

The Uneven Spatial Nature of Access to External Finance in UK SMEs: Determinants, Impacts and the “Levelling Up” Agenda

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The Uneven Spatial Nature of Access to External Finance in UK SMEs: Determinants, Impacts and the “Levelling Up” Agenda

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ABSTRACT

While SMEs are central to productivity growth, they often encounter difficulties accessing finance to help grow their operations. This problem is magnified for SMEs located in certain peripheral parts of the UK economy. Recent research has identified a key subset of the business population comprising firms who were previously happy to seek external capital but have subsequently withdrawn from the market completely even though they needed finance. In this study, we identify the consequences in terms of lost jobs and sales of dropping out of the capital market for smaller firms. We conduct our analysis at the regional level as it is at this level where the majority of smaller firms operate, and the economic consequences of this choice manifest themselves. We find that around 230,000 smaller firms have dropped out of the UK capital market and that in many localities this has reduced job creation and sales income growth. We conclude that this credit self-rationing behaviour will add further to existing regional and sub-regional economic inequalities in the UK, making the “levelling up” agenda an even more intractable policy objective for some geographical localities to achieve.

Key Words: SMEs; Capital Markets; Scarring; Sub-Regional; Economic Impact; Jobs

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NON-TECHNICAL SUMMARY

Finance is crucial for new and small and medium-sized enterprises (SMEs) as it enables them to undertake growth-oriented activities enabling them to expand and upscale their operations.

Conversely, a lack of capacity to self-finance their activities can impede and hamper entrepreneurial activities coming to fruition, especially by firms with limited relational networks to access informal funds from family and friends.

Despite this, SMEs often face perennial problems accessing finance which can hamper productivity growth. These problems can be particularly acute for SMEs located in certain parts of the UK, especially those located in northern and peripheral regions.

In this report, the authors provide new evidence on some of these problems SMEs confront obtaining finance in different parts of the UK. In particular, it examines the effects of self-exclusion from the credit market in the UK. The focus of this study is on bank finance as this is the dominant form of funding used by SMEs, accounting for 85% of all outstanding debt owed by UK SMEs

It is this rationing aspect of the small firm capital market that can have unanticipated consequences as firms that have been refused capital can self-exclude from the market due to first-person scarring effects. In other words, credit rationing is cumulative and results in self-reinforcing borrowing behaviour which prevents SMEs accessing external finance.

Past research has tended to identify the problems SMEs face when accessing finance without looking at the wider impact of these credit restrictions. In this report we provide novel evidence at the impact of this self-exclusion from the small business credit market in terms of how this affects sales and employment growth within SMEs.

In section 1 we introduce the context for the study and then in section 2 we outline the relevant literature on SME access to finance before outlining previous academic research on nature of spatial variations in terms of the UK small business credit market. Section 3 then provides information on the data used for this study together with some descriptive statistics. The study examines the Longitudinal Small Business Survey over the years between 2015-2020.

By way of preview of some key findings, we find that around quarter of a million smaller firms have dropped out of the UK capital market and that in many localities this has reduced job creation and sales income growth. Overall, we find that in a general sense stopping applying for finance when one still has a need is sub-optimal for future growth outcomes.

The general time-series trend in terms of small firms seeking external finance from capital markets is downwards over the period from 2015 to the onset of the Covid-19 crisis in 2020, although there is considerable year-on-year variation. What is apparent is that this demonstrates a distinct shift in the willingness of small firms to seek external capital in the UK since the Global Financial Crisis (GFC).

On the whole, this credit self-rationing negatively impacted SMEs in terms of sales and employment growth. On our two outcome measures which represent the key dependent variables of our final modelling of the effects of capital market engagement on growth we find that this was a period generally characterised by low growth and declining employment. The Covid-19 crisis led to a dramatic decline in sales of more than 25.3% and a 5.56% decline in employment.

In its totality, there appear quite stark spatial variations in access to finance with Northern Ireland and Scotland having the most problematic experiences of capital markets and this is reflected in a high incidence of simply refusing to even go to the capital market in future periods when they need funds. These locations have the largest demand for finance, but also face the greatest amount of rationing by banks.

We see that full rationing of funding applications is most prevalent in Northern Ireland, where 12.7% of finance applications result in a full rejection, the West Midlands (12.4% fully rejected), and Scotland (12.2% fully rejected). This compares to the relatively favourable outcomes found in the East of England, where only 10.1% of applications receive a full rejection, the East Midlands (10.2%) and the North East (10.3%).

Partial rationing of funding applications is most prevalent in Northern Ireland, where 14.2% of finance applications result in a partial rejection, Scotland (12.2% partially rejected), and Wales (10.5% partially rejected). This compares to the relatively favourable outcomes found in the North West of England, where only 7.2% of applications receive a partial rejection, the South East of England (7.9%) and East Midlands (8.0%).

A similar spatial picture applies to firms who simply stopped applying for finance. The incidence of firms stopping applying for finance is most prevalent in Northern Ireland, where



11.0% simply refuse to make funding applications even when they need finance, Scotland (9.9%), and London (9.4%). This compares to the relatively low incidences found in the South East England, where only 7.3% of firms stopped applying, the East of England (7.5%) and Yorkshire & Humber (7.6%).

We also observe that there was a negative relationship between employment size and firms who stopped applying for funds. In this sense, the problem of self-rationing in capital markets is heavily concentrated amongst the smallest size classes of firm. In contrast, firm age was not found to be significant. Very few industry effects were apparent.

The study found that innovating firms were more likely to stop applying. This was the case for goods & service innovators and process innovators. This is of concern in that it suggests that one of the key drivers of growth amongst the small business sector, the innovators, are withdrawing from capital markets even when they have a latent demand for funds.

We also estimated a dynamic model for moving from a state of applying for external funding to not applying. Here we find that firm size had no effect but innovative firms and particularly product and service innovators were more likely to change to a non-applying state.

At the broad geographic region, we find that firms that continued to apply for external capital when they needed it achieved high jobs growth in Scotland and Wales and that this effect was magnified in Wales where firms that stopped applying were found to grow their employment at a significantly slower rate. In this sense, we are drawn to conclude that self-exclusion from external capital markets, often induced by a previous incidence of full rationing, has a clear and detrimental effect on the ability of firms to create jobs and that these effects are strong at the regional level.

In terms of sales growth, at the regional level, we find that self-excluding from capital markets has a strong and negative effect on sales growth in the East Midlands and Yorkshire & Humberside regions of England, and in Scotland. The magnitude of the effect is particularly large in the East Midlands.

Our key concern was that lack of access to capital for investment in growth enhancing activities would have a real and tangible impact on their ability to generate new jobs and sales. At the macro-economic level, this would directly impact on the UK economy as smaller firms create a disproportionate share of net new jobs and have increased their aggregate share of total UK GDP significantly over time.

We find a clear and distinct causal chain of events which have their roots in capital markets. When small firms make funding applications and are rejected in an absolute sense (full rationing) this increases the probability that in the future they will self-exclude from capital markets, although this is not the sole reason. Importantly, once a small firm has made this initial choice it becomes more embedded over time.

In an average year, we estimate that 230,000 small firms make this choice to self-exclude from capital markets even though they need additional funds. Ultimately this reduces their ability to grow their employment and sales as new investment in growth enhancing capability is scaled back. Importantly, there is a differential effect for both self-exclusion from capital markets due to full rationing and jobs and sales growth being constrained by this self-exclusion across UK regions and sub-regions.

The report suggests introducing spatially calibrated policy instruments. In particular, loan guarantee instruments could play a major role as a spatial policy is by using the four key parameters (the guarantee coverage ratio, the interest rate premium, the term structure, and the maximum loan size), to create unique configurations of these four scheme parameters to target specific types of firms located in particular spatial areas with high prevalence rate of full rationing and also self-exclusion from capital markets.

The authors conclude that this credit self-rationing behaviour will add further to existing regional and sub-regional economic inequalities in the UK, making the “levelling up” agenda an even more intractable policy objective for some geographical localities to achieve.

1. INTRODUCTION

Finance is crucial for new and small and medium-sized enterprises (SMEs)¹. It enables them to grow, expand and upscale their operations (Berger and Udell, 1998; Cassar, 2004). Conversely, often a key growth constraint for many SMEs is an inability accessing finance either to fund day-to-day operations and/or to fund new investment (Beck and Demirguc-Kunt, 2006; Ayyagari et al, 2008; Cowling et al, 2020a), a process being magnified due to the Covid-19 pandemic (Brown et al, 2020). Consequently, long-term investing and finance for SMEs has “never been more important than today” (Ivashina and Lerner, 2021, p. 1).

The most common form of funding for SMEs is debt-based finance provided by high street banks, accounting for 85% of all outstanding debt owed by UK SMEs (HMSO, 2022). Whilst larger firms often seek recourse to internal earnings to fund their operations (Ughetto, 2008), SMEs are more likely to seek finance from external capital markets from banks (Berger and Udell, 1998; O’Toole et al, 2015). However, research frequently uncovers that entrepreneurs commonly underestimate the difficulties associated with raising all types of finance (Fraser, 2013). Consequently, a lack of capacity to self-finance their activities can impede and hamper entrepreneurial activities coming to fruition, especially by firms with limited relational networks to access informal funds from family and friends.

Due to problems associated with asymmetric information it is also the case that when small firm seek external capital, they are often turned-down by all types of financiers (Berg, 2015; Holton et al, 2014; Lee et al, 2015). It is this rationing aspect of the small firm capital market that can have unanticipated consequences as firms that have been refused capital can self-exclude from the market due to first-person scarring effects (Cowling et al, 2021b). Equally, others who might have put forward applications for external funding self-exclude if they observe their peers being refused funding which is the secondary discouragement effect (Cowling et al 2016; Mol-Gomez-Vasquez et al, 2021). In other words, credit rationing is cumulative and results in self-reinforcing borrowing behaviour (Brown et al, 2022).

¹ For the purposes of this study with define SMEs using the standard classification outlined by the European Union. Under this criteria SMEs are defined as firms who employ less than 250 employees with a turnover threshold of less than €50m.

Until recently spatial and regional issues have been largely neglected factor in the literature on the financing of SMEs (Ughetto et al., 2019). However, it is becoming increasingly clear that there are persistent regional differences in credit availability, the use of different credit sources, the cost of credit and levels of “borrower discouragement”², especially for the critical cohort of dynamic SMEs and start-ups (Lee et al, 2015; Brown et al, 2019; Cowling et al, 2019; Brown et al, 2022). Given that strong evidence suggests that lack of access to finance is one of the biggest growth obstacles confronting SMEs (Ayyagari et al, 2008), understanding the nature of spatial funding gaps will be crucial for helping policy makers tackle the UK’s so-called “levelling-up” agenda (Mayer et al, 2021). Indeed, the recent White Paper on the levelling up agenda acknowledges that a key barrier to “levelling up” in owes to the fact that there are “sharp differences in access to financial capital across different parts of the UK” (HMSO, 2022 p. 66).

Most small firms operate in spatially proximate markets hence traditionally small business finance was perceived to be a highly localised “close-knit affair” (DeYoung et al, 2008, p. 114). This close spatial proximity helps resolve informational problems involved in lending and facilitates the transmission of soft information between small firms and bank lenders (Berger and Udell, 1998; Lee and Brown, 2014). Furthermore, it is at this localised spatial level where the benefits of growing small firms manifest itself through higher incomes, employment growth and associated spillovers (Baptista et al 2008; Fritsch and Storey, 2014). Consequently, many of the “essential determinants of economic performance are to be found at the regional level” (Porter, 2003, p.550).

However, the functioning and spatial nature of credit markets for SMEs is changing. Over the past few decades, the distances between small business and bank lenders have increased markedly which has further exacerbated credit constraints, especially for rural and peripheral SMEs (Alessandrini et al, 2010; Lee and Brown, 2017). The main causes of this seem to be the pervasive use of new automated lending technologies and the rapid decrease in the size of the bank branch network (Lee and Brown, 2017). There is now a growing body of empirical evidence revealing large spatial variations in access to bank finance in UK SMEs (Lee and Brown, 2017; Zhao et al, 2017; Degryse et al, 2018). The overwhelming bulk of this work suggests a firm’s geographic location plays a pivotal role in

² The prevalent academic definition of borrower discouragement follows Kon and Storey (2003, p. 37) where a ‘...good borrower may not apply for a loan to a bank because they feel they will be rejected.’ However, there are a wide variety of different definitions of borrower discouragement, often a result of bespoke terminology used by different government surveys (for an overview see Brown et al, 2022).

shaping their ability to access finance (Brown, 2018). Consequently, access to finance is very “place specific” affair (Ughetto et al, 2019, p. 617) whereby some SMEs encounter a so-called “liability of distance” in terms of their ability to access external finance (Lee and Brown, 2017, p. 233). Typically, the regions’ most adversely affected are peripheral and rural areas with sparse bank branch networks. Conversely, firms located in large cities are much less likely to perceive access to capital as a growth constraint (Lee and Luca, 2019). The cumulative knock-on effect of these trends may be increasing the use of other expensive forms of “substitutive finance” – such as credit cards (Brown et al, 2019)- and increased levels of “borrower discouragement” within SMEs (Lee and Brown, 2017).

This may account for the overall decline in the demand for external finance from SMEs since the global financial crisis (Lee et al, 2015). In 2010, roughly 25% of all SMEs had sought external finance in the previous 12 months whereas in 2020 this figure had decreased to approximately 10% (BEIS, 2021). The level of decrease was even more acute for medium-sized firms, employing between 50-250 employees (i.e. 40% to 13%). Some indicative evidence suggests that the current pandemic is having a further constricting effect on the demand and supply of finance for SMEs (Brown et al, 2020; Brown and Rocha, 2020; Cowling et al, 2020). In 2020, government or local authority grants or schemes directly related to Covid-19 measures became the most common forms of external finance used by SMEs (28%) (see BEIS, 2021).

Funding is often particularly problematic for innovative start-ups and SMEs who are crucial for job creation, innovation and productivity growth (Hall and Lerner, 2010; Lee et al, 2015). These are probably the most important and growth-oriented cohort of the small business community, yet they are avoiding external sources of finance. This is crucially important as the lack of demand for external finance may be having a major impact in terms of productivity growth within these types of SMEs (Collier and Mayer, 2020; Levine and Warusawitharana, 2021). This under-capitalisation of SMEs potentially limits their growth prospects whilst simultaneously undermining overall productivity growth (Owalla et al, 2021). Although it would appear that regional funding gaps palpably exist, the full ramifications of their effects on firm performance and wider economic growth remain overlooked. Therefore, this begs an important question: what impact is this decline in demand (and supply) of external finance having on SME performance?

In order to examine the actual impact of these credit restrictions, this research will focus on the employment and sales income growth effects of SMEs dropping out of capital markets using a large longitudinal panel data set of UK SMEs over the period 2015-2020 using the

UK's Longitudinal Small Business Survey. Specifically, it will establish the consequences of SMEs self-excluding from capital markets, and how this affects different geographical regions they operate in. We begin by identifying what types of firms have moved into a state of not engaging with capital markets, how persistent this state is, and what experiences drive this. Then we move on to tracing out the consequences of adopting this position, and not applying for external funding, even when funds are required.

We conduct our analysis at the regional level as it is at this level where the majority of smaller firms operate, and the economic consequences of this choice manifest themselves. By way of preview of some key findings, we find that around 230,000 smaller firms have dropped out of the UK capital market and that in many localities this has reduced job creation and sales income growth. Overall, we find that in a general sense stopping applying for finance when one still has a need is sub-optimal for future growth outcomes. However, the full consequences of this excluding behaviour for the regions of the UK is strengthened, or weakened, by the precise characteristics of the underlying business population. This would imply that policy attention explicitly targeted at supporting access to finance would have very different impacts, depending upon the precise nature of the regional firm population. We conclude that this behaviour will add further to existing regional economic inequalities in the UK, making the “levelling up” agenda an even more intractable policy objective for some geographical localities to achieve.

The rest of the report is structured as follows. In Section 2 we discuss the literature relating to small firms and capital markets, paying particular attention to spatial issues in this context and the contribution of small firms to regional economies. In Section 3 we present the longitudinal data we use to examine these issues. Section 4 reports the findings of our econometric modelling around engagement with capital markets and subsequently the impact on job growth and growth in real sales incomes. We conclude in Section 5 and identify some public policy issues arising from our findings.

2. LITERATURE REVIEW

2.1 Small Businesses and Access to Finance

Here we begin by reviewing the small business finance literature. While interest in SME research boomed in the 1990s, research on SME productivity in particular gained increased attention from the mid-2000s when many advanced economies began experiencing declining labour productivity growth (Owalla et al, 2021). While there has been a rapid expansion of this body of work in recent years the literature is marked by some limitations which potentially hinder our knowledge of the impact of finance and other factors in determining productivity growth in SMEs.

It is a “stylized fact” that small firms play a key role in promoting and stimulating economic dynamism, job creation and growth through their contribution to innovation, competitiveness and productive ‘churn’ (Urbano et al, 2019). This perhaps explains the vast plethora of policy initiatives that have emerged over the years which are designed to stimulate entrepreneurial activity (Audretsch et al, 2020). The factors that are associated with the growth of small, entrepreneurial firms have been the subject of an expanding volume of literature and it is widely agreed that the availability of credit to entrepreneurs with good investment opportunities is one of the key drivers of economic growth and competition (Beck and Demirguc-Kunt, 2006; Marlow & Patton, 2005; Cassar, 2003). Here access to finance refers to both a firm’s ability to secure external capital and its willingness to apply for it (Coleman, 2007). As such, ensuring smaller firms to have access to adequate finance for investment and growth is an important priority for regional, national and supra-national policy-makers (Appleyard, 2013; Calabrese et al, 2021).

Limited access to financial resources is can seriously constrain entrepreneurial activities and the growth of small businesses (Ayyagari, et al, 2008). Consistent with Beck and Demirguc-Kunt (2006), using the latest UK SME Finance Monitor data, Calabrese et al (2021) report that nearly one third of SMEs found access to external finance as the main obstacle to business growth. Evidently, financial deficiencies prevent SMEs from growing to their optimal size (Beck et al, 2005) and limit economic development (Beck and Demirguc-Kunt, 2006). The existence of discouraged borrowing, non-application of external finance due to perception of rejection (Kon and Storey, 2003), may further constrain growth especially when a large proportion of these discouraged borrowers would have been approved had they applied (Cole and Sokolyk, 2016; Cowling et al, 2016). However, whilst banks are often cited as the sole cause of all small business lending

problems, the behaviours of small firms can exacerbate these problems. This arises as they often have low levels of precautionary savings and financial management skills (Brown and Cowling, 2021; Howorth and Westhead, 2003), which are also commonly associated with an increased chance of failure (Carter and Auken, 2006).

Employment and sales are two natural candidates of, and mostly used growth measures (Achtenhagen et al, 2011), but not all studies use both (or multiple) measures (Delmar et al, 2003). Financial constraints largely restrict SMEs' ability to invest in operational improvements and new projects (Coleman, 2007), and the direct consequence is the low growth in sales revenue (Ayyagari et al, 2008). On the other hand, a stream of recent studies on the real effect of credit shocks, or a sudden constriction of liquidity, using quasi-experimental techniques, find that reduction in loan supply significantly increases job losses, particularly in the SME sector (Ayyagari et al, 2021; Bentolila et al, 2018; Greenstone et al, 2020). However, the effect of capital constraints is not always consistent between sales and employment (Shepherd and Wiklund, 2009). For example, Cowling et al (2015) and Cowling et al (2018) find better access to finance is crucial to achieving growth in sales but not employment during a recessionary environment. Further, the availability of financial resources is usually uneven across firms, resulting in varying growth performance. For instance, the low growth in women-owned businesses is often attributed to larger funding gaps for women entrepreneurs (Brush and Copper, 2012).

However, lacking growth momentum is likely to 'feedback' to difficulties in securing external finance, making SMEs turn to more expensive finance such as credit card and trade credit, as a form of improvised "financial bootstrapping" (Brown et al, 2019). Financial bootstrapping is widely used by entrepreneurial and small firms to reduce the reliance on costly external finance (Harrison et al, 2004). Often early-stage firms with insufficient revenue or revenue growth or collateral are forced to use bootstrapping as a means of survival (Ebben & Johnson, 2006). As such, collateral is viewed by banks as a sorting device to signal borrower quality and alleviate the information asymmetry between borrowers and lenders (Berger and Udell, 1998). Again, low-growth firms that are less likely to pledge collateral will consider bootstrapping such as credit card a necessary response to collateral requirement (Van Auken and Neeley, 1996; Brown et al, 2019). As some have noted excessive use of techniques such as bootstrapping may eventually hinder firm performance and development in the longer term, further embedding borrower discouragement (Brown et al, 2022).

2.2. The Nature and Impact of Spatial Variations in Access to Finance

We now wish to turn our attention to the literature on spatial variations in terms of accessing finance in SMEs. Since the GFC, studies examining access to finance in SMEs show that since this period, access to credit has become increasingly more problematic for many UK SMEs irrespective of location (Cowling et al, 2012). Importantly, however, there has also been an upsurge of studies examining the role of geography in determining the ability of SMEs to access finance. Together these have been instructive in demonstrating the so-called “liabilities of distance” confronting SMEs located in different locations (Lee and Brown, 2017). The bulk of this evidence suggests SMEs located in peripheral and rural regions find it harder to access all forms of SME finance (see Table 1 below). This has been corroborated by different studies using different data sources and covering differing time periods, the majority of whom have been conducted in the UK and Italy (see Alessandrini et al, 2010; Lee and Brown, 2017; Zhao and Jones-Evans, 2017). While these findings largely correspond with other studies from other EU countries (Donati and Sarno, 2014), some UK studies find no greater problems for SMEs in deprived areas (Lee and Drever, 2014).

Interestingly, a study by Lee and Brown (2017) found that certain types of peripherally located SMEs are disproportionately affected by credit constraints. Innovative SMEs in particular are more likely to have their bank loan applications rejected than those located in core regions. The impact on innovative SMEs is supported in other studies in different contexts, such as Italy (see Alessandrini et al, 2010). They were also more likely to be discouraged from applying altogether for fear of rejection, so-called “discouraged borrowers” (Lee and Brown, 2017). A nuanced addition to these empirical studies is a recent study examining the cost of finance in different spatial locations (Cowling et al, 2020c). This found that, *ceteris paribus*, regional differences directly and indirectly affect the way banks allocate and price short-term credit. In other words, there is evidence of a peripheral region “price penalty” (Cowling et al, 2020c).

Table 1: Studies on Geography and Access to Finance in SMEs between 2010 and 2022

Study	Data	Empirical Setting	Key Findings
Alessandrini et al (2010)	Survey of Manufacturing Firms published every 3 years by the Italian banking group Unicredit	Italy	SMEs located in provinces where the local banking system is functionally distant are less inclined to introduce process and product innovations
Mason and Pierrakis (2013)	British Venture Capital Association	UK	Early stage VC is heavily concentrated in London and the south-east of England
Donati and Sarno (2014)	Panel data of SMEs	Italy	Reliance on internal growth finance more important for SMEs in backward regions than core regions
Lee and Drever (2014)	Small Business Survey	UK	SMEs in deprived areas find it no harder to access finance than those located elsewhere
Zhao and Jones-Evans (2017)	SME Finance Monitor	UK	Greater functional distance between bank headquarters and branches exacerbates the credit constraints faced by local SMEs
Lee and Brown (2017)	SME Finance Monitor	UK	Strong evidence that innovative SMEs in peripheral regions have their applications for finance rejected
Degryse et al (2018)	FAME/BankScope/Annual Clearings Directory	UK	SMEs with a lower functional distance had less credit constraints during the financial crisis
Brown et al (2019)	Longitudinal Small Business Survey	UK	SMEs located in peripheral regions have greater usage levels of credit card finance and innovative and 3 growth-oriented SMEs are the most predisposed to this form of finance
Lee and Calabrese (2019)	SME Finance Monitor/Points of Interest	UK	Firms in areas with more bank branches are more likely to successfully obtain finance whilst bank diversity does not matter
Cowling et al (2020c)	SME Finance Monitor	UK	Faced with the same risk, banks do react fairly to funding applications in terms of access but not price at the regional level. We conclude that regional differences directly and indirectly affect the way banks allocate and price short-term credit
Cowling et al (2021a)	British Business Angels Association	UK	Found pronounced regional disparities, with investment activity dominated by BAs in London and Southern England.
Brown et al (2022)	Longitudinal Small Business Survey	UK	Discouraged borrowers are more prevalent in London and peripheral UK regions

In the last few years, a number of studies have examined some of the potential causes and effects of these difficulties accessing finance in peripheral/rural regions. In terms of causes, an important recent study has found that credit restrictions are greatest for SMEs in regions with the least number of bank branches (Lee and Calabrese, 2018). By contrast, the diversity of different banks had little bearing on access to finance in SMEs. This suggests that the huge decrease in bank branches may have exacerbated credit restrictions for SMEs in more remote UK regions. The possible effects of these credit constraints in SMEs has also been examined in recent research and one study found that SMEs located in peripheral regions have a greater use of costlier forms of finance such as credit card finance (Brown et al, 2019). Therefore, SMEs found to face the toughest credit constraints – such as innovative and growth-oriented firms – had the strongest propensity to seek recourse to credit card finance. Another recent study discovered that levels of borrower discouragement are also higher in peripheral UK regions (Brown et al, 2022). This suggests that problems accessing credit may lead to the twin problems of increased levels of discouragement and increased recourse of substitutive forms of funding.

In term of the gaps in our knowledge, there is now a growing (albeit incomplete) body of evidence examining spatial variations in access to finance in UK SMEs but this has rarely been examined at a granular spatial level. A SME's geographic location seems to play a crucial role in mediating a firms' ability to access finance, a problem accentuated for innovative and growth-oriented firms. In sum, debt finance markets for SMEs appear just as spatially constructed as equity markets which are marked by substantive inter-regional differences (Cowling et al, 2021a). However, whilst the evidence has increased greatly over the last decade, our knowledge remains partial. For example, there is less evidence on the impact of these regional funding gaps in terms of firm investment and productivity growth. We can speculate however that it will significantly reduce investment and growth within affected SMEs, leading to a knock-on effects on regional productivity growth.

Another omission notable in the literature is a lack of empirical studies examining intra-regional variations in accessing SME finance. This is important because as stated by the White paper the economic geography of the UK has a “fractal pattern”, with spatial differences often “replicating themselves at higher levels of geographic resolution” (HMSO, 2022, p. 58). In other words, credit availability is likely to vary significantly within regions as well as between them. Undoubtedly, more spatially granular work on the potential negative spill-overs of credit constraints in peripherally-located SMEs is therefore needed to help public policy better target initiatives to mitigate these negative impacts.

3. DATA AND METHODOLOGY

3.1 General Descriptive Statistics

The data available for our analysis is the UK Longitudinal Small Business Survey (LSBS) that is funded by the Department for Business, Energy & Industrial Strategy (BEIS). The longitudinal aspect of the LSBS allows us to explore the dynamics of previous interactions and outcomes of capital market interactions and how this impacts future job and sales growth. The LSBS is a detailed nationally representative survey of the UK SMEs. The LSBS is a telephone-based survey of the UK small business owners and managers constructed using a stratified sample of owner-managers of SMEs with less than 250 employees across the four constituent parts of the UK (England, Northern Ireland, Scotland and Wales). The survey collects detailed information relating the financial and non-financial activities of SMEs, including: the nature of any innovative activities, export activities, barriers to growth, attitudes toward accessing external finance and reasons for borrower discouragement.

It is a longitudinal panel data set that began in 2015, and the latest wave available is for 2020. It contains 27,921 firm units and 89,814 observations in total spread across six survey waves from 2015, 2016, 2017, 2018, 2019, and 2020. In this sense, the large sample size and the panel structure of the data enables us to explore the evolution of firms financing behaviours and the consequences of growth whilst allowing for changes in financing behaviour to fully play- out over time. It also allows us to delve deeper into the core geographic regions of the UK and get into the uniqueness of localities where the majority of smaller firms reside and trade.

The Inter Departmental Business Register (IDBR) was the sample source for registered businesses. Dun & Bradstreet's database was the sample source for unregistered businesses with no employees and contacts were screened out if they either had employees on their payroll or paid VAT, as these would in theory have duplicated contacts found within the IDBR. The IDBR is a record of all UK enterprises that pay VAT or PAYE, containing around 2.7 million unique entries for enterprises. The BEIS Business Population Estimates (BPE) publication estimates around 5.7 million enterprises in the UK in total. The difference in the figures is accounted for by unregistered enterprises that do not pay VAT or PAYE. Dun & Bradstreet was retained as the source for top-up businesses with no employees as its database contains records for both registered and unregistered businesses.

A 336-cell sample stratification matrix was devised, the targets within each cell informed by the BPE. These cells were combinations from the:

- 14 'one-digit' SIC 2007 categories (ABDE, C, F, G, H, I, J, KL, M, N, P, Q, R, S)
- six size categories (unregistered zero employees, registered zero employees, 1-4 employees, 5-9 employees, 10-49 employees, 50-249 employees)
- four nations (England, Scotland, Wales, Northern Ireland)

The key capital market questions that inform our analysis are:

Please can you tell me all the types of finance that your business sought in the last 12 months? Please include applications for all types of finance including where you failed to obtain it. Please include renewals and extensions to existing facilities, e.g. to overdrafts, credit cards and loans.

For each the types of finance you sought in the last 12 months), Please tell me whether you obtained all that you applied for, some but not all, or no finance.

The first question gives us the simple share of small firms each year that are actively seeking external finance. The second question allows us to calculate, conditional upon making an application, the outcome. There are three outcomes and these include (a) got all the finance I requested, (b) got some but not all of the finance I requested, and, (c) got none of the finance I requested. We designate these responses as NO RATIONING, PARTIAL RATIONING, and FULL RATIONING.

Although you did not apply for it, have you had a need for finance in the last 12 months?

Which of these, if any, are reasons why you did not apply for this additional finance in the last 12 months? (a) feared rejection, (b) perceived it would be too expensive, (c) reluctance to take on additional risk, (d) prevailing economic conditions, (e) didn't know where to find appropriate finance, and, (f) poor credit history.

However, not all small firms that need finance make an application to a financier. This group of firms we designate as self-excluded from the external capital market and this formally includes various reasons for discouragement including being a poor credit risk through to the state of the macro-economy. The raw correlation between self-excluding from making

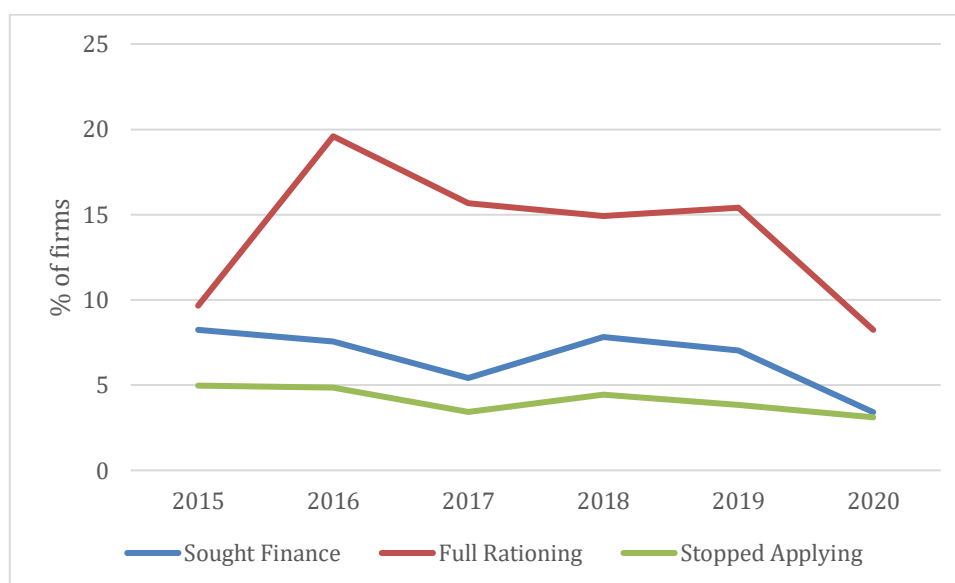
funding applications and the one year lag of full and partial credit rationing are 0.097*** and 0.067*** respectively.

Table 1 reports the full means, standard deviations, medians and correlations for our variables available for analysis. We observe that the typical small firm has £452,000 of real sales and 6 employees. It has been trading for around 20 years. It does not export, conduct R&D, innovate in any form and is not likely to seek finance. In contrast, 6.4% of small firms do export, 1.9% conduct R&D, 10.0% innovate their goods & services and 9.5% innovate their processes. Of the 6.6% who sought external finance, 11.1% were partially rationed, and 14.3% were fully rationed. In aggregate, 4.1% dis-engaged from the capital market even when they had a need for additional finance.

The correlation matrix shows that firm size is positively correlated with exporting and innovation and negatively associated with being fully rationed, even though the larger a firm is, the more likely it is to seek finance. In general, innovating firms are associated with a greater need for finance and a higher level of all forms of credit rationing. It was also the case that there was a positive and significant correlation between innovation and dis-engaging from capital markets. Finally, we find that all forms of capital rationing are positively associated with disengaging from capital markets *per se*.

The general time-series trend in terms of small firms seeking external finance from capital markets is downwards over the period from 2015 to the onset of the Covid-19 crisis in 2020, although there is considerable year-on-year variation (see Figure 1 below). Perhaps this is to be somewhat expected given the gravity of the uncertainty caused by the slowly unfolding and elongated Brexit process coupled with the onset of the global pandemic in early 2020. What is apparent is that this evidences a distinct shift in the willingness of small firms to seek external capital in the UK since the Global Financial Crisis (GFC) that, in the UK, extended from late 2008 through to 2011. Prior to this, it was common to observe 20% to 30% of small firms seeking external capital (Cowling et al, 2012).

Figure 1: Time-Series for Sought Finance, Full-Rationing, Stopped Applying



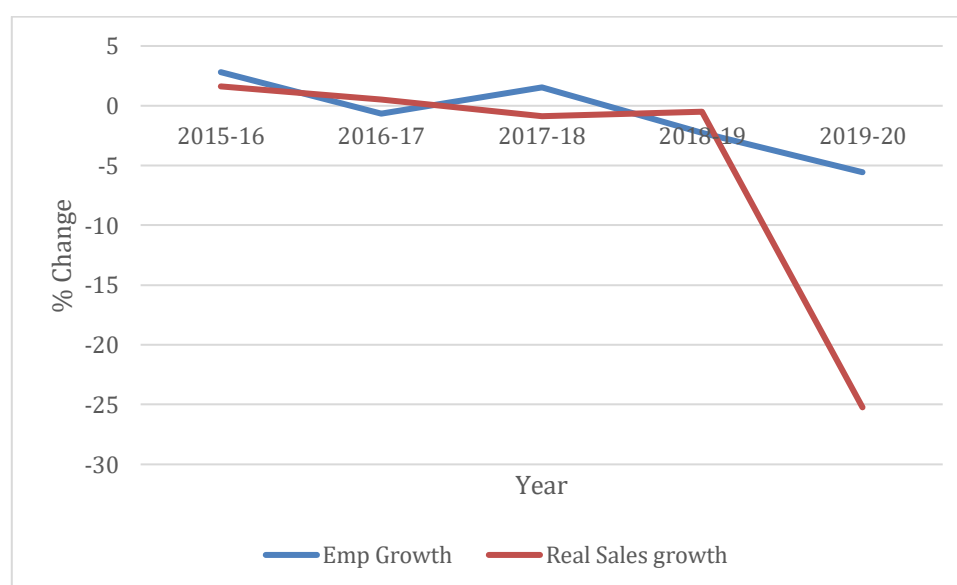
Conditional upon making an application for external capital, there is very considerable variation over time in the extent of full rationing, when a firm is completely rejected for all funds applied for. This ranges from 8.2% in the 2020 Covid-19 year to 19.6% in 2016 the year that the UK voted to leave the European Union. Over the full period from 2015 to 2020, on average, 14.3% of funding applications were completely rejected. This would equate to a total of around 51,673 smaller firms in the UK population. The provision of the three largest ever UK loan guarantee schemes ever during the Covid-19 crisis reduced the incidence of full rationing to a historical low level (Calabrese et al, 2022).

The final piece of the small firm – capital market chain is the extent to which small firms simply stopped applying for external funds even when they had a need for capital. On average 4.1% of small firms simply stopped applying for capital over the period. This equates to 38.6% of the total population of small firms who need additional capital. Again, the Covid-19 year (2020) had the lowest incidence of self-exclusion from capital markets with a rate of 3.1% which we might attribute to the large-scale government intervention in capital markets (Calabrese et al, 2022). This compares to a peak of 5.0% in 2015 when the UK economy was growing after the GFC. In this sense, it would appear that small firms do take note of the general macroeconomic environment but also the relative munificence of government policy in the small firm arena.

On our two outcome measures which represent the key dependent variables of our final modelling of the effects of capital market engagement on growth we find that this was a period generally characterised by low growth and declining employment (see Figure 2

below). The Covid-19 crisis led to a dramatic decline in sales of more than 25.3% and a 5.56% decline in employment. The fact employment was less affected is probably attributable to the Coronavirus Job Retention Scheme which enabled firms to retain employers despite facing extreme declines in sales in 2020. Average growth rates in real sales are driven by a small proportion of faster growing small firms, whilst the median small firm reported slightly negative real sales growth and zero employment change. This dynamic is well grounded in previous studies of small firm growth (Bottazzi and Secchi, 2010; Reichstein and Jensen, 2005).

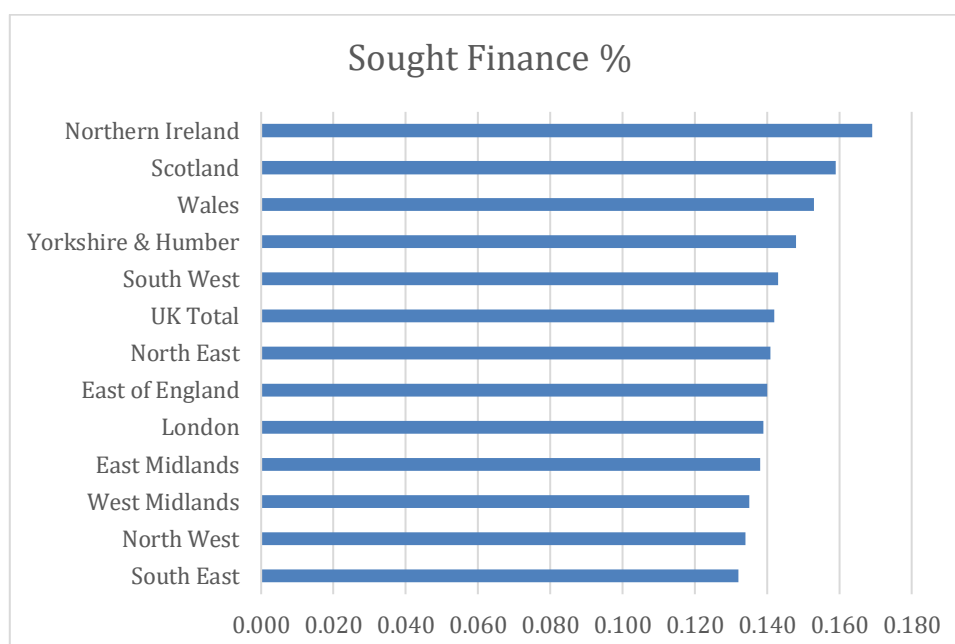
Figure 2: Time-Series Growth Rates in Employment and Real Sales



3.2 Region Specific Descriptive Statistics

Here we present the individual region statistics for our key finance market variables, sought finance, full rationing, partial rationing, and stopped applying. This will help us understand more about how SMEs in different regions differ in terms of their interactions with capital markets and, when they do, the responses they receive.

Figure 3: Proportion of SMEs who Sought Finance, by Region



From Figure 3, we observe that demand for finance is highest in the devolved nations of Northern Ireland (where 16.3% of firms sought external finance), Scotland (15.9%), and Wales (15.3%). This compares to only 13.2% of firms in the South East, 13.4% in the North West, and 13.5% in the West Midlands. Added to this is the fact that English peripheral regions also appear to have a stronger demand than London and the South East of England. The reasons for these spatial variations around the demand-side appetite for finance is unclear but this suggests that there are important differences between the devolved nations that are geographically peripheral to the capital city of England.

From Figure 4, we see that full rationing of funding applications is most prevalent in Northern Ireland, where 12.7% of finance applications result in a full rejection, the West Midlands (12.4% fully rejected), and Scotland (12.2% fully rejected). This compares to the relatively favourable outcomes found in the East of England, where only 10.1% of applications receive a full rejection, the East Midlands (10.2%) and the North East (10.3%). In this sense, the issue of capital rationing appears strongest and most apparent in Northern Ireland and Scotland where firms have high application rates and higher rejection rates than in more core UK regions.

Figure 4: Proportion of SMEs Fully Rationed for Finance, by Region

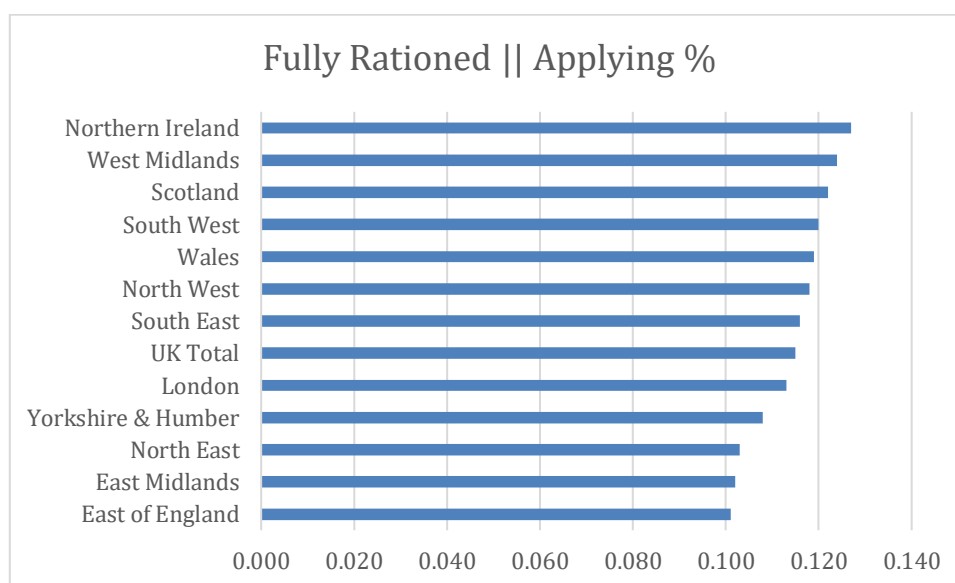
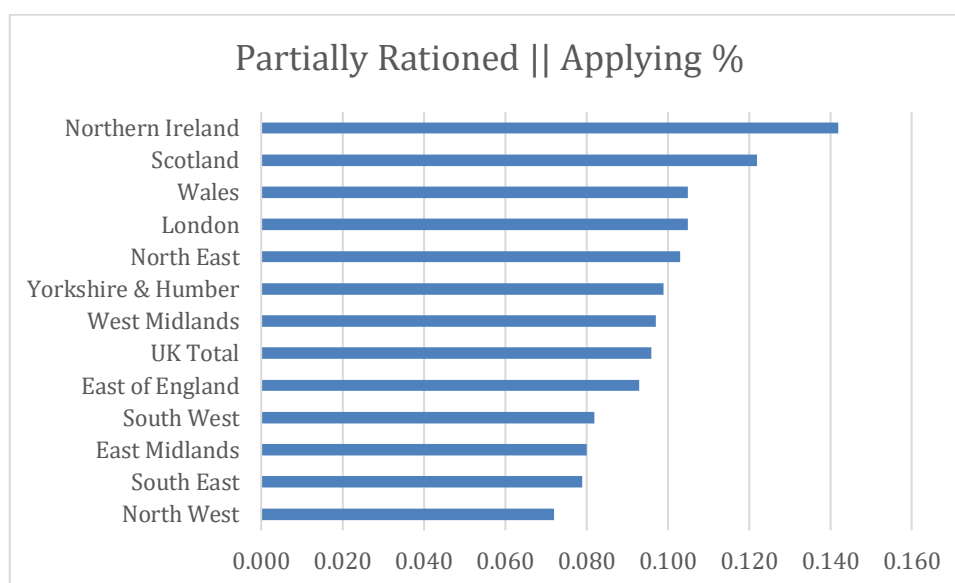


Figure 5 shows that partial rationing of funding applications is most prevalent in Northern Ireland, where 14.2% of finance applications result in a partial rejection, Scotland (12.2% partially rejected), and Wales (10.5% partially rejected). This compares to the relatively favourable outcomes found in the North West of England, where only 7.2% of applications receive a partial rejection, the South East of England (7.9%) and East Midlands (8.0%). In this sense, the issue of full and partial capital rationing appears strongest and most apparent in Northern Ireland and Scotland where firms have high application rates, high full rejection rates, and high partial rejection rates. This contrasts very distinctly with the experience of the East Midlands and South East where outcomes are more favourable.

Figure 5: Proportion of SMEs Partially Rationed for Finance, by Region



Finally, we show in Figure 6 below the relative incidence of firms that simply stopped even applying for finance even though they had a need for it. This is an important group and it is likely that their future plans for new investment and growth will be curtailed due to lack of finance. The incidence of firms stopping applying for finance is most prevalent in Northern Ireland, where 11.0% simply refuse to make funding applications even when they need finance, Scotland (9.9%), and London (9.4%). This compares to the relatively low incidences found in the South East England, where only 7.3% of firms stopped applying, the East of England (7.5%) and Yorkshire & Humber (7.6%).

In its totality, Northern Ireland and Scotland have the most problematic experiences of capital markets and this is reflected in a high incidence of simply refusing to even go to the capital market in future periods when they need funds. The South East has a very different, and more favourable, experience all round. This picture reflects other work on access to finance in the UK and shows a clear “liability of distance” effect for SMEs the further they are located from the UK’s capital city.

Figure 6: Proportion of SMEs Stopped Applying for Finance, by Region



4. RESULTS

We begin by considering what types of firms and the geography of these firms who have stopped applying for external funding. As we are interested in the regional levels, we estimate specific models using these distinct regional geographical identifiers. Then we move on to estimate separate models to test for the potential impact of stopping applying to capital markets for funds on employment growth and sales income growth. Again, we estimate models for geographic region. In all cases, we create an interaction term using the *Stopped Applying* dummy variable and the full set of 12 regions.

4.1 Stopped Applying

The first point from the broad geographic region set of models is that there is persistence in being in the Stopped Applying state in the sense that if a firm moved into that state last year there was an increasing chance that it remained in that state this year. We also observe that there was a negative relationship between employment size and stopping applying for funds. In this sense, the problem of self-rationing in capital markets is heavily concentrated amongst the smallest size classes of firm. In contrast, firm age was not found to be significant. Very few industry effects were apparent with the exception of a low probability of self-exclusion from capital markets amongst firms in real estate.

Consistent with other recent research on SME “borrower discouragement”, it was also the case that innovating firms were more likely to stop applying (see Brown et al, 2022). This was the case for goods & service innovators and process innovators. This is of concern in that it suggests that one of the key drivers of growth amongst the small business sector, the innovators, are withdrawing from capital markets even when they have a latent demand for funds. This is also consistent with information asymmetries being magnified for innovative small firms to the extent that they are more likely to face rationing in capital markets (Lee et al, 2015). It would appear that this knowledge and experience stimulates self-exclusion. More generally, we also find that any prior experience of absolute rationing in capital markets will lead to an increase in the probability of stopping applying for external funds.

In addition to this general, and average, effect of prior absolute rationing in capital markets in terms of increasing the probability that firms will self-exclude in the future, we also identified some very specific geographic effects. Here we find that smaller firms in the East, South East, South West, West Midlands, and Yorkshire & Humber regions of England and firms in Northern Ireland when faced with absolute rationing when making prior applications for funds from capital markets all had a significantly higher probability of self-excluding from the capital market and stopping making future funding applications. Interestingly, at this higher spatial level, there is no clear and evident pattern in respect of relative wealth and economic dynamism.

We also estimated a dynamic model for moving from a state of applying for external funding to not applying. Here we find that firm size had no effect but innovative firms and particularly product and service innovators were more likely to change to a non-applying state. Geography was also important and the strength of the full rationing from a funding application last year was very strong for firms located in the East Midlands, London, North West and West Midlands of England and Scotland and Northern Ireland. Again, there was no straightforward or discernible spatial pattern for firms moving from a state of applying to ceasing applying thereafter.

4.2 Job Growth

In this section we explore the impact on job growth with a particular focus on firms that have stopped applying for external funds in the previous year. Again, we focus specifically on the regional differences in impact by incorporating an interaction term between lagged stopped applying and our geographical identifier (region) to allow for time to elapse

between the initial decision to stop applying for external funding and the impact on job growth. As with our initial models, we include a full set of firm specific demographic characteristics including lagged firm size and growth, firm age, and a full set of industry sector dummy variables.

First, we find that smaller firms grow faster which is consistent with a body of research testing firm size growth effects often using a Gibrat's Law approach (Daunfeldt and Elert, 2013). However, we also find that lagged firm growth had a negative and significant effect on current growth. This confirms that growth is not persistent and is frequently discontinuous and temporally lumpy (Coad, 2022). In contrast with many previous studies, we find that firm age did not impact on current job growth and that very few industry effects were apparent. We do observe significant innovation effects and both goods & service innovators and process innovators had higher job growth.

At the broad geographic region, we find that firms that continued to apply for external capital when they needed it achieved high jobs growth in Scotland and Wales and that this effect was magnified in Wales where firms that stopped applying were found to grow their employment at a significantly slower rate. In this sense, we are drawn to conclude that self-exclusion from external capital markets, often induced by a previous incidence of full rationing, has a clear and detrimental effect on the ability of firms to create jobs and that these effects are strong at the regional level.

4.3 Real Sales Growth

Here we repeat the core employment growth analysis, but use real sales growth as our outcome variable of interest. The core findings are consistent with our job growth results in that smaller firms grow faster and that lagged growth rates have a negative effect on current sales growth rates. Again, growth is not persistent which highlights the volatility of smaller firms income (and employment) over time. Firm age was not found to be significant, and few industry sector effects were apparent. However, process innovators were associated with higher sales growth suggesting that improving internal operations is important to generating higher sales.

At the regional level, we find that self-excluding from capital markets has a strong and negative effect on sales growth in the East Midlands and Yorkshire & Humberside regions of England, and in Scotland. The magnitude of the effect is particularly large in the East Midlands.

5. CONCLUSION

We set out to trace out the potential effects of smaller firms dis-engagement and experiences with external capital markets on job and sales growth using a large UK longitudinal survey. This is important as smaller firms are most constrained by internal financial resources and external capital markets. Our key concern was that lack of access to capital for investment in growth enhancing activities would have a real and tangible impact on their ability to generate new jobs and sales. At the macro-economic level, this would directly impact on the UK economy as smaller firms create a disproportionate share of net new jobs and have increased their aggregate share of total UK GDP significantly over time. Indeed, due to the fact the majority of jobs in the UK are created by small firms, in 2010 their share of employment was triple that of 1998 (Wright et al, 2015).

We also considered the fact that most small firms are deeply rooted in their spatial environments in the sense that they trade locally, employ local people, and when they grow can stimulate local economic multipliers through an income and consumption spillover effects. In this respect, it was important to establish whether there was a general effect for smaller firms in respect of access to capital and growth but also whether there was a unique and differential effect across regions. This is important as there are many regions of the UK that have been underperforming for a generation following the de-industrialisation which began in the 1970s and has accelerated through the transition from a manufacturing economy to a service-based economy. It also ties into the current UK government narrative and White Paper around 'levelling-up' the economic geography of the UK (HMSO, 2022).

We find a clear and distinct causal chain of events which have their roots in capital markets. When small firms make funding applications and are rejected in an absolute sense (full rationing) this increases the probability that in the future they will self-exclude from capital markets, although this is not the sole reason. Importantly, once a small firm has made this initial choice it becomes more embedded over time. In an average year, we estimate that 230,000 small firms make this choice to self-exclude from capital markets even though they need additional funds. This ultimately reduces their ability to grow their employment and sales as new investment in growth enhancing capability is scaled back. Importantly, there is a differential effect for both self-exclusion from capital markets due to full rationing and jobs and sales growth being constrained by this self-exclusion across UK regions and sub-regions.

So what do these findings mean for the current Government's declared "levelling up" agenda? The most obvious effect of this reluctance to raise external finance is likely to be an under-provision of debt finance in different parts of the UK which in turn is likely to severely impede productivity growth in those locations (Mayer et al 2021). According to the British Business Bank, the UK has regional debt gaps of between £2-3bn in regular bank lending and £0.9bn in private debt each year (HMSO, 2022). Every region of the UK also faces an equity gap (where potential demand for equity finance exceeds supply), which is proportionately worse outside London. The equity gap at the seed and venture stages represents around £1.2bn each year, while the total equity gap is around £2.8bn per year across the UK (BEIS, 2019). A key contributor to the spatial unevenness of access to finance is often attributed to the centralised nature of the UK banking system relative to other countries such as the US and Germany (Mayer et al, 2021). Clearly, this is having important knock-on effects in terms of how it mediates access to finance for SMEs. It is hard to ascertain what policy makers can do to address a structural impediment such as banking system. That said, there are policy tools at the disposal of UK policy makers which can be considered.

Our findings have very direct public policy implications given the centrality of small firms to regional, and national economic growth and employment. Here we draw on the experience of the UK government Covid-19 loan guarantee schemes which supported the sustainability of more than a million small firms through the crisis by supporting their capitalisation and liquidity. Importantly, these schemes were accessed by many small firms who were previously self-excluding from external capital markets. In this sense the Covid-19 guaranteed lending schemes firstly reduced the incidence of full rationing and secondly reduced the incidence of complete dis-engagement from external capital markets (Cowling et al, 2021b). Given the quite clear differential regional effects of full rationing and subsequent dis-engagement from capital markets *per se*, it follows that the public policy instrument that is the loan guarantee scheme has the potential to address both capital market issues simultaneously as has been established for local loan schemes (Cowling et al, 2020c). This would help prevent a low investment – low growth scenario as the small firm sector emerges from the Covid-19 crisis loaded up with existing debt.

The loan guarantee instrument could play a major role as a spatial policy is by using the four key parameters (the guarantee coverage ratio, the interest rate premium, the term structure, and the maximum loan size), to create unique configurations of these four scheme parameters to target specific types of firms located in particular spatial areas with high prevalence rate of full rationing and also self-exclusion from capital markets. This

would increase small firm growth *per se* which would directly increase regional employment rates and potentially create a regional economic multiplier through increased income and consumption. The benefits of such an approach is that an existing scheme is already *in situ* and would only require minor adaptation to align with different regional conditions.

As well as requiring re-calibration, the manner in which these support instruments are pitched to the SME community also needs rethinking. Often SMEs who self-ration from debt finance are unaware of schemes aimed at tackling borrower discouragement such as loan guarantees (Wernli & Dietrich, 2021). Policies such as these can only be effective if they achieve strong uptake by the local small business community. In order to overcome this type of informational opacity, banks should work closely with LEPs and regional agencies to make a concerted effort to proactively advertise and publicise these types of loan guarantee support instruments to potential borrowers. Frequently business support initiatives pay far too little attention to these promotional aspects during the design of new support mechanisms³. Banks could also offer a more straightforward application as many SMEs are often deterred from applying for finance due to the costs and hassle of applying⁴.

In order to take the “levelling up” agenda seriously, this is the type of innovative and spatially calibrated policy initiative required to address the structural spatial inequalities confronting the UK economy. In order to tackle the deeply embedded inter and intra-regional productivity differentials within SMEs much more innovative and creative policy making will be required in the future.

³ <https://whatworksgrowth.org/policy-reviews/business-advice/>

⁴ This suggestion would help address the 10% of discouraged borrowers who claimed they had too little time or thought it involved ‘too much hassle’ to apply for finance even if they need it (see Brown et al, 2022).

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Table 1: Sample Means, S.D, Median and Pairwise Correlations

	Mean	Std Dev	Median	Real Sales	Employment	Age	EXPORT	RD	Innovation I	Innovation II	Partially Rationed	Fully Rationed	Stopped Applying	Sought Finance
Real Sales £s	2,733,806	7,548,547	452,000	1.000	1.000									
Employment	22.04	16.4	6	0.525	1.000									
Age of Firm	23.79	16.4	20	-0.032	-0.051	1.000								
EXPORT	0.064	0.245	0	0.077	0.031	-0.005	1.000							
RD	0.019	0.135	0	0.042	0.048	0.127	0.098	1.000						
Innovation - Goods & Services	0.100	0.300	0	0.056	0.069	-0.025	0.190	0.169	1.000					
Innovation - Process	0.095	0.294	0	0.071	0.114	-0.140	0.179	0.176	0.353	1.000				
Partially Rationed	0.111	0.314	0	0.003	0.019	0.059	0.024	0.020	0.066	0.067	1.000			
Fully Rationed	0.143	0.35	0	-0.023	-0.013	0.036	0.041	0.016	0.071	0.060	0.074	1.000		
Stopped Applying	0.041	0.198	0	-0.038	-0.027	-0.027	0.049	0.042	0.135	0.122	0.104	0.117	1.000	
Sought Finance	0.066	0.248	0	0.052	0.097	-0.045	0.076	0.051	0.165	0.160	0.321	0.339	0.117	1.000

Table 2: Government Office Region Models

	[1] Stopped Applying			[2] Real Sales Growth			[3] Employment Growth		
	Coeff	Z	Pr>z	Coeff	Z	Pr>z	Coeff	Z	Pr>z
Lag Real Sales Growth				-0.300	-13.85	0.000			
Lag Real Sales				-0.010	-2.43	0.015			
Lag Stopped Applying	1.904	24.23	0.000						
Lag Employment Growth							-0.321	-31.40	0.000
Lag Employment Size	-0.078	-3.10	0.002				-0.045	-11.30	0.000
Year Firm Started	6.054	1.37	0.170	0.081	0.09	0.926	-0.835	-1.20	0.229
Industry Sector									
ABDE - Primary									
C - Manufacturing	-0.136	-0.70	0.485	0.043	1.14	0.253	0.014	0.47	0.641
F - Construction	0.182	0.96	0.339	0.040	1.01	0.313	-0.010	-0.33	0.742
G - Wholesale/ Retail	-0.127	-0.70	0.485	0.012	0.33	0.741	0.006	0.21	0.831
H - Transport/ Storage	-0.100	-0.41	0.685	0.060	1.20	0.229	0.045	1.15	0.249
I - Accommodation/ Food	0.156	0.76	0.446	0.036	0.85	0.394	0.009	0.25	0.802
J - Information / Comms	-0.168	-0.79	0.427	-0.028	-0.67	0.504	0.002	0.05	0.962
KL - Financial/ Real Estate	-0.741	-2.67	0.008	0.003	0.06	0.954	-0.005	-0.15	0.880
M - Professional/ Scientific	-0.247	-1.34	0.181	-0.043	-1.22	0.222	-0.029	-1.00	0.319
N - Administrative/ Support	0.037	0.18	0.854	0.053	1.31	0.190	0.016	0.51	0.611
P - Education	0.260	1.09	0.274	0.039	0.78	0.438	0.047	1.18	0.237
Q - Health/ Social Work	0.174	0.86	0.388	0.081	2.07	0.038	0.081	2.49	0.013
R - Arts/ Entertainment	0.421	1.79	0.073	-0.001	-0.02	0.980	-0.028	-0.67	0.504
S - Other service	-0.018	-0.07	0.941	-0.023	-0.49	0.623	-0.025	-0.64	0.520
EXPORT	-0.040	-0.37	0.708	0.010	0.50	0.617	0.002	0.13	0.898
R&D	0.094	0.74	0.462	0.003	0.12	0.906	0.017	0.96	0.338
Innovation Goods & Services	0.388	4.61	0.000	0.013	0.74	0.458	0.045	3.63	0.000
Innovation Process	0.294	2.78	0.005	0.083	4.25	0.000	0.043	2.97	0.003
Region									
East Midlands									
East of England	-0.239	-1.37	0.170	-0.010	-0.28	0.779	0.021	0.79	0.428
London	0.090	0.54	0.589	-0.049	-1.33	0.182	-0.033	-1.19	0.234
North East	-0.150	-0.58	0.561	-0.127	-2.32	0.020	0.022	0.53	0.595
North West	-0.172	-0.96	0.335	-0.002	-0.05	0.963	0.047	1.66	0.097
South East	-0.232	-1.46	0.145	-0.066	-2.01	0.045	0.041	1.63	0.103
South West	-0.224	-1.36	0.175	-0.027	-0.78	0.433	0.024	0.91	0.363
West Midlands	-0.155	-0.87	0.385	-0.034	-0.90	0.366	0.043	1.49	0.135
Yorkshire & Humber	0.075	0.42	0.675	0.014	0.34	0.733	0.026	0.87	0.386
Scotland	0.183	1.14	0.252	-0.003	-0.09	0.931	0.075	2.73	0.006
Wales	0.287	1.42	0.154	0.007	0.14	0.892	0.072	1.97	0.049
Northern Ireland	0.022	0.11	0.910	0.049	1.15	0.250	0.050	1.47	0.142
Region									
East Midlands	1.059	1.89	0.059	-0.395	-3.62	0.000	0.014	0.21	0.833
East of England	0.206	0.30	0.764	0.067	0.83	0.409	-0.154	-2.68	0.007
London	1.832	4.21	0.000	-0.066	-0.80	0.425	0.000	-0.01	0.995
North East	0.889	1.03	0.303	-0.163	-0.90	0.366	-0.035	-0.29	0.772

North West	0.899	1.45	0.147	-0.073	-0.81	0.421	0.005	0.09	0.932
South East	1.370	3.54	0.000	-0.023	-0.29	0.772	-0.016	-0.30	0.768
South West	1.408	3.41	0.001	0.027	0.35	0.725	-0.023	-0.43	0.668
West Midlands	1.276	2.50	0.012	-0.074	-0.93	0.355	0.013	0.21	0.835
Yorkshire & Humber	1.338	2.47	0.013	-0.187	-2.02	0.044	-0.003	-0.05	0.962
Scotland	0.601	1.28	0.199	-0.128	-2.02	0.043	0.020	0.43	0.665
Wales	0.065	0.06	0.952	-0.077	-0.44	0.663	-0.246	-2.66	0.008
Northern Ireland	1.858	3.33	0.001	0.045	0.58	0.559	0.124	1.93	0.053
Lag Fully Rationed				-0.007	-0.16	0.875	0.027	0.86	0.390
Constant	-48.736	-1.46	0.146	-0.517	-0.08	0.938	6.349	1.20	0.228
Observations	13,764			3,558		8,130			
Group	8,491			2,257		4,915			
Wald Chi-2	831.04			291.28		1,371.16			
Pr>Chi-2	0.00001			0.00001		0.00001			

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