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Does Local Bank Structure Influence Access to Finance? Evidence from Online Mapping

By *Neil Lee and Raffaella Calabrese*

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WP N° 18-013

3rd Quarter 2018

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Abstract

The UK has experienced significant declines in the number of bank branches, particularly in less affluent areas. At the same time, there are widespread concerns that funding gaps faced by SMEs may be hindering economic development efforts. Does the structure of local banking influence access to finance? This paper addresses this question using a unique dataset of bank branches in England and Wales, taken from an online mapping database and linked to a large-scale survey of firm finances. First, we present new evidence on the geography of credit institutions which offer business finance, showing that while richer and denser areas tend to have more banks per capita, there is significant local variation. Second, we relate this to access to finance amongst local firms and show that, correcting for selection bias and a range of firm and local level controls, firms in areas with more bank branches are more likely to successfully obtain finance. In contrast, bank diversity - proxied through the share of branches which are the 'big four' banks - does not matter. Our results suggest that, despite rapid technological change, local banking markets still matter.

Keywords: Finance, SMEs, bank structure, diversity, peripheral regions
JEL classifications: M13, 031, R30

1. Introduction

The past twenty years have seen pronounced changes in banking. Bank branch networks have declined in many countries, partly due to long-term restructuring but also as a result of the financial crisis (Edmonds, 2018). This decline has been geographically biased: the bank branch network has often been retained in more affluent parts of the country, with the sharpest decline in less developed, more peripheral areas (Leyshon and Thrift, 1994; 1995; French et al., 2008). At the same time, the way in which banks provide lending – the lending technologies which connect borrower and lender – have changed (see Berger and Udell, 2006). The traditional form of relationship banking - where banks try and engage clients over the long term, sharing soft-information - has declined. Instead, lending decisions are increasingly made by automated lending technologies which use algorithms to evaluate a firm balance sheet based solely on the basis of hard information. These two related changes, one geographical and one technological, have increased the distance between SMEs and their lenders (Petersen and Rajan, 2002; Degryse and Ongena, 2005).

Some argue that the latter change, new lending technologies, means that the changing geography of bank branches doesn't matter (see Alessandrini et al., 2009 for examples). Yet there is growing evidence suggesting that access to finance varies geographically (Lee and Luca, 2018), with important consequences for economic development. In her seminal paper, Pollard (2003) argued that small firm finance was an important, but often overlooked factor underpinning regional inequality, and since then there has been a growing recognition that access to finance both reinforces and reflects regional disparities. Work has long shown that equity finance has a pronounced spatial bias (Clark, 2005; Mason and Pierrakis, 2013), and more recent econometric work has focused on debt finance, finding that access to finance varies geographically for firms in general (Zhao and Jones-Evans, 2017; Brown et al. 2018), but specifically for innovative firms (Lee and Brown, 2017; Cowling et al., 2018; Siepel, 2018).

However, these studies have tended to focus on organisational structure at the bank level. For example, Zhao and Jones-Evans (2017) find convincing evidence that the interaction of bank organisation structure and geography matters, in that functional distance between banks and their headquarters exacerbates funding gaps. Fewer, if any, studies, have considered the question of whether the density and diversity of credit institutions at a local level matter. In part, this is because it countries such as the UK lack comprehensive and easily available data

on banking structure. Studies have used data at the highly-aggregate regional level (Zhao and Jones-Evans, 2017) or relatively blunt local level indicators (Lee and Drever, 2015). This is an important omission for policy and research. Bank branch networks have been declining in the UK, in response to technological change, efforts to cut costs and a post-crisis consolidation of branches. The decline has been particularly acute in local areas with weaker economies, meaning that linked processes of finance and regional decline reinforce each other.

In this paper, we investigate the relationship between local banking structure - in particular the diversity and density of banking activity – and access to finance in England and Wales. Our primary research question is: does local banking structure influence access to finance? We answer this question using a new source of data on bank branches: the EDINA digimaps service produced by the Ordinance Survey, the UK's leading mapping agency. This contains a significant amount of information about the banks in each local area. We draw on literature from both economic geography (e.g. French et al., 2008; Leyshon et al., 2008) and that from the economics of finance (e.g. Canales and Nandha, 2012) to develop a framework for thinking about how local banking structure might influence access to finance for Small and Medium Sized Enterprises (SMEs). We then consider how applications and rejection rates vary for firms in different areas. The results suggest that local banking structure matters for access to finance: greater local diversity and extent of bank branches is associated with lower rejection rates for loans, even when controlling for a large number of firm level characteristics and probability of applying. However, we find no evidence that the share of 'big four' banks matters.

In doing so, the paper makes three contributions to the literature. First of all, we present new data on the extent of the business bank branch network and new measures of bank diversity in England and Wales. Secondly, we extend the literature on the geography of access to finance by focusing on bank branch diversity and density, developing a literature which has tended to focus on distance between headquarters and branches. Thirdly, we extend the literature on the importance of bank branches – commonly focused on personal banking (e.g. Henry et al., 2017) and extend it to focus on the implications for business banking. In doing so, we hope to turn attention away from 'high finance' to more everyday geographies of access to finance amongst more mundane firms (Pike and Pollard, 2010; Hall, 2012) and help develop understanding of how firm finance influences economic geography. As Pollard (2003: 442)

notes: “Firm finance is ‘integral to our understandings of firm behaviour, governance and strategy”. Our aim in this paper is to develop this understanding.

We focus on England and Wales for three reasons. First, it has a particularly interesting banking system. By international standards, it has a particularly centralised banking system (Hutton and Lee, 2014; Gärtner and Flögel, 2018; Cowling et al., 2018) and one which has experienced long-term shrinkage of the bank branch network. But while concentrated, the UK also has a relatively developed banking sector which is relatively competitive. Second, it has relatively large regional disparities, with regional banks being one suggested solution to this problem (Sensier, 2017). But the results have wider implications for countries experiencing declines in their bank branch network (Alamá and Tortosa-Ausina, 2012).

The remainder of the paper is structured as followed. In section 2, we review the literature on the geography of access to finance and develop a framework for why local bank diversity might aid access to finance. In section three, we present new data on the geography of business bank branches in England and Wales and relate this to geographical indicators. Section four presents a series of regression models which consider both demand for finance, in the form of applications for loans, and supply, success of those applications. Section five concludes with implications for theory and policy.

2. Framework: Demand, supply and local context

The question of whether a firm’s location influences their chances of obtaining finance is far from settled in the literature. In much mainstream finance, many hold the view that location will not matter (Petersen and Rajan, 2002). According to proponents of this position, the rise of lending technologies based on the internet mean that a firm can access finance without reaching a branch. Because lending decisions are made increasingly on the basis of hard information such as credit scores, geography is unimportant. There is a an of truth to this position, as firms are able to access finance from some sources regardless of their independence. But this argument is a partial one based on a limited view of firm behaviour. Instead, many studies suggest that location matters significantly for access to finance.

In our framework for thinking about the relationship between local banking and firm finance, we argue it is important to think about the *demand* for finance which comes from firms, the *supply* of finance which depends on the decision of banks or other institutions to offer credit, and the *matching* between firms and banks which partially determines the success of applications. While each stage tends to be modelled simply with reference to the firm or bank, all three stages are influenced significantly by local factors. In the following, we set out this argument for each stage, before reviewing empirical evidence.

Demand, supply and matching

The demand for finance will depend on whether the firm decides to seek finance and to whom they apply. In Myers and Majluf's (1984) classic 'pecking order theory' of finance, firms have a preference for internal funding, then debt and finally equity (the implication is that asymmetric information makes the less preferred two options more expensive). Firms will only apply for debt finance from banks if they lack internal capital and if the expected returns exceed the expected costs. But demand for finance from banks will also depend on the availability of other sources of finance, such as management loans, credit cards, and loans from family and friends. Because of this, the demand for finance has a large local element, independent of the basic characteristics of the firm: in richer places, entrepreneurs are likely to have greater collateral, family and friends may have more assets, and perceived returns are likely to be higher (Mason, 2013). Despite the availability of online banking, a significant minority of firms are reliant on bank branches – the data used for this paper suggests that in 2013 around 25% of firms do not bank online – and many others will rely on interpersonal contact in branches.

Both the likelihood of application and the quality of applications will vary locally. Firms are locally embedded in social networks, value chains and the economy (Taylor and Asheim, 2001). This embeddedness, and that of their management, will shape their decisions when applying for finance, with access to credit negotiated according to the interpersonal networks and place-specific expertise of the management of the firm (Pollard, 2003). Because of this, firms should not be seen as rational, calculating, independent actors, but groups of individuals working in the context of information failures and often 'borrowing' business models from each other (Taylor and Asheim, 2001; Clark and Monk, 2013). Uzzi (1999) shows how local cultures can develop around finance: firms network with each other locally, develop similar

attitudes and behaviours, share knowledge (correct or not), and so make similar applications In some areas, firms will only have local ties and so focus on local resources and options only; in others, broader social networks firms with both ties embedded in the local area but also those in other areas will access a broader range of providers of finance. In fact, most SMEs tend to be relatively inward looking and more mundane than they are sometimes portrayed (Nightingale and Coad, 2013). Most of these firms are locally embedded, making choices based on existing relationships with banks. Empirical evidence supports the view that networks are vital, as the applications of firms depends as much on their networks as 'objective' factors such as financial needs (Seghers et al., 2012).

The supply of capital depends on the decisions taken by banks about whether to approve or reject an application. This decision is complex, dependent on bank organisational structure, capital reserves, strategy and so on (Berger and Udell, 2006). One important factor is the degree of local autonomy: banks with centralised decision making may be forced to make decisions based on hard information such as credit scores and balance sheet information, transmitted electronically to a central decision making system. In contrast, smaller or more decentralised banks may have greater autonomy to make decisions locally (Flogel, 2017). This matters for certain classes of SME which are informationally opaque – such as start-ups or those seeking to finance innovative projects – as they may be penalised if they cannot prove their merit through hard information.

Having both a dense and diverse banking system may aid the matching of supply and demand for finance. Firms are better able to select a local bank most likely to offer them a loan with conditions they agree to. This allows improved specialisation, as in larger local lending markets banks will be able to offer specialised loan terms in a way they would not in areas with lower density. Secondly, there will be improved local competition between banks. Bank managers seeking to establish their own position may offer more competitive terms when they face other, nearby sources of credit. Greater diversity may also indicate a greater share of local banks, as some banks will predominantly serve local markets (Gärtner and Flogel, 2014). Small banks may be better at relationship lending than larger banks which may focus on other lending technologies (Berger and Black, 2011).

But density and diversity may also hinder the application processes of firms. A greater density of local banks may encourage firms to make more speculative applications, knowing

they have other local alternatives they can try. It may, paradoxically, reduce the extent to which firms build relationships locally: if firms are able to switch between local bank branches, this may prevent them from establishing long term relationships with bank managers. Banks are also embedded in local economies, with staff suffering similar difficulties in gathering information as firms (Flogel, 2017). So while there are potential benefits to a more diverse local banking sector, there are also potential costs.

Bank structure and access to finance: Empirical evidence

There are a number of studies which have focused on the influence of local bank characteristics on access to finance. The econometric literature on banking and access to finance has been preoccupied with distance. Degryse and Ongena (2005) use Belgian data to show that the closer the bank to the borrower, the lower the interest rate paid. Alessandrini et al. (2010) show that SMEs in Italian provinces which are functionally distant from the bank HQs are less likely to introduce new innovations. They use the concepts of functional distance, the distance between bank headquarters and branches, and operational distance, the distance between bank branches and borrowers. Using data for UK regions, Zhao and Jones-Evans (2017) show that while functional distance matters, their evidence on operational distance – of more interest to this paper – is more nuanced, with a relationship which is driven by London only. However, they only use regional variation for 12 regions.

Studies using qualitative methodologies have tended to support these views. As noted, Uzzi (1999) shows strong local embeddedness amongst borrowers, with this influencing the decision to apply. Flogel (2017) conducts participant observation at German banks. He challenges the influence of functional distance as a concept in the literature, arguing that the internal organisation of the bank means more complex concepts might be necessary. Instead, he argues that soft information allows the bank to contextualise the hard information they gain from sources such as rating agencies.

Studies in finance have also come to the conclusion that local banking structures matter. Berger et al. (2005) show that firms in US counties with more large banks found it harder to access finance than those near decentralised banks. Canales and Nandha (2012) show that where there are concentrated banking markets, decentralised banks are better able to choose firms – charging higher rates of interest for smaller loans. Local banking structure is also seen

as important for local economic development: Hakanes et al. (2014) show that German regions with more small banks grow faster.

In summary, there is growing evidence that local banking structure might matter in access to finance, but the literature has – to date – been preoccupied with notions of functional and operational distances. Yet, as Flogel (2017) argues, these are limited concepts which do not capture the complexity of banking provision. In this paper, we argue that two other measures of local banking structure – based on density and diversity of provision – may prove more fruitful. In the following section, we set out how we will test these potential determinants of firm access to finance.

3. Mapping local business banking

To map local banking market structures, we use a unique dataset on 8,051 credit institutions (primarily bank branches, but also some other providers of small firm finance finance) in England and Wales from the Ordnance Survey's 'Points of Interest' dataset.[1] This data provides us with raw, uncorrected data on local bank structures across the UK – the Ordnance Survey check the data four times a year across multiple providers of local information, making it both reliable and comprehensive. Nevertheless, we engage in a process of data cleaning to ensure we are only including financial institutions which might provide capital to firms. To do this, we restrict the sample to bank branches which offer some form of business banking (this process excludes a number of building societies, where they have no business bank services, and credit unions) by checking the institution's online presence and – where necessary – calling, a process undertaken first by a research assistant and then checked by one of the authors.

To match this data with the local identifiers in the data on SME financial access, we then construct indicators for the postcode area level. These are units similar to the NUTS 2 level, with an average population of around 500,000 and a range of 18,000 to 1.9 million. While this means we miss some very local issues (for example, Leyshon et al. [2008], discuss the difficulties of travel across nearby Welsh valleys), for most firms this should capture the distance to their nearest bank branches.

[1] This provides data for Scotland as well, but sadly we cannot match it to the control variables.

We compute 5 indicators of local banking structure which are intended to capture density and diversity of banking provision. The first two reflect the density of branches: (1) *Banks per capita* – calculated as bank branches per 1,000 population and (2) *Bank Density* – bank branches per 1,000 hectares. These two indicators give us the simplest measure of access to banking services. By including per capita measures we are trying to capture one measure of proximity (for example, in dense urban areas banks may be close, but it may take some time to reach them), our indicator of geographical density means to capture actual distance (for example, in rural areas where firms may be a significant distance from nearby branches).

We are also interested in whether diversity of bank availability matters for finance. To do this we calculate (3) *Unique banks per capita* – calculated as branches of unique banks per 1,000 population, and (4) *Unique bank density* – unique bank branches per 1,000 hectares.[2] This latter indicator provides an indicator of diversity which reflects choice, as individuals are unlikely to make applications to the same bank twice, even if there are a number of branches of the same bank locally. It provides probably our clearest measure of local banking choice. Finally, to capture local concentration we also use a variable for (5) *Big Four Share* – the share of big four banks which account for a significant share of the business banking market (Barclays, HSCB, Lloyds and Royal Bank of Scotland).[3] Indicators of population come from the 2011 Census.

Insert table 1 around here

To show which types of postcode areas tend to have higher (or lower) levels of banking provision, table 1 gives simple pairwise correlations between the measures of local banking structure at postcode level and the geographical variables. There are high correlations between the bank branch variables. Branches per capita and branches per hectare are closely related, with a correlation of around .9. The correlation with unique branch density or branches per capita is also relatively high. However, the two measure of bank type are less clearly related. Big four banks have a more even coverage across the country than others, and

[2] An alternative option would be to calculate a Herfindahl index of local banking concentration. However, we do not have data on the share of local business banking markets captured at a local level.
[3] We also attempt an indicator of Challenger Banks but these are a small share of bank branches but the results are never statistically significant.

because of this they are negatively related to most other indicators of banking structure: big banks have a higher share of local branches in areas with fewer branches, however measured. This variable reflects, in part, the absence of other banks.

There are statistically significant relationships with the two local level indicators, population density and the share of the population qualified to NVQ4 +. Areas with more graduates are more likely to have more bank branches, more diverse bank branches but no larger or smaller a share of the Big Four banks. Denser areas are likely to have more branches, whether measured per capita or per hectare, and a lower share of the Big Four branches. In short, the patterns of bank branches seem to have clear relationships with the local control variables. However, the correlations are less strong suggesting that local factors still matter.

Insert figure 1 around here

Figure 1 shows our indicator of bank branches per capita (left) and bank branches per hectare (right). The most bank branches per capita are, unsurprisingly, in Central London. But there are also relatively high (but still much lower) levels in central wales, some parts of the North, in particular, rural Yorkshire and the North West. These are often places with a low population density, which may inflate the 'per capita' measure. Lower levels are found in areas around London, such as Luton, Northampton and Medway in Kent. Many of these places are in the remit of London's banking sector. In short, this presents a pattern that places with very high levels of bank branches per capita tend to be those which are either very rural (with low population density but some bank branches) or urban areas with a specialism in banking.

The map of branches per hectare is a more familiar pattern of urban density (figure 2). Bank density is strongest in London, but also other major urban areas such as Birmingham, Newcastle and Manchester. Rural areas are – unsurprisingly – the least dense in this category with Shrewsbury, Carlisle, Lincoln, and Hereford having the lowest levels. Rural areas such as those in central Wales perform less well once their size is taken into account.

Insert figure 2 around here

Two maps of the unique bank branches per capita variables are given in figure 2. Bank density is strongest in two central London postcodes: East Central and West Central London (EC and WC). But it is also high in some parts of central Wales (with low populations). Bank diversity is relatively low in Sheffield, South East London (SE), Portsmouth, Nottingham and Newcastle. These are large, but not particularly prosperous areas. Those in South East London will have good access to banks in other parts of the capital, but in the other areas it may be the effect of bank consolidation in less affluent areas.

Insert figure 3 around here

The final indicator, share of Big Five banks, gives an indicator of bank market concentration at a local level. Their relative dominance is greatest in Cambridge, Crewe, Norwich, and some parts of Wales. It is lower in some urban areas such as London, Leeds and parts of Kent. In short, while this generally reflects patterns of population density and has some links with the local economy, considerable local variation remains.

4. Model and results

Firm level data

To assess whether local bank structure influences access to SME finance, this paper uses the data collected from the UK SME Finance monitor survey from Q1 2011 (the 1st wave) to Q2 2015 (the 17th wave). This is a quarterly cross-sectional survey which gives comprehensive information on the main borrowing events of 5,000 different SMEs for each quarter. The interviewed sample consists of for-profit organizations with turnover less than £25 million and not more than 50% owned by another company. To ensure a balanced sample, quotas for size (measured by number of employees), sector and region were allocated. The survey provided weights to make the results representative of SMEs with less than 250 employees in each region. These data have been extensively used by policymakers, including the Bank of England (2015) and industry bodies, to analyse the credit conditions for UK SMEs. We remove from the sample the SMEs located in Northern Ireland due to the lack of indicators on the local banking market and Scotland because of different policy frameworks and because there are some very large, low density postcode areas in the Highlands and Islands.

Model

To test whether local banking diversity influences firm access to finance, we estimate a probit regression model where the dependent variable is either application or rejection for finance. Because the probability of success is conditional on the likelihood of application, we also estimate rejection rate models this with the common Heckman selection model (see Fraser 2009; Mina et al., 2013; Lee et al., 2015). Essentially, we estimate the following question:

$$BankFin_i = \alpha + \beta 1\ Firm_i + \beta 2\ Finance_i + \beta 3\ BankStructure_i + \beta 4\ Wave_i + \varphi + \varepsilon \qquad (1)$$

For firm 'i', where *BankFin* is a measure of success of an application for finance, *Firm* is a set of firm level characteristics such as size, age and sector, *Finance* controls for various firm level factors such as credit score, *Wave* controls for the survey wave and so time effects, "φ" is a regional dummy variable, the constant is "α" and "ε" is the error term. The variable of interest 'BankStructure' is an indicator of the local banking structure in the postcode area in which the firm is located.

Access to finance

We focus on loan applications as our measure of access to finance. This is because businesses are more likely to have an overdraft option, making them more standard. They are also particularly important for small firms investing for future growth, whereas overdrafts may simply be due to cash flow issues. Our measure of demand is whether a firm applied for a loan in the past 12 months (around 2.6% did). Our measure of supply is the rejection rate, the proportion of these firms who either are not offered finance, not offered all they seek or on terms they do not find acceptable (just over half of firms who apply are rejected).

Control variables

We control for a set of variables likely to influence the demand and supply of finance. In addition to our measure of local banking structure, we include two indicators at the postcode area level. The first is the share of residents qualified to NVQ level 4 and above, essentially degree level but also including some who. We use this partly as a proxy because data on incomes are not reported at the postcode area level. But it should account for levels of incomes at the local level because skills are the key determinant of incomes (see Bacolod, 2017). We

also want to account for the density of the local economy as a way of indication the size of the potential market. A variable for population density controls for this.

Table 2 around here

We include a set of variables which account for the basic structure of the firm. These are *legal structure,* a set of binary variables which take the value one if a firm is a Sole Proprietorship, Partnership, Limited Liability Partnership or Limited Liability Company. We also control for the *number of employees* through binary variables for 1-9 employees, 10-49 employees and 50-249 (the reference category is zero employees), with the expectation that – as they have spread their bets more widely – larger firms will be better able to borrow. Past studies have suggested that *female owned* firms may find it harder to obtain finance, and so we include a dummy which is 1 if the firm is more than 50% owned by women. *Sector* may also matter, and we control for 9 sector dummies (Agriculture, Hunting and Forestry, and Fishing; Manufacturing; Construction; Wholesale / Retail; Hotels and Restaurants; Transport, Storage and Communication; Real Estate, Renting and Business Activities; Health and Social Work; Other Community, Social and Personal Services). Finally, we include a variable for *firm age* as older firms may have built up longer track records and history. The age dummies are for less than a year old, between one year and two, two to five years, six to nine, ten to fifteen and more than fifteen years old.

We include two variables which account for the financial structure of the firm. These are the *risk score* of the firm, which is available as the Dunn and Bradstreet credit score institution provides the sample frame for the UK SME Finance Monitor. We expect firms with worse credit scores to find it harder to obtain loans (although it may simply be reflected in higher prices). We also control for whether firms are *profit making*, as firms which make profits will be more successful in their applications (but may be less likely to apply for loans).

Management matters, and so we include a series of dummy variables for the activities of the firm. These are whether the firm has a formal written *business plan*, a basic management practice which we expect them to be associated with better loan applications and so greater success. We also control for *exporting*, with this expected to be positively related to firm performance and so loan application success. Past studies have suggested that access to finance may sometimes be harder for innovative firms (e.g. Freel, 2007; Lee et al., 2015), so we also

include two measures of innovation, whether firms have developed a *new product or service* in the past 3 years and whether they have *significantly improved* an aspect of the business in the past 3 years.

Finally, to control for variation in credit conditions over the period of the survey, we include a set of dummy variables for the survey wave. Finally, to capture broad regional variation such as greater access to central London for firms in the South East, we include a set of dummies for the government office regions.

Results: Local bank diversity and access to finance

Table 2 around here

We begin with basic probit regressions where the dependent variable is applications for new loans. Columns 1 to 4 in table 2 presents these results. As there is the potential for collinearity between the different measures of bank density, we include local bank structure variables in separate columns but are able to include the variable for big four bank branch share in all models.

Table 4 around here

The results show that local bank structure does matters for bank loan applications. Columns 1 – 4 begin with measures of demand for finance. All four indicators of local banking structure are statistically significantly related to loan applications, even when controlling for firm characteristics and other geographical variables. Areas with more credit institutions and a larger number of unique branches are less likely to apply for finance. While this may seem counter-intuitive at first, this is likely to be because banks will locate in more affluent areas. Higher application rates in less advantaged areas might be driving this result.[4] In contrast, the share of big four branches is positively related to applications in all models. One interpretation is that these banks follow demand, as they are less locally rooted they can choose to locate

[4] One concern is an omitted variable bias caused by the use of a qualification variable rather than one specifically for local economic strength. Re-running these regressions with postcode or region fixed effects, which will help control for problems such as this, do not change the results (with postcode FE's the coefficient on unique branches per capita is -0.014, p=0.021; with region, -0.019, p=0.001).

branches in areas with high demand. In contrast, banks which are locally rooted, such as those which developed from building societies, will have less choice about the region in which they locate.

The results also suggest that firms in areas with greater density of bank branches are less likely to be rejected for finance. Columns 5 – 8 consider the relationship between the four measures of local banking structure. Each is negatively and statistically significantly related to rejection rates, even when controlling for factors such as firm risk score. This provides some support for the idea that in bank-dense areas firms are making better applications.

The control variables also provide some insights into the demand for, and supply of, bank finance. The share of the population with NVQ 4 and above doesn't matter in any model, implying perhaps that the characteristics of the firm matter more than the local residents. Population density is unimportant for loan applications but is positively related to rejection rates. Legal structure matters for applications, but not for rejection. Making a profit has no impact on applications but reduces chances of rejection. Of the management variables, firms which improve products and services are more likely to apply than those which are introducing new ones, but that these firms are also more likely to be rejected, providing partial support for the literature which suggests there are funding gaps for innovative firms. Firms with a business plan, which presumably implies a more ambitious application, are both more likely to apply and be rejected. Being more than 50% owned by women does not seem to matter.

One problem with the results for rejection in table 2 is that they may suffer from sample selection bias, as only firms which are apply for finance can be rejected. In particular, because firms in local areas with certain types of banking structure are more likely to apply for finance, this will bias the results. To address this, we use a common Heckman two-step correction model. This essentially estimates the latent probability of applying for finance and uses this to correct the model for selection bias. The results are presented in table 3.[5]

Insert table 3 around here

[5] Note results for the first stage are very similar to those in table 2, so are not reported. We also exclude the regional dummies as some perfect prediction groups make the results erratic.

Even correcting for this selection problem, firms applying for finance in local areas with higher levels of banking provision are more likely to successfully access finance. Table 3 presents the results of the Heckman regressions. The coefficients are very similar in magnitude to those without correction, but there is little change. The results are clearer for the measures of the extent of the bank networks, but there is no statistically significant relationship with dominance of the big four. In short, it seems that total bank branches matter more than the structure of the local banking market.

Across the uncorrected results, there is little difference between the four measures: using a per capita measure means similar results to those using hectares. In the selection models, however, the only variable significant below 5% is unique branches per hectare. This indicator captures both choice of potential providers but also how easy they are to reach geographically. While we need to be cautious with the interpretation of this model, as the variables are closely correlated and the other three variables are statistically significant at the 10% level, this might indicate that spatial proximity matters. In contrast, the share of Big Four branches – one measure of concentration – does not seem to have a statistically significant relationship with rejection rates. Overall, these selection results suggest that part, but by no means all, of the effect of bank structure on rejection rates is due to selection. Geographical proximity to bank branches seems to be particularly important in determining rejection rates.

5. Conclusion

This paper has considered whether local bank density matters for access to finance. Given the decline in bank branch networks, this is an important question, but some suggest that changes in lending technologies, in particularly the rise of online banking and the decline of relationship banking may mean that local banking structure matters little (see Alessandrini et al., 2009). The results of this paper show that local banking structure does matter. By combining a unique dataset on the structure of local banking markets with detailed, firm level data on applications for finance, we show that firms in areas with greater density of banks are less likely to apply for finance, but more likely to successfully receive it if they do. This result is robust to the selection effects, numerous firm and local level controls and alternative measures of local banking structure. The results add to a growing literature which suggests that

access to finance is one way in which capital reinforce uneven development (Pollard, 2003; Sokol, 2013; Lee and Luca, 2018). Our results provide additional nuance, as they suggest the legacy of bank branch geographies is not a simple divide between the richer parts of the country and the less affluent areas. The also highlight the ongoing importance of bank branches, which have been the subject of much attention for their impact on personal finance, for firm finance.

The policy implications of this research are relatively clear: efforts to support bank branches outside of core areas can be justified not just in terms of individual access to finance, but for access to SME finance as well (Brown and Lee, 2016). In this respect, they provide support for the idea of regional banks (Sensier, 2017). While there are some efforts in the UK to provide finance outside of the core regions (e.g. the Northern Powerhouse investment fund), these tend to be sporadic. It might be appropriate to formalise them with, for example, the British Business Bank making an explicit commitment to ensure geographical coverage in access to finance (Hatfield, 2017). However, policy design needs to avoid the problems faced by past efforts to provide equity finance in the regions (Nightingale et al., 2009).

Our paper suggests important avenues for future work. Firstly, we do not investigative total lending at a local level, as Henry et al. (2017) do, but further data disclosures might help enable this. Our work has attempted to deal with selection effects, but it is harder to address causality. We suggest that one of the regulatory changes related to banking competition might help provide exogenous variation. Second, we have done little to discriminate between types of firms and have focused solely on access to finance, rather than cost which can also be a significant problem for firms (Rostamkalaei and Freel, 2016). Finally, the banking industry is undergoing significant technological change with the rise of, for example, crowdfunding. Future work may wish to re-evaluate these results in the light of these changes, to see whether they perpetuate the spatial patterns we identify (Langley and Leyshon, 2017).

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Figure 1. Bank branches per capita and per hectare

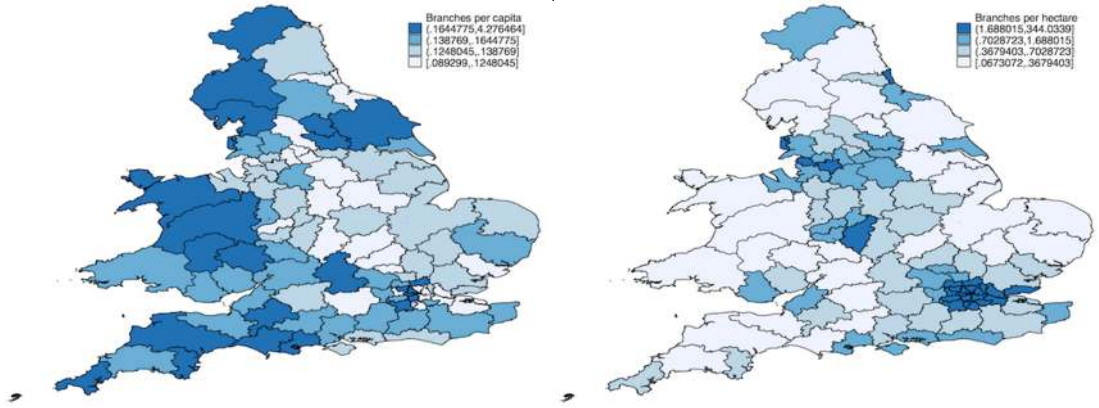

Figure 2. Unique branches per capita and per hectare

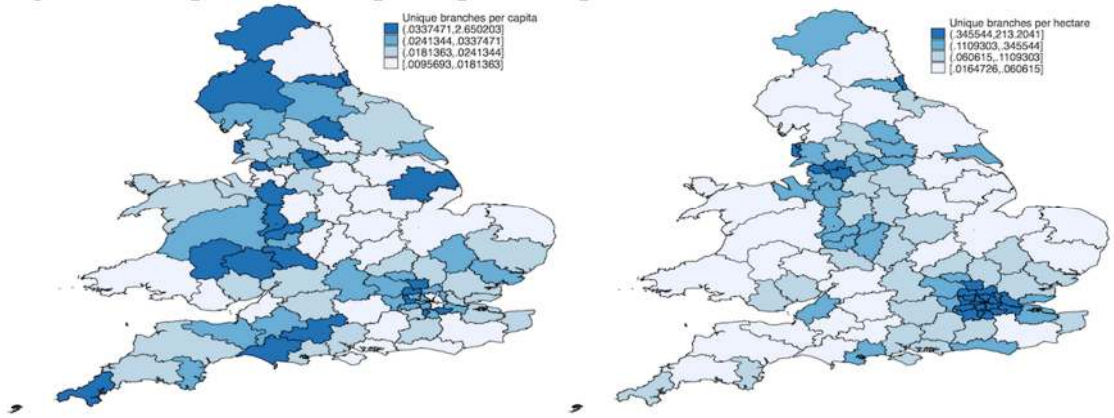

Figure 3. 'Big four' bank branches as a % of all branches

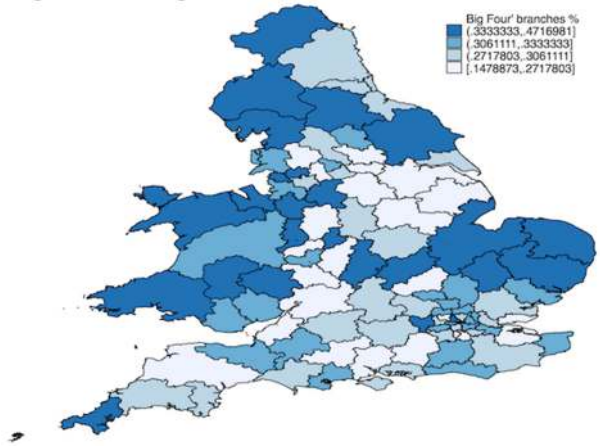

Table 1. Banking structure and local characteristics: Pairwise correlations

	Branches per capita	Branches per hectare	Unique branches per capita	Unique branches per hectare	Big four banks as % of branches	Population with NVQ 4 + (%)	Population density
Branches per capita	1.0000						
Branches per hectare	0.9128 0.0000	1.0000					
Unique branches per capita	0.9549 0.0000	0.9745 0.0000	1.0000				
Unique branches per hectare	0.9185 0.0000	0.9907 0.0000	0.9908 0.0000	1.0000			
Big four banks as % of branches	-0.2782 0.0041	-0.3619 0.0001	-0.3208 0.0008	-0.3501 0.0003	1.0000		
Population with NVQ 4 + (%)	0.3449 0.0003	0.4553 0.0000	0.3734 0.0001	0.4029 0.0000	-0.1186 0.2282	1.0000	
Population density	0.3243 0.0007	0.4726 0.0000	0.3423 0.0004	0.3876 0.0000	-0.2263 0.0203	0.6870 0.0000	1.0000

Note: Table presents pairwise correlations for 105 postcode areas. Source: Bank data from Ordnance Survey, 2016; Controls from the 2011 Census.

Table 2. Local banking structure and firm bank use: Probit regression results

Dependent variable:	Has made loan application in past 12 months				Has been rejected for loan application in past 12 months			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Branches per capita	-0.115***				-0.182***			
	(0.0376)				(0.0617)			
Unique branches per capita		-0.195***				-0.289***		
		(0.0610)				(0.0984)		
Branches per hectare			-0.00153***				-0.00225***	
			(0.000486)				(0.000759)	
Unique branches per hectare				-0.00243***				-0.00356***
				(0.000760)				(0.00121)
Big four as % of branches	0.00354**	0.00340**	0.00349**	0.00351**	0.00201	0.00184	0.00198	0.00199
	(0.00171)	(0.00172)	(0.00171)	(0.00171)	(0.00212)	(0.00213)	(0.00213)	(0.00212)
Population with NVQ 4 + (%)	0.00228	0.00223	0.00220	0.00213	0.00339	0.00319	0.00316	0.00303
	(0.00422)	(0.00421)	(0.00420)	(0.00420)	(0.00531)	(0.00530)	(0.00529)	(0.00529)
Population density	0.00208	0.00212	0.00239	0.00219	0.00392**	0.00396**	0.00434**	0.00406**
	(0.00177)	(0.00177)	(0.00180)	(0.00178)	(0.00194)	(0.00193)	(0.00198)	(0.00194)
Profit	-0.0609	-0.0610	-0.0609	-0.0610	-0.143***	-0.143***	-0.143***	-0.143***
	(0.0379)	(0.0379)	(0.0379)	(0.0379)	(0.0473)	(0.0473)	(0.0473)	(0.0473)
Business plan	0.211***	0.211***	0.211***	0.211***	0.188***	0.188***	0.188***	0.188***
	(0.0371)	(0.0371)	(0.0371)	(0.0371)	(0.0477)	(0.0477)	(0.0477)	(0.0477)
Exports	-0.00669	-0.00664	-0.00668	-0.00668	0.0262	0.0261	0.0260	0.0260
	(0.0659)	(0.0659)	(0.0659)	(0.0659)	(0.0896)	(0.0896)	(0.0896)	(0.0896)
New product	0.0601	0.0601	0.0602	0.0601	0.0828	0.0828	0.0829	0.0829
	(0.0478)	(0.0478)	(0.0478)	(0.0478)	(0.0612)	(0.0612)	(0.0612)	(0.0612)
Improved product	0.192***	0.192***	0.192***	0.192***	0.205***	0.205***	0.205***	0.205***
	(0.0382)	(0.0382)	(0.0382)	(0.0382)	(0.0492)	(0.0492)	(0.0492)	(0.0492)
Woman owned	-0.0500	-0.0501	-0.0502	-0.0502	-0.0649	-0.0650	-0.0650	-0.0650
	(0.0411)	(0.0411)	(0.0411)	(0.0411)	(0.0543)	(0.0543)	(0.0543)	(0.0543)
Constant	-1.174***	-1.323***	-1.385***	-1.385***	-1.772***	-2.013***	-2.104***	-2.103***
	(0.246)	(0.242)	(0.243)	(0.243)	(0.339)	(0.331)	(0.332)	(0.332)
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	70,785	70,785	70,785	70,785	70,783	70,783	70,783	70,783

Note: unreported controls for employment bands, age bands, sector, region and legal status. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3. Local banking structure and access to finance: Heckman regression results correction for selection

Dependent variable:	Has been rejected for loan application in past 12 months, correcting for probability of applying			
	(1)	(2)	(3)	(4)
Branches per capita	-0.0714*			
	(0.0429)			
Unique branches per capita		-0.139*		
		(0.0740)		
Branches per hectare			-0.00118**	
			(0.000586)	
Unique branches per hectare				-0.00180*
				(0.000930)
Big four as % of branches	-0.000385	-0.000453	-0.000383	-0.000366
	(0.00115)	(0.00115)	(0.00115)	(0.00115)
Constant	-2.122***	-2.133***	-2.142***	-2.141***
	(0.142)	(0.142)	(0.142)	(0.142)
Observations	70,785	70,785	70,785	70,785
LR Test	11.39	11.49	11.75	11.63
	0.0007	0.0007	0.0006	0.0006
Wald test	396.14	398.03	399.64	399.18
	0.0000	0.0000	0.0000	0.0000

Note: controls as in table 2 excluding region due to perfect prediction groups. First stage results similar to table 2. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

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