices and Gross Value Added (GVA) of the non-financial business economy between 2007 and 2009 in the region where SMEs are located. We gathered the quarterly Halifax House Price Index (which tracks the price of a standardized house over time, adjusting for monthly variation in the composition of house price sales) and then computed the regional change rate of house prices on the quarterly average. The change rate of GVA of non-financial business at the regional level is derived from the data of Annual Business Inquiry of Office for National Statistics (ONS). The purpose of introducing those two additional regional-specific control variables is to capture the change in the effectiveness of bank branch officers in using collateral as a risk management tool to bridge the funding gap and that in their risk appetite due to the uncertainty in the local operational environment. While our sample starts from 2011, the questions asked were related to borrowing events of SMEs in the past 12 months (i.e. between Q4, 2010 and Q4, 2011). The financial crisis of 2007–08 is considered by many economists to have been the worst since the Great Depression of the

⁸ The Herfindahl–Hirschman Index (HHI) is computed on the share of branches held by banks operating in an economic region. The HHI index is widely used in the banking literature as the measurement of competition of the local banking system and has been recently employed by studies on financial constraints e.g Alessandrini et al., (2009b) and Alessandrini et al., (2010). Specifically, the HHI of locality r is measured via via $\sum_{b=1}^B \left(\frac{branches_{br}}{\sum_{b=1}^B branches_{br}} \right)^2$. $branches_{br}$ is the total number of branches of bank b at locality r . B is the number of banks who have branches at locality r . $\sum_{b=1}^B branches_{br}$, the denominator gives the total number of branches at locality r .

1930s (Temin, 2010) and it would be expected that the shock experienced by the banking community would propagate into future risk taking due to institutional memory (Bouwman and Malmendier, 2015).

It is plausible to argue that the movement in local-area house prices would influence the likelihood of SMEs in securing bank credit. To increase their chances of accessing external finance, owners of small unlisted firms typically demonstrate the confidence and commitment in the investment financed through pledged property-based collateral (Pollard, 2003). The movement in local house prices may affect the capacity of the owners of unlisted SMEs in signaling their creditworthiness (Disney and Gathergood, 2009). It would also influence the effectiveness of branch officers using collateral pledged by borrowers as the tool of risk management to attenuate the problem of adverse selection and moral hazard problem in the provision of bank credit (Jiménez and Saurina, 2004). Regarding the change rate of non-financial business GVA at a regional level, this would reflect the change in the sale and the profitability of local business. The deterioration of non-financial business GVA would induce banks to upward revise the expectation of default risk of lending to local businesses. The greater uncertainty as a direct result of larger reversal of economic performance of local businesses would induce branch officers to reduce their risk appetite. We present the estimated results in Table 7.

Our main results therefore show that the economic region where SMEs are located is important for the probability of facing bank credit constraints. The longer functional distance is associated with higher bank credit constraints although the shorter operational distance does not seem to lead to a lower likelihood of bank credit constraints hold in all robustness tests.

6. Conclusion

Prior research has shown that SMEs have faced increased difficulties to access bank credit in the aftermath of the global financial crisis (Cowling et al., 2012; Armstrong et al., 2013; Fraser et al., 2015; Degryse et al., 2015). By using the SME Finance Monitor together with a unique data on the geographical location of all bank branches in eleven UK economic regions, we examine the relevance of the geographical location for SMEs' access to bank finance. We then investigate whether (and how) the variation across the banking markets of

different economic regions in terms of operational distance and functional distance plays a role in the importance of the effect of geographical location.

We find evidence suggesting the economic region where SMEs are located matters for the probability of SMEs facing bank credit constraints. Moreover, the closer proximity between bank branches (where information on SMEs is collected) and the bank's headquarters (where the decision-making authority is located) appears to be related to a lower likelihood of bank credit constraints for SMEs, *ceteris paribus*. The empirical results show the positive role of geographical closeness in reducing internal organizational friction in the communication of soft information and thereby guiding the flow of financial capital to SMEs, supporting previous research examining this issue (Alessandrini et al., 2009b; Degryse et al., 2015). The finding also suggests that the local branches of a large, centralized nationwide bank would be disadvantageous in meeting the needs of local SMEs for bank credit as compared to a small, local bank with independent decision-making autonomy. However, the result on the role of the proximity between bank branches and borrowers is mixed - whilst the closer distance between bank branches and borrowers appears to lead to higher probability of bank credit constraints experienced by SMEs, the result seems to be driven by the abnormality in London.

Our finding also conveys important policy-oriented messages. The UK banking system is notoriously centralized when compared to banking systems in other developed countries which have a more varied financial ecology (Carbo et al., 2009; Leyshon et al., 2008). The institutional developments of branch banking in the UK has produced a geographical concentration in decision-making that is based in the strategic centres of banking institutions and that has downgraded the importance of tacit and personalized local knowledge in the underwriting of bank credit towards SMEs. In addition, the rationalization of the branch networks engaged by the major national UK banks has exacerbated the disparity of the branching infrastructure across national space. Those movements have reshaped the UK financial space and have important implications for the participation of banks in the SME lending market including the risk of further marginalization of small borrowers located in, and a continuing decline in the economic and financial power of, peripheral regions. Since the financial crisis, the UK government has implemented a number of supportive measures to enhance the access of SMEs to external finance (BIS, 2012). However, those policy efforts have been formulated only at a national level and have been delivered through the network and the professional experience of private sector banking institutions on a risk-sharing basis. Despite various reports on the need for regionally-based

funds (EAG, 2013; Jones-Evans, 2013; Scottish Government, 2013), there had been a failure by the UK Government to consider regional disparities in funding within its policy initiatives. The development of a separate British Business Bank is to increase the amount of lending to businesses and provide more diverse sources of finance by bringing together, and building upon, existing government schemes aimed at supporting access to finance for businesses under a single organisation (BIS, 2013b). Until the recent announcement of a Northern Powerhouse Investment Fund by the UK Government, there were concerns that such a nationally-based business bank would not respond to the different regional economic contexts of parts of the UK (Cox and Schmueker, 2013) and that regional differentiation between prosperous and peripheral areas would increase. Whilst the move towards regional funds is long overdue, other UK regions do not have similar institutional developments. More importantly, the distribution of the public sector support without a concomitant effort in rebalancing the spatial configuration of the private sector banking infrastructure would be subject to the spatial reflexivity of unbalanced pattern of bank-borrower proximity. Given the importance of a healthy SME sector for the competitiveness of a region, it appears urgent to design policies that stimulate greater external bank financing that uses sufficient local knowledge and vested interest for the successful understanding and the management of the investment of local SMEs. The banking crisis has prompted a policy debate on the development of a geographically decentralized financial system with sizeable and well-embedded regional clusters of institutions and networks (Jones-Evans, 2015). Our research findings lend support to such policy initiatives.

While the paper presents the first attempt to empirically test for the relevance of characteristics of local credit market in terms of two types of closeness for SMEs' access to bank finance in the UK context, some limitations from the current study offer opportunity for further research. In the current paper, we focused on credit rationing which is the most serious problem faced by SMEs in accessing bank finance. The examination on whether and how there is geographical differentials in price and non-price terms and conditions on approved bank credit will be useful for a more in-depth analysis of the presence of different types of market frictions and interplay among them. In addition, our definition of geographical location is at a UK regional (NUTS1) level and an analysis at a more disaggregated level, combined with an investigation of the extent to which the evidence generated from the aggregated level could be generalized into that at a more refined spatial level, is an important direction for future study.

Reference:

- Agarwal, S., Hauswald, R., (2010), Distance and private information in lending, *Review of Financial Studies*, 23: 2757–2788.
- Angrist, J.D., Pischke, J.S., (2009) *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton, NJ: Princeton University Press.
- Alessandrini, P., Papi, L., Zazzaro, A., (2003), Banks, regions and development, *BNL Quarterly review*, 23-55
- Alessandrini, P., Presbitero, A.F., Zazzaro, A., (2009a), Global banking and local markets: Anational perspective, *Cambridge Journal of Regions, Economy and Society*, 2:173–192.
- Alessandrini, P., Presbitero, A.F., Zazzaro, A., (2009b), Banks, distances and firms' financing constraints, *Review of Finance*, 13:261–307.
- Alessandrini, P., Presbitero, A.F., Zazzaro, A., (2010), Bank size or distance: What hampers innovation adoption by SMEs?, *Journal of Economic Geography*, 10: 845–81.
- Allee, K., Yohn, T., (2009), The demand for financial statements in an unregulated environment: An examination of the production and use of financial statements by privately-held small businesses, *The Accounting Review*, 84: 1-25.
- Armstrong, A., Davis, E.P., Liadze, I., Rienzo, C., (2013), An assessment of bank lending to UK SMEs in the wake of the crisis, *National Institute Economic Review*, 225: 39–51.
- Bank of England. (2014) Trends in lending - January, Bank of England, London.
- Bauernschuster, S., Falck, O., Henlich, S., (2010), Social capital access and entrepreneurship, *Journal of Economic Behaviour and Organization*, 76: 821–833.
- Beck, T., Demirguc-Kunt, A., (2006), Small and medium-size enterprises: Access to finance as a growth constraint, *Journal of Banking and Finance*, 30: 2931–2943
- Beck, T., De La Torre A., (2007), The basic analytics of access to financial services, *Financial Markets Institutions and Instruments*,16: 79–117
- Berger, A.N., Udell, G.F., (2002), Small business credit availability and relationship lending: The importance of bank organizational structure, *The Economic Journal*, 112:F32-F53.
- Berger, A.N., Frame, W.S., (2007), Small business credit scoring and credit availability, *Journal of Small Business Management*, 47: 5–22.
- Bell, V., Young, G., (2010), Understanding the weakness of bank lending, *Bank of England Quarterly Bulletin*, Q4:311-320.
- Berlin, M., (2009), Bank credit standards, Federal Reserve Bank of Philadelphia Business Review, 1–10
- BIS. (2012) *SME Access to External Finance*. BIS Economics Paper No 16, January.

BIS. (2013a) *Evaluating changes in bank lending to UK SMEs over 2001-12 – ongoing tight credit. Econometric analyses using data from the UK Survey of SME Finances and the SME Finance Monitor*, Department of Business Skills and Innovation, London

BIS. (2013b) *Building the Business Bank – strategy update*, March.

BMG Research. (2013) *Small and medium-sized enterprise (SME) journey towards raising external finance*, Department of Business Skills and Innovation, London, available at <http://british-business-bank.co.uk/wp-content/uploads/2013/10/SME-Journey-Towards-Raising-Finance.pdf>

Boot, A. W. A., Thakor, A.V., (2000), Can relationship banking survive competition?, *Journal of Finance*, 55: 679–713.

Bouwman, C., Malmendier, U., (2015), Does a bank's history affect its risk-taking?, *American Economic Review*, 105: 321–325.

Brevoort, K. P., Hannan, T.H., (2006), Commercial lending and distance: Evidence from Community Reinvestment Act Data, *Journal of Money, Credit, and Banking*, 38: 1991-2012.

Brevoort, K.P., Wolken, J.D, (2009), Does distance matter in banking?, In: Alessandrini P. Fratianni. M. and Zazzaro A (eds) *The Changing Geography of Banking and Finance*. New York: Springer, 27-56.

Broecker, T., (1990), Credit-worthiness tests and interbank competition, *Econometrica*, 58: 429–452.

Carbo, S., Humphrey, D., Maudos, J., Molyneux, P., (2009), Cross- country comparisons of competition and pricing power in European banking, *Journal of International Money and Finance*, 28: 115-134.

Canales, R., Nanda, R., (2012), A darker side to decentralized banks: Market power and credit rationing in SME lending, *Journal of Financial Economics*, 105: 353–366.

Cetorelli, N., Goldberg, L., (2012), Liquidity management of U.S. global banks: Internal capital markets in the great recession, *Journal of International Economics*, 88: 299–311.

Chakravarty, S. P., (2006), Regional variation in banking services and social exclusion, *Regional Studies*, 40: 415–428.

Cohen, A., Mazzeo, M., (2007), Market structure and competition among retail depository institutions, *The Review of Economics and Statistics*, 89: 60-74.

Cole, R.A., (1998), The importance of relationships to the availability of credit, *Journal of Banking and Finance*, 22: 959–977.

Cowling, M., Liu, W., Ledger, A., (2012), Small business financing in the UK before and after the financial crisis, *International Small Business Journal*, 30: 778–800.

- Cox, E., Schmuecker, K., (2013) Beyond banks and big governments – strategies for local authorities to promote investment, Northern Economic Futures Commission, Institute for Public Policy Research, March 2013
- De Haas, R., Van Horen, N., (2013), Running for the exit? International bank lending during a financial crisis, *Review of Financial Studies*, 26: 244–285.
- Degryse, H., Ongena, S., (2005), Distance, lending relationships, and competition, *Journal of Finance*, 60: 231–266.
- Degryse, H., Laeven, L., Ongena, S., (2009), The impact of organizational structure and lending technology on banking competition, *Review of Finance*, 13: 225–259.
- Degryse, H., Matthews, K., Zhao, T., (2015), *SMEs and access to bank credit: Evidence on the regional propagation of the financial crisis in the UK*, CESifo Working Paper No. 5425. Centre for Economic Studies, Munich.
- Diamond, D.W., (1991), Monitoring and reputation: The choice between bank loans and directly placed debt, *Journal of Political Economy*, 99: 688–721.
- Disney, R., Gathergood, J., (2009), Housing wealth, liquidity constraints and self-employment, *Labour Economics*, 16:79-88
- Dow, S. C., (1987), The treatment of money in regional economics, *Journal of Regional Science*, 27: 13-24.
- Dow, S.C., Montagnoli, A., (2007), The regional transmission of UK monetary policy, *Regional Studies*, 41: 797–808.
- Dow, S.C., Rodriguez-Fuentes C.J.. (1997), Regional finance: A survey, *Regional Studies*, 31: 903–920.
- EAG. (2013) Review of access to finance for NI businesses. Belfast, March 2013.
- Fraser, S., (2012) *The impact of the financial crisis on bank lending to SMEs – Econometric Analysis from the UK Survey of SME Finance*, Department for Business Innovation and Skills, July, 2012.
- Fraser, S., Bhaumik, S. Wright, M., (2013). What do we know about the relationship between entrepreneurial finance and growth?, ERC White Paper, (4).
- Fraser, S., Bhaumik, S. K., Wright, M., (2015), What do we know about entrepreneurial finance and its relationship with growth?, *International Small Business Journal*, 33: 70-88.
- Freixas, X., and Rochet, J. C., (2008) *Microeconomics of banking* (2nd ed.). Cambridge, MA: MIT Press.
- French, S., Leyshon, A., Signoretta, P., (2008), All gone now: The material, discursive and political erasure of bank and building society branches in Britain, *Antipode*, 40: 79–101.

- Gelman, A., (2007a), Struggles with survey weighting and regression modelling, *Statistical Science*, 22:153-164.
- Gelman, A., (2007b), Rejoinder: Struggles with survey weighting and regression modeling, *Statistical Science*, 22: 184–188.
- Gertler, M., (1984), Regional capital theory, *Progress in Human Geography*, 8: 50-81.
- Giannetti, M., Laeven, L., (2012), The flight home effect: Evidence from the syndicated loan market during financial crises, *Journal of Financial Economics*, 104: 23–43.
- Giles, D., (2012), *Another Gripe About the Linear Probability Model*, viewed 10 April 2016, < <http://davegiles.blogspot.co.uk/2012/06/another-gripe-about-linear-probability.html>>.
- Gobbi, G., Sette, E., (2014), Do firms benefit from concentrating their borrowing? Evidence from the great recession, *Review of Finance*, 2: 527-560.
- Greve, A., Salaff, J. W., (2003), Social networks and entrepreneurship, *Entrepreneurship Theory and Practice*, 28: 1–22.
- Harrison, R.T., Baldock, R., (2015), ‘Financing SME growth in the UK: Meeting the challenges after the global financial crisis, *Venture Capital*, 17:, 1-6.
- Heckman, J., (1979), Sample selection bias as a specification error, *Econometrica*, 47: 153-161
- Hoff, K., Stiglitz, J.E., (1997), Moneylenders and bankers: Price-increasing subsidies in a monopolistically competitive market, *Journal of Development Economics*, 52: 429-462.
- Hoggarth, G., Hooley, J., Korniyenko, Y., (2013), Which way do foreign branches sway? Evidence from the recent UK domestic credit cycle, Bank of England, Financial Stability paper No. 22, June, 2013
- Horrace, W., Oaxaca, R., (2006), Results on the bias and inconsistency of ordinary least squares for the Linear Probability Model, *Economics Letter*, 90: 321–327.
- Jones-Evans, D., (2013) Access to Finance Review, Welsh Government, Cardiff. November.
- Jones-Evans, D., (2015), Access to finance to SMEs at a regional level—the case of Finance Wales, *Venture Capital*, 1-15.
- Jiménez, G., Saurina, J., (2004), Collateral, type of lender and relationship banking as determinants of credit risk, *Journal of Banking and Finance*, 28: 2191–2212.
- Klagge, B., Martin, R., (2005), Decentralized versus centralized financial systems: Is there a case for local capital markets?, *Journal of Economic Geography*, 5: 387–421.
- Lee, N. Brown, R., (2016), Innovation, SMEs and the liability of distance: The demand the supply of bank funding in UK peripheral regions, *Journal of Economic Geography*, 1-28

- Lee, N., Drever, E., (2014), Do SMEs in deprived areas find it harder to access finance? Evidence from the UK Small Business Survey, *Entrepreneurship and Regional Development*, 26: 337-356.
- Lee, N., Sameen, H., Cowling, M., (2015), Access to finance for innovative SMEs since the financial crisis, *Research Policy*, 44: 370-380.
- Leyshon, A., French, S., Signoretta, P., (2008), Financial exclusion and the geography of bank and building society branch closure in Britain, *Transactions of the Institute of British Geographers*, 33: 447–465.
- Liberti, J.M. (2004), *Initiative, incentives, and soft information: How does delegation impact the role of bank relationship managers?*, Mimeo, London Business School, IFA Working Paper 404.
- Matthews, K., Thompson, J., (2008) *The Economics of Banking*. Chichester, Wiley, second edition.
- Mester, L., (1997), What's the point of credit scoring?, *Federal Reserve Bank of Philadelphia Business Review*, September/October, 3–16.
- Marthon, Vik, P., (2014), The demise of the bank branch manager: The depersonalisation and disembedding of modern British banking, PhD thesis, University of Salford
- Nachtsheim, C. J., Neter, J., Kutner, M. H., Wasserman, W., (2004) *Applied linear regression models*. McGraw-Hill Irwin.
- OECD (2015) *Opportunities and constraints of market-based financing for SMEs. OECD report to G20 finance ministers and central Bank Governors*, OECD:Paris.
- Ongena, S., Popov, A., Udell, G., (2013), When the cat's away the mice will play: Does regulation at home affect bank risk-taking abroad?, *Journal of Financial Economics*, 18: 727-750.
- Petersen, M.A., (2004), Information: Hard and soft, Mimeo, Northwestern University.
- Petersen, M.A., Rajan, G. R., (2000), Does distance still matter? The information revolution in small business lending, *Journal of Finance*, 57: 2533-2570.
- Pirinsky, C., Wang, Q., (2010), Geographic location and corporate finance: A review, In: Tourani-Rad, A. and Ingley, C.(eds) *Handbook of Emerging Issues in Corporate Governance*. Singapore: World Scientific Publishing.
- Pollard, J., (2003), Small firm finance and economic geography, *Journal of Economic Geography*, 3: 429–452.
- Pollard, J., (2007), Making money, (re)making firms: Microbusiness financial networks in Birmingham's Jewellery Quarter, *Environment and Planning A*, 39: 378-397.
- Popov, A., Udell, G.F., (2012), Cross-border banking, credit access, and the financial crisis, *Journal of International Economics*, 87: 147–161

- Pratt, D.J., (1998), Re-placing money: The evolution of branch banking in Britain, *Environment and Planning A*, 30: 2211-2226.
- Presbitero, A. F., Udell, G. F., Zazzaro, A., (2014), The home bias and the credit crunch: A regional perspective, *Journal of Money, Credit and Banking*, 46(S1), 53–86.
- Prilmeier, R., (2011), The structuring of financial covenants when lenders acquire soft information, available online at: <http://fisher.osu.edu/supplements/10/10869/Structuring-Financial.pdf>.
- Rajan, R., (1992), Insiders and outsiders: The choice between informed and arm's length debt, *Journal of Finance*, 47: 1367–400.
- Rajan, R., Zingales, L., (1998), Financial dependence and growth, *American Economics Review*, 88: 393–410.
- Rajan, R., Zingales, L., (2003), The great reversals: The politics of financial development in the twentieth century, *Journal of Financial Economics*, 69: 5–50.
- Ruckes, M., (2004), Bank competition and credit standards, *Review of Financial Studies*, 17: 1073–1102.
- Sidaway, J., Pryke, M., (2000), The strange geographies of “emerging markets”, *Transactions of the Institute of British Geographers*, 25: 187–201
- Shaffer, S., (1998), The winner's curse in banking, *Journal of Financial Intermediation*, 7: 359–392.
- Sokol, M., (2013), Towards a ‘newer’ economic geography? Injecting finance and financialisation into economic geographies, *Cambridge Journal of Regions, Economy and Society*, 6: 501–515.
- Solon, G., Haider, S. J., Wooldridge, J. M., (2015), ‘What are we weighting for?’, *Journal of Human Resources*, 50(2), 301-316.
- Stein, J., (2002), Information production and capital allocation: Decentralized versus hierarchical firms, *Journal of Finance*, 57: 1891-1921.
- Stiglitz, J., Weiss, A., (1981), Credit rationing in markets with imperfect information, *American Economic Review*, 71 (3), 393–410.
- Storey, D., (1994). *Understanding the Small Business Sector*. Routledge, London.
- Temin, P., (2010), The great recession and the great depression, Working Paper 15645, National Bureau of Economic Research.
- The Scottish Government (2013) Sustainable, Responsible Banking: A strategy for Scotland. Edinburgh 2013

Ter Wal, A.L.J, Boschma, R.A., (2009), Applying social network analysis in economic geography: Theoretical and methodological issues, *Annals of Regional Science*, 43: 739–756.

Udell, G.F., (2009), Financial innovation, organizations, and small business lending, In: Alessandrini P. Fratianni. M. and Zazzaro A (eds) *The Changing Geography of Banking and Finance*. New York: Springer, 15–26.

Uzzi, B.. (1999), Social relations and networks in the making of financial capital, *American Sociological Review*, 64: 481-505.

Uzzi, B., Lancaster, R., (2003), Relational embeddedness and learning: The case of bank loan managers and their clients, *Management Science*, 49: 383-399.

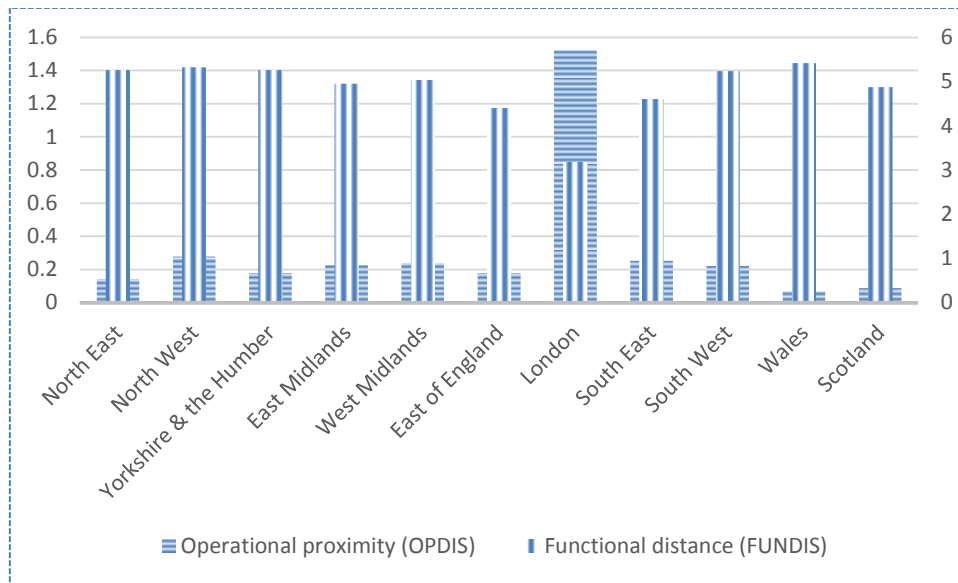
Vos, E., Jia-Yuh Yeh, A., Carter, S., Tagg, S., (2007), The happy story of small business financing, *Journal of Banking and Finance*, 31: 2648–2672.

Williamson, O., (1988), Corporate finance and corporate governance, *Journal of Finance*, 43: 567-91.

Wooldridge, J., (2009) *Introductory Econometrics– International Edition*, South Western Cengage Learning, 4th Edition

Zazzaro, A., (1997), Regional banking systems, credit allocation and regional economic development, *Economie Appliquee*, 1: 51–74.

Chart 1: Average main variables of interest by economic regions



Average value of each indicator for 2008-2011. The y-axis for operational proximity (OPDIS) is on the left-hand side and for functional distance (FUNDIS) is on the right-hand side. Definitions of variables are in Table 1.

Table 1: A summary of the name and definition of variables.

Name of the variables	Definition of the variable
Dependent variables	
<i>overconstraint_i</i>	Constrained access to bank overdraft in last 12 months
<i>loanconstraint_i</i>	Constrained access to bank loan in last 12 months
Independent variables	
<i>region_{ir}</i>	The economic region where the SME is located
<i>OPDIS_{ir}</i>	The operational proximity of the economic region where the SME is located
<i>FUNDIS_{ir}</i>	The functional distance of the economic region where the SME is located
<i>risk_κ</i>	4 categorical dummies for Dun & Bradstreet risk rating of the SME, namely, “Minimal”, “Low”, “Average” and “Above average”
<i>profit_τ</i>	3 categorical dummies for the net profit or loss of the SME during last financial period, namely, “Profit”, “Loss”, and “Break even”.
<i>delinq</i>	a dummy variables which take value 1 if the respondent have missed a loan repayment and went into unauthorised overdraft on its account in the last 12 months, and zero otherwise
<i>industry_i</i>	9 categorical dummies for the principal activity of the SME, namely, Agriculture, Hunting and Forestry, Fishing”, “Manufacturing”, “Construction”, “Wholesale / Retail”, “Hotels and Restaurants”, “Transport, Storage and Communication”, “Real Estate, Renting and Business Activities”, “Health and Social Work”, and “Other Community, Social and Personal Service Activities”
<i>growth_i</i>	5 categorical dummies for SMEs’ business growth plan over the next year, namely, “Grow substantially”, “Grow moderately”, “Stay the same size”, “Become smaller”, and “Sell pass on or close the business”
<i>genderowner</i>	3 categorical dummies for the gender of the owner / managing or leading partner / shareholder of the SME, namely, “Male”, “Female”, or “Male and female”
<i>ageowner_i</i>	4 categorical dummies for the age of the owner / managing or leading partner / shareholder of the SME, namely, “18-30”, “31-50”, “51-65” and “66+”
<i>size_ε</i>	6 categorical dummies for the number of employees of the SME, namely, “zero employees”, “1-9 employees”, “10-49 employees”, “50-99 employees”, “100-199 employees”, and “200-249 employees”
<i>legalform_i</i>	4 categorical dummies for the legal status of the SME, namely, “Sole Proprietorship”, “Partnership”, “Limited Liability Partnership (LLP)”, and “Limited Liability Company”
<i>applicstatus_i</i>	4 categorical dummies for the application status of bank credit, namely, “First time application”, “New but not first time”, “Renewal ” and “Reduction”
<i>WAVE_t</i>	9 dummies for the time when the survey was conducted, referring to the 3rd to the 12nd wave, respectively.

Table 2: Regional-specific impact on bank credit constraints

	1	2
Dependent variable	Overconstraint _i	Loanconstraint _i
<i>region_{it}</i> (reference category: East of England)		
East Midlands	0.178*** (0.058)	0.133*** (0.052)
London	0.111** (0.055)	0.076** (0.037)
North West	0.114*** (0.043)	-0.009 (0.034)
North/North East	0.157** (0.068)	-0.026 (0.040)
Scotland	0.013 (0.059)	-0.068 (0.098)
South East	0.007 (0.048)	-0.018 (0.038)
South West	0.001 (0.046)	0.054 (0.044)
Wales	0.166** (0.067)	0.226*** (0.047)
West Midlands	0.024 (0.044)	0.085** (0.037)
Yorkshire/Humberside	0.028 (0.041)	0.163** (0.066)
<i>risk_{it}</i> (reference category: Minimal)		
Low	0.071 (0.051)	-0.019 (0.046)
Average	0.019 (0.048)	0.081* (0.046)
Above Average	0.059 (0.037)	0.152*** (0.037)
<i>applicant_{it}</i> (reference category: First time applicant)		
new	-0.196*** (0.044)	-0.067** (0.034)
reduction	-0.105 (0.077)	-0.309*** (0.100)
renewal	-0.478*** (0.037)	-0.304*** (0.058)
<i>delinq</i> (reference category: no event of delinquency)	0.093*** (0.021)	0.215*** (0.046)
<i>WAVE_{it}</i> (reference category: W3,Q4 2011)		
W4 - Q1 2012	-0.063 (0.044)	-0.127** (0.054)
W5 - Q2 2012	-0.011 (0.056)	-0.238*** (0.083)
W6 - Q3 2012	0.045 (0.053)	-0.046 (0.059)
W7 - Q4 2012	0.000 (0.051)	-0.088 (0.060)

W8 - Q1 2013	0.068 (0.058)	-0.006 (0.081)
W9 - Q2 2013	0.021 (0.064)	-0.020 (0.057)
W10 - Q3 2013	0.027 (0.053)	0.103 (0.069)
W11 - Q4 2013	0.032 (0.061)	-0.086 (0.084)
W12 - Q1 2014	0.040 (0.056)	0.015 (0.060)
<i>profit_i</i> (reference category: Profit)		
Loss	0.056** (0.026)	0.103** (0.048)
Broke even	0.021 (0.031)	0.102** (0.051)
<i>size_i</i> (reference category: Zero employees)		
1-9	-0.007 (0.027)	-0.001 (0.029)
10-49	-0.088*** (0.030)	-0.093* (0.049)
50-99	-0.143*** (0.038)	-0.199*** (0.058)
100-199	-0.171*** (0.043)	-0.169** (0.069)
200-249	-0.143** (0.072)	-0.076 (0.098)
<i>industry_i</i> (reference category: Agriculture, Hunting and Forestry, Fishing)		
Manufacturing	-0.002 (0.047)	0.122 (0.123)
Construction	0.062* (0.036)	0.183** (0.087)
Wholesale / Retail	0.064 (0.044)	0.114 (0.105)
Hotels and Restaurants	0.185*** (0.049)	0.163* (0.095)
Transport, Storage and Communication	0.117** (0.047)	0.072 (0.088)
Real Estate, Renting and Business Activities	0.058 (0.039)	0.090 (0.080)
Health and Social Work	0.106** (0.052)	0.107 (0.097)
Other Community, Social and Personal Service Activities	0.066 (0.067)	0.123 (0.094)
<i>legalform_i</i> (reference category: Sole Proprietorship)		
Partnership	-0.092*** (0.034)	-0.064 (0.070)
Limited Liability Partnership	-0.110*** (0.033)	0.031 (0.077)
Limited Liability Company	0.001 (0.023)	0.013 (0.034)
<i>ageowner_i</i> (reference category: 18-30)		

31-50	-0.029 (0.059)	-0.042 (0.099)
51-65	0.026 (0.043)	-0.075 (0.081)
66+	-0.038 (0.052)	-0.329** (0.133)
<i>genderown_{it}</i> (reference category: Male)		
Female	-0.067** (0.032)	-0.076 (0.048)
Both (joint partners)	0.047 (0.075)	-0.172** (0.075)
<i>growth_{it}</i> (reference category: Grow substantially)		
Grow moderately	0.039 (0.033)	-0.028 (0.071)
Stay the same size	0.000 (0.040)	-0.150** (0.066)
Become smaller	0.060 (0.061)	0.103 (0.137)
Sell pass on or close the business	0.034 (0.049)	0.054 (0.079)
Subpop. no. of obs	3928	2155
Subpop. Size (1000s)	206.137	108.830
Design df	55	55
Prob > F	0.000	0.000

*Note: the second row indicates the dependent variable used in the probit model. The probit model is estimated with the standard errors being clustered at the size*region level. The estimation utilizes the weight provided by SME Finance Monitor. Figures reported are average marginal effects. The figures in bracket are linearized standard errors allowing for sampling of covariates. Column 1 reports the presence of the constrains in accessing bank overdraft for SMEs located 11 economic regions in England, Scotland and Wales. Column 2 reports the presence of the constrains in accessing bank loans for SMEs located 11 economic regions in England, Scotland and Wales. ***, **, and * refer to the significant level of 1%, 5% and 10%, respectively. A summary of the definition of all variables is presented in Table 1.*

Table 3: The impact of regional-specific distance on bank credit constraints

	1	2	3	4
Dependent variable	overconstraint _i	Loanconstraint _i	overconstraint _i (excluding London)	loanconstraint _i (excluding London)
<i>OPDIS</i> _{ir} (No. branch per square kilometre)	0.171*** (0.061)	0.157** (0.065)	-0.085 (0.225)	-0.224 (0.351)
<i>FUNDIS</i> _{ir} (lnmile)	0.096** (0.042)	0.101** (0.048)	0.096** (0.039)	0.103** (0.044)
<i>risk</i> _γ (reference category: Minimal)				
Low	0.069 (0.054)	-0.004 (0.043)	0.057 (0.060)	-0.002 (0.054)
Average	0.011 (0.046)	0.098** (0.043)	0.004 (0.052)	0.114** (0.047)
Above Average	0.054 (0.037)	0.156*** (0.038)	0.038 (0.039)	0.188*** (0.047)
<i>applicsta</i> _{us} (reference category: First time applicant)				
new	-0.196*** (0.047)	-0.073** (0.035)	-0.180*** (0.054)	-0.079** (0.042)
reduction	-0.128* (0.075)	-0.309*** (0.101)	-0.171** (0.069)	-0.221** (0.094)
renewal	-0.486*** (0.040)	-0.309*** (0.058)	-0.489*** (0.045)	-0.249*** (0.058)
<i>delinq</i> (reference category: no event of delinquency)	0.090*** (0.021)	0.218*** (0.043)	0.087*** (0.025)	0.204*** (0.046)
<i>WAVE</i> _t (reference category: W3,Q4 2011)				
W4 - Q1 2012	-0.063 (0.046)	-0.139** (0.058)	-0.069 (0.047)	-0.113* (0.065)
W5 - Q2 2012	-0.007 (0.059)	-0.233*** (0.084)	-0.017 (0.061)	-0.277*** (0.090)
W6 - Q3 2012	0.042 (0.052)	-0.050 (0.061)	0.033 (0.058)	-0.085 (0.062)
W7 - Q4 2012	-0.002 (0.055)	-0.082 (0.062)	0.027 (0.055)	-0.080 (0.068)
W8 - Q1 2013	0.068 (0.057)	-0.016 (0.083)	0.069 (0.059)	0.004 (0.094)
W9 - Q2 2013	0.017 (0.064)	-0.021 (0.062)	-0.010 (0.065)	-0.047 (0.075)
W10 - Q3 2013	0.035 (0.051)	0.100 (0.071)	0.074* (0.039)	0.076 (0.081)
W11 - Q4 2013	0.032 (0.062)	-0.087 (0.086)	0.040 (0.063)	-0.069 (0.093)
W12 - Q1 2014	0.040 (0.055)	0.022 (0.060)	0.046 (0.055)	-0.033 (0.041)
<i>profit</i> _t (reference category: Profit)				
Loss	0.060** (0.026)	0.089** (0.043)	0.069** (0.029)	0.110** (0.047)
Broke even	0.023 (0.034)	0.093* (0.054)	0.012 (0.034)	0.083 (0.060)

<i>size_q</i> (reference category: Zero employees)				
1-9	-0.013 (0.035)	-0.009 (0.038)	0.011 (0.031)	-0.034 (0.043)
10-49	-0.092** (0.038)	-0.101** (0.042)	-0.073** (0.035)	-0.106** (0.046)
50-99	-0.146*** (0.047)	-0.207*** (0.051)	-0.115** (0.049)	-0.255*** (0.043)
100-199	-0.180*** (0.047)	-0.179*** (0.057)	-0.143*** (0.046)	-0.194*** (0.066)
200-249	-0.150** (0.071)	-0.091 (0.090)	-0.092 (0.064)	-0.103 (0.109)
<i>industry_i</i> (reference category: Agriculture, Hunting and Forestry, Fishing)				
Manufacturing	0.006 (0.050)	0.122 (0.124)	0.031 (0.051)	0.116 (0.129)
Construction	0.066* (0.036)	0.179** (0.086)	0.086** (0.041)	0.189** (0.083)
Wholesale / Retail	0.068 (0.046)	0.112 (0.112)	0.083* (0.048)	0.107 (0.115)
Hotels and Restaurants	0.187*** (0.052)	0.160 (0.098)	0.190*** (0.053)	0.133 (0.099)
Transport, Storage and Communication	0.118*** (0.044)	0.091 (0.090)	0.137*** (0.052)	0.037 (0.105)
Real Estate, Renting and Business Activities	0.062 (0.039)	0.102 (0.083)	0.077* (0.045)	0.047 (0.079)
Health and Social Work	0.111** (0.050)	0.127 (0.102)	0.082 (0.052)	0.170 (0.107)
Other Community, Social and Personal Service Activities	0.080 (0.072)	0.139 (0.102)	0.100 (0.075)	0.109 (0.108)
<i>legalform_i</i> (reference category: Sole Proprietorship)				
Partnership	-0.102*** (0.032)	-0.059 (0.070)	-0.096*** (0.032)	-0.067 (0.074)
Limited Liability Partnership	-0.119*** (0.037)	0.048 (0.079)	-0.109*** (0.040)	0.112 (0.075)
Limited Liability Company	-0.005 (0.024)	0.026 (0.033)	-0.020 (0.022)	0.039 (0.036)
<i>ageowner_i</i> (reference category: 18-30)				
31-50	-0.035 (0.058)	-0.052 (0.097)	-0.056 (0.065)	0.010 (0.086)
51-65	0.019 (0.042)	-0.105 (0.079)	0.003 (0.047)	-0.067 (0.066)
66+	-0.058 (0.051)	-0.360*** (0.125)	-0.073 (0.053)	-0.266*** (0.103)
<i>genderowner_q</i> (reference category: Male)				
Female	-0.064* (0.033)	-0.068 (0.051)	-0.053* (0.028)	-0.102** (0.043)
Both (joint partners)	0.059 (0.078)	-0.164** (0.074)	0.047 (0.079)	-0.131* (0.076)
<i>growth_i</i> (reference category: Grow substantially)				
Grow moderately	0.043 (0.033)	-0.021 (0.071)	0.015 (0.031)	-0.107* (0.060)

Stay the same size	0.004 (0.039)	-0.141** (0.068)	-0.035 (0.038)	-0.194*** (0.070)
Become smaller	0.075 (0.064)	0.134 (0.135)	0.104 (0.070)	0.050 (0.116)
Sell pass on or close the business	0.038 (0.050)	0.077 (0.075)	0.004 (0.051)	0.011 (0.072)
Subpop. no. of obs	3928	2155	3540	1900
Subpop. Size (1000s)	206.137	108.830	178.358	90.383
Design df	55	55	50	50
Prob > F	0.000	0.000	0.000	0.000

*Note: the second row indicates the dependent variable used in the probit model. The probit model is estimated with the standard errors being clustered at the size*region level. The estimation utilizes the weight provided by SME Finance Monitor. Figures reported are average marginal effects. The figures in bracket are linearized standard errors allowing for sampling of covariates. Column 1 reports the presence of the constraints in accessing bank overdraft for SMEs located 11 economic regions in England, Scotland and Wales. Column 2 reports the presence of the constraints in accessing bank loans for SMEs located 11 economic regions in England, Scotland and Wales. Column 3 and 4 reports the presence of the constraints in accessing bank overdraft and bank loans for SMEs located 10 regions with London being excluded. ***, **, and * refer to the significant level of 1%, 5% and 10%, respectively. A summary of the definition of all variables is presented in Table 1.*

Table 4: Regional-specific impact on bank credit constraints with the amount of bank credit applied being controlled

	1	2
Dependent variable	Overconstraint _i	Loanconstraint _i
<i>region</i> (reference category: East of England)		
East Midlands	0.187*** (0.056)	0.098*** (0.037)
London	0.113** (0.056)	0.074** (0.029)
North West	0.125*** (0.047)	-0.071** (0.031)
North/North East	0.169*** (0.064)	-0.070 (0.052)
Scotland	0.024 (0.060)	-0.067 (0.079)
South East	0.021 (0.048)	-0.067** (0.029)
South West	0.004 (0.045)	0.012 (0.031)
Wales	0.180*** (0.063)	0.199*** (0.040)
West Midlands	0.031 (0.044)	0.042 (0.031)
Yorkshire/Humberside	0.042 (0.042)	0.118* (0.062)
Subpop. no. of obs	3507	1915
Subpop. Size (1000s)	193.807	100.488

*Note: the table contains estimated results for equation (1) with the additional control for the amount of bank credit applied. The second row indicates the dependent variable used in the probit model. The probit model is estimated with the standard errors being clustered at the size*region level. The estimation utilizes the weight provided by SME Finance Monitor. Figures reported are average marginal effects. The figures in bracket are linearized standard errors allowing for sampling of covariates. Column 1 reports the presence of the constrains in accessing bank overdraft for SMEs located 11 economic regions in England, Scotland and Wales. Column 2 reports the presence of the constrains in accessing bank loans for SMEs located 11 economic regions in England, Scotland and Wales. ***, **, and * refer to the significant level of 1%, 5% and 10%, respectively. For the sake of space, only the estimated marginal effect on the regional dummies is reported, although all other variables reported in Table 2 have been included in the estimation. A summary of the definition of all variables is presented in Table 1.*

Table 5: The impact of regional-specific distance on bank credit constraint: with the amount of bank credit applied being controlled

	1	2	3	4
Dependent variable	overconstraint _i	Loanconstraint _i	overconstraint _i (excluding London)	loanconstraint _i (excluding London)
<i>OPDIS_{ir}</i> (No. branch per square kilometre)	0.172*** (0.063)	0.132** (0.066)	-0.065 (0.229)	-0.447 (0.300)
<i>FUNDIS_{ir}</i> (lnmile)	0.100** (0.043)	0.067 (0.050)	0.103** (0.040)	0.077* (0.042)
Subpop. no. of obs	3507	1915	3146	1689
Subpop. Size (1000s)	193.807	100.488	166.456	83.528

*Note: the table contains results of equation (2) with the amount of bank credit applied as the additional control. The second row indicates the dependent variable used in the probit model. The probit model is estimated with the standard errors being clustered at the size*region level. The estimation utilizes the weight provided by SME Finance Monitor. Figures reported are average marginal effects. The figures in bracket are linearized standard errors allowing for sampling of covariates. Column 1 reports the presence of the constraints in accessing bank overdraft for SMEs located 11 economic regions in England, Scotland and Wales. Column 2 reports the presence of the constraints in accessing bank loans for SMEs located 11 economic regions in England, Scotland and Wales. Column 3 and 4 reports the presence of the constraints in accessing bank overdraft and bank loans for SMEs located 10 regions with London being excluded. ***, **, and * refer to the significant level of 1%, 5% and 10%, respectively. For the sake of space, only the estimated marginal effect on the main variables of interest is reported, although all other variables reported in Table 3 have been included in the estimation. A summary of the definition of all variables is presented in Table 1.*

Table 6: The impact of regional-specific distance on bank credit constraint: two-step Heckman procedure

Panel A:	1	2	3	4
Dependent variable	Overconstraint _i	Loanconstraint _i	Demand for external finance (Y/N)	Demand for external finance (Y/N)
<i>region</i> (reference category: East of England)				
East Midlands	0.135*** (0.039)	0.273*** (0.086)	-0.098*** (0.031)	0.023 (0.046)
London	0.093*** (0.025)	0.129** (0.059)	-0.069** (0.035)	-0.041 (0.085)
North West	0.211*** (0.059)	0.175*** (0.065)	-0.048** (0.024)	-0.005 (0.053)
North/North East	0.180*** (0.042)	0.214* (0.111)	-0.142*** (0.046)	0.051 (0.055)
Scotland	0.014 (0.051)	0.090 (0.065)	-0.055 (0.035)	0.054 (0.069)
South East	0.017 (0.027)	0.065 (0.071)	0.042** (0.017)	0.095* (0.053)
South West	-0.039 (0.029)	0.126* (0.074)	0.029 (0.055)	-0.009 (0.071)
Wales	0.251*** (0.043)	0.218* (0.133)	-0.202*** (0.060)	-0.045 (0.114)
West Midlands	0.004 (0.043)	0.030 (0.076)	0.020 (0.031)	0.085 (0.066)
Yorkshire/Humberside	0.036 (0.054)	0.156* (0.088)	0.031 (0.037)	-0.045 (0.047)
Subpop. no. of obs	2,039	1,108	2,039	1,108
Subpop. Size (1000s)	106.308	57.667	106.308	57.667
Panel B:	1	2	3	4
Dependent variable	overconstaint _i	Loanconstraint _i	overconstraint _i (excluding London)	loanconstraint _i (excluding London)
<i>OPDIS</i> _{ir} (No. branch per square kilometre)	0.210*** (0.054)	0.246*** (0.067)	-0.045 (0.246)	-0.071 (0.292)
<i>FUNDIS</i> _{ir} (lnmile)	0.137*** (0.045)	0.174*** (0.049)	0.141*** (0.047)	0.187*** (0.048)
Subpop. no. of obs	2,039	1,108	1,834	961
Subpop. Size (1000s)	106.308	57.668	92.477	46.147

Note: the table contains estimated results via a two-step Heckman procedure where the first-step is to correct for the selection bias in the demand for external finance dependent on unobservables. Results of equation (1) are reported in Panel A and results of equation (2) are reported in Panel B. The heckman probit model is estimated with the standard errors being clustered at the size*region level. The estimation utilizes the weight provided by SME Finance Monitor. Figures reported are average marginal effects. The figures in bracket are linearized standard errors allowing for sampling of covariates. For Panel A, column 1 reports the results of the presence of bank overdraft constraints and column 2 reports the results of the presence of bank loan constraints.

*As far as column 3 and 4 are concerned, it contains results for the first-step probit estimates for the presence of positive demand for external finance. The exclusion restrictions used in the two-step Heckman procedure are answers towards whether the owner/any of partners/ the majority shareholder belongs to any business groups or industry bodies (i.e. SOCIAL), and that whether the person in charge of the financial management within the business has a finance qualification or has undertaken financial training (i.e. LITERACY). Regarding Panel B, column 1 reports the presence of constraints in accessing bank overdraft for SMEs located 11 economic regions in England, Scotland and Wales. Column 2 reports the presence of the constraints in accessing bank loans for SMEs located 11 economic regions in England, Scotland and Wales. Column 3 and 4 reports the presence of the constraints in accessing bank overdraft and bank loans for SMEs located 10 regions with London being excluded. ***, **, and * refer to the significant level of 1%, 5% and 10%, respectively. For the sake of space, only the estimated marginal effect on the main variables of interest is reported, although all other variables reported in Table 2 (for Panel A) and 3 (for Panel B) have been included in the estimation. A summary of the definition of all variables is presented in Table 1.*

Table 7: The impact of regional-specific distance on bank credit constraints: with the additional regional-specific controls.

	1	2	3	4
Dependent variable	overconstraint _i	Loanconstraint _i	overconstraint _i (excluding London)	loanconstraint _i (excluding London)
Panel A: with the additional controls for regional-specific HHI index, the movement in regional house prices, and t only the change rate in the GVA of regional non-financial business economy (probit)				
<i>OPDIS</i> _{ir} (No. branch per square kilometre)	0.144* (0.076)	0.167*** (0.058)	-0.141 (0.306)	-0.088 (0.269)
<i>FUNDIS</i> _{ir} (lnmile)	0.111*** (0.043)	0.104*** (0.041)	0.102** (0.041)	0.089** (0.042)
HHI index _{ir}	0.574 (0.782)	1.689** (0.901)	-0.129 (1.090)	0.991 (0.968)
GVA change rate _{ir}	0.002 (0.002)	-0.011*** (0.003)	0.004* (0.002)	-0.011*** (0.003)
Halifax price index change rate _{ir}	-0.025*** (0.009)	-0.018* (0.011)	-0.021** (0.010)	-0.015 (0.003)
Subpop. no. of obs	3928	2155	3540	1900
Subpop. Size (1000s)	206.137	108.830	178.358	90.383

Panel B: with the additional controls for regional-specific HHI index, the movement in regional house prices, and t the change rate in the GVA of regional non-financial business economy (Heck probit)				
<i>OPDIS</i> _{ir} (No. branch per square kilometre)	0.158** (0.070)	0.227*** (0.083)	-0.161 (0.270)	-0.256 (0.301)
<i>FUNDIS</i> _{ir} (lnmile)	0.175*** (0.047)	0.178*** (0.055)	0.163*** (0.048)	0.157*** (0.049)
HHI index _{ir}	0.357 (0.917)	0.384 (1.222)	-0.452 (0.944)	-0.902 (1.479)
GVA change rate _{ir}	0.009** (0.003)	0.001 (0.005)	0.011*** (0.003)	0.002 (0.006)
Halifax price index change rate _{ir}	-0.045*** (0.010)	-0.013 (0.021)	-0.038*** (0.012)	-0.008 (0.021)
Subpop. no. of obs	2,039	1,108	1,834	961
Subpop. Size (1000s)	106.308	57.668	92.477	46.147

Panel C: with the additional controls for the amount of bank credit applied and regional-specific HHI index, the movement in regional house prices, and t the change rate in the GVA of regional non-financial business economy (probit)				
<i>OPDIS</i> _{ir} (No. branch per square kilometre)	0.144* (0.078)	0.166*** (0.045)	-0.148 (0.300)	-0.219 (0.281)
<i>FUNDIS</i> _{ir} (lnmile)	0.116*** (0.045)	0.079** (0.038)	0.109** (0.043)	0.065* (0.036)

HHI index _{it}	0.501 (0.769)	2.426*** (0.812)	-0.252 (1.023)	1.395 (1.038)
GVA change rate	0.003 (0.002)	-0.012*** (0.004)	0.004* (0.002)	-0.012*** (0.003)
Halifax price index change rate	-0.025*** (0.009)	-0.021* (0.011)	-0.020** (0.010)	-0.016 (0.013)
Subpop. no. of obs	3507	1915	3146	1689
Subpop. Size (1000s)	193.807	100.488	166.456	83.528

*Note: the table contains results of the robustness tests for equation (2). Panel A reports the results of probit model for the presence of bank credit constraints with regional-specific HHI index, the movement in regional house prices, and the change rate in the GVA of regional non-financial business economy as the additional controls. Panel B reports the results of two-step Heckman procedure with regional-specific HHI index, the movement in regional house prices, and the change rate in the GVA of regional non-financial business economy as the additional controls. The exclusion restrictions used for the presence of positive demand for external finance are answers towards whether the owner/any of partners/ the majority shareholder belongs to any business groups or industry bodies (i.e. SOCIAL), and that whether the person in charge of the financial management within the business has a finance qualification or has undertaken financial training (i.e. LITERACY). Panel C reports the results of probit model for the presence of bank credit constraints with the additional controls for the regional-specific HHI index, the movement in regional house prices, and the change rate in the GVA of regional non-financial business economy and the amount of bank credit applied. The second row indicates the dependent variable used in the probit model for the presence of bank credit constraints. The probit model is estimated with the standard errors being clustered at the size*region level. The estimation utilizes the weight provided by SME Finance Monitor. Figures reported are average marginal effects. The figures in bracket are linearized standard errors allowing for sampling of covariates. Column 1 reports the presence of constrains in accessing bank overdraft for SMEs located 11 economic regions in England, Scotland and Wales. Column 2 reports the presence of the constraints in accessing bank loans for SMEs located 11 economic regions in England, Scotland and Wales. Column 3 and 4 reports the presence of the constraints in accessing bank overdraft and bank loans for SMEs located 10 regions with London being excluded. ***, **, and * refer to the significant level of 1%, 5% and 10%, respectively. For the sake of space, only the estimated marginal effect on the main variables of interest is reported, although all other variables reported in Table 3 are included in the estimation.*