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Sticking it on Plastic: The Spatial Dynamics of Credit Card Finance in UK Small and Medium Sized Enterprises

By *Ross Brown, Jose Liñares-Zegarra, and John O.S. Wilson*

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Abstract

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Keywords: Access to finance, credit cards, SMEs, bootstrapping, peripheral regions, thin markets

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1. Introduction

This paper investigates the role of credit cards in financing small and medium sized enterprises (SMEs) and how this varies across different geographical areas in the UK. Financing or lack thereof is one of the core themes of entrepreneurship research (Berger and Udell, 1998; Cassar, 2004). Financial constraints may prevent the launch of new firms or reduce the capacity of existing firms to grow. Existing firms, when faced with financing constraints may also be forced to seek alternative, and in some cases inappropriate, sources of finance. As such financing constraints have profound implications for the overall level of start-ups and growth of SMEs (Cassar, 2004; Colombo and Grilli, 2007; Dobbs and Hamilton, 2007), which in turn has implications for economic growth (Beck and Demirguc-Kunt, 2006; Fraser et al, 2015).[1]

Recent empirical evidence suggests that the SME funding landscape has become less conducive in recent years brought about by the interplay of the global financial crisis combined with the ongoing structural, regulatory and technological changes that have taken place in the banking industry (Scellato, and Ughetto, 2010; Cowling et al, 2012; Cole and Sokolyk, 2016).[2] Banks have reduced lending to SMEs, often discriminating against innovative firms (Freel, 2007; Lee et al, 2015), and instead prioritising lending to large firms with substantial collateral (Cowling et al, 2012). In the UK, these financing constraints are particularly acute for firms located in peripheral geographical areas (Lee and Brown, 2016; Zhao and Jones-Evans, 2016). Given this unfavourable environment, small innovative firms may seek less traditional modes of funding to finance day-to-day activities and longer term growth. Indeed, while bank loans remain the primary source of external finance for larger SMEs (Basu and Parker, 2001), alternative sources of funding such as factoring, purchase order finance, trade credit and crowdfunding are becoming increasingly popular with start-ups and SMEs (Bruton et al, 2015; Casey and O'Toole, 2014; McGuiness and Hogan, 2016; OECD, 2015; Brown et al, 2017).

While extant research has sought to understand alternative sources of finance, especially business angel and venture capital finance (Martin et al, 2005; Nightingale et al,

[1] Beck et al 2004, for example, find that on average financial constraints reduce firm growth by 6% for large firms and 10% for small firms.

[2] Ivashina and Scharfstein (2010) find that new loans to borrowers declined by 47% during the peak period of the financial crisis (fourth quarter of 2008) while others observe a 20% decline in bank lending to SMEs following the global financial crisis (Cole and Sokolyk, 2016).

2009), credit card finance has received much less attention. This is somewhat surprising given that the percentage of SMEs using credit card financing has increased steadily over the past decade (Wescott et al, 2010). For example, in the US, credit cards have become a "*major source of financing for small businesses and have relaxed liquidity constraints faced by small firms"* (Blanchflower and Evans, 2004, p. 93). It is estimated around half of all US entrepreneurs use credit cards to either start a new firm or finance the expansion of an existing firm (Moore et al, 2008). Evidence for the UK suggests that credit cards are the single largest source of external finance for SMEs.[3] Approximately one in five SMEs use credit cards (British Business Bank, 2014), with seven per cent using credit cards as the sole form of external finance (BDRC, 2016).[4] Research shows that SMEs have an average credit card debt of £30,000, which is approximately 50% greater than the average domestic user (Hesse, 2012). Clearly a strong factor for this high level of use concerns availability. Recent research shows that credit cards have the second highest success rate for SMEs seeking finance (Owen et al, 2016).

Available evidence suggests that entrepreneurs can circumvent credit rationing by seeking credit card financing (Parker, 2005; Mach and Wolken, 2006).[5] The use of credit cards may provide flexible financing, which allows SMEs to adjust payments to fit patterns in cash flow (Wescott et al., 2010). Unfortunately, to date there is a paucity of evidence regarding the nature of SMEs utilising this form of finance. It would appear likely that certain borrowers may be more susceptible to using credit card finance. Fast growing, opaque firms with limited collateral may be particularly attracted (Rostamkalaei and Freel, 2016; Brush et al, 2006). According to Blanchflower and Evans (2004), credit card lenders charging very high interest rates attract riskier borrowers through a process of "adverse selection". This results in less risky firms accessing traditional forms of credit, leaving "*shakier firms hooked on plastic*" (Deustche Bank, 2009, p.12).

[3] Data provided by BDRC reveals that credit cards were used by 15% and 17% of SMEs in the first two quarters of 2016, respectively. This compares to the banks overdrafts which were used by 14% and 16% in the same respective quarters.

[4] This is perhaps unsurprising given that the UK is the largest credit card market in Europe, accounting for over 70% of all credit cards in the EU (UK Cards Association, 2014). Indeed, the UK credit card market has expanded significantly over the last two decades with 34 new entrants between 2000-2010 (BIS, 2016).

[5] Given most credit cards are issued by banks, this means banks may be inadvertently funding SMEs through this "hidden" form of unsecured lending.

Given that access to finance is spatially uneven across the UK (Lee and Brown, 2016), credit constrained SMEs in more peripheral areas may also be more pre-disposed to using credit cards to finance day-to-day activities and longer term growth. Often peripheral locations are characterised by low levels of venture capital and business angel financing which often finance risky innovative ventures (Martin et al, 2005; Mason, and Pierrakis, 2013; Nightingale et al, 2009). Start-ups are also likely to be attracted by credit cards financing. The results of prior research suggest that credit cards are a core form of "bootstrapping" in new entrepreneurial ventures (Winborg and Landström, 2001; Brush et al, 2006). Furthermore, the availability of credit cards increases the probability of new firm start-ups (Elston and Audtretsch, 2011). Examples of dynamic entrepreneurs who have successfully grown through this form of finance include the founders of Google, Sergey Brin and Larry Page (Deutsche Bank, 2009).[6] Despite these notable examples, evidence regarding the type of SMEs using credit card financing remains scant.

In this paper, we investigate for the first time the use of credit cards by UK SMEs from a geographical perspective. Specifically, we seek answers to the following questions: (i) do innovative, growth and export-oriented SMEs have a greater use of credit cards than *typical* SMEs? (ii) do SMEs in peripheral regions have greater usage of credit cards than counterparts located in "core" regions? (iii) do peripheral growth-oriented, peripheral innovative-oriented and peripheral export-oriented SMEs have a greater propensity to use credit cards compared to *typical* SMEs? (iv) do peripheral growth-oriented, peripheral innovative and peripheral export-oriented SMEs using credit cards have a greater propensity to apply for further external finance compared to *typical* SMEs? [7]

In order to answer these questions, we use data from the UK SME Finance Monitor (a nationally representative survey of SME Finance). The information includes quarterly data regarding prior borrowing and future intentions to borrow by SMEs. The data are disaggregated at regional and local level, thus allowing spatial comparisons between SMEs located in in different geographic areas.

[6] Kevin Plank founded the clothing giant Under Armour employing 11,000 people in his grandmother's basement in 1995 with $40,000 on credit cards.

[7] "Typical" SMEs are used as a benchmark through the paper and include SMEs which are: Core (non-peripheral), non-growth, non-innovative or non-exporting.

To investigate the use of credit card financing, we use a probit model to investigate the probability of using credit card financing taking explicit account of the location of the SME's headquarters. Our key dependent variables capture SME use of credit cards, and whether the SME is likely to apply for more external finance in the next three months. Both variables are binary and time varying. Our key independent variable is an indicator variable which captures whether a SME is located in a 'core' or 'peripheral' region in the UK. The available data allow us to classify SMEs based upon their respective orientations toward innovation, growth and exporting. Our model also includes a series of covariates to account for differences in size, profitability, gender and ethnic group of main owner, establishment age, extent of strategic planning, risk and legal form of the SME.

We contribute to the small business finance and entrepreneurship literature in the following ways. First, we make an important contribution to the limited evidence regarding the use of credit card financing by SMEs. Our results suggest innovative, growth and export-oriented SMEs are particularly attracted to this form of finance. In other words, firms with the highest levels of informational opacity are more likely to utilise this form of financing.

Second, we augment prior literature that has identified spatial variations in access to finance among SMEs. This literature (reviewed in further detail in section 2) suggests that problems faced by SMEs in accessing finance are particularly acute in peripheral geographic areas (Lee and Brown, 2016; Zhao and Jones-Evans, 2016). Our findings suggest that the nature of demand for credit card financing in peripheral parts of the UK economy differs from demand in core geographic areas. A lack of finance in certain geographic areas has a substitutive impact on alternative sources of funding being sought. Therefore, a lower probability of obtaining bank credit (or being a discouraged borrower) may force credit-constrained SMEs to seek alternative financing sources such as credit cards.

Third, the results of our study have implications for public policy. Increasing access to funding for SMEs is a major and long-standing policy concern in the UK (Hughes, 1997; Sunley et al, 2005; British Business Bank, 2014; Udell, 2015). It is vital that the evidence based on SME finance incorporates the full range of funding instruments utilised by SMEs if policy makers are to design effective demand and supply-side interventions (Wright et al, 2015).

Overall, this paper is the first to shed evidence on the importance of credit card finance for different types of SMEs and, in particular, those located in different geographic

areas. The remainder of the paper is structured as follows. Section 2 reviews of relevant literature. In section 3 we present the data set used in the empirical investigation and outline the estimable models. Section 4 presents the results of our empirical investigation. Section 5 discusses the results and highlights implications and areas for further research.

2. Literature and Hypotheses

This section reviews salient issues related to the financing of small business at various stages of development. We discuss how informational opacity and asymmetries pervade the market for small firm finance, and the implications for the extent and types of finance used by small firms. We then examine the empirical evidence regarding the use of credit cards by SMEs. Finally, we present our research hypotheses.

2.1 Theory of Small Business Finance

Prior literature suggests SMEs find it both difficult and expensive to rise outside capital from banks and other investors (Berger and Udell, 1998). Agency problems and informational asymmetries lead to credit rationing in SMEs (Jaffee and Russell, 1976; Stiglitz and Weiss, 1981). Informational opacity is a key feature of start-ups and SMEs (Berger and Udell, 1998; Cassar, 2004). Small firms do not have audited financial statements or publicly visible contracts with staff and suppliers (Carpenter and Peterson, 2002). As such small firms are less able to convey creditworthiness and growth to potential investors (Berger and Udell, 1998). Furthermore, most SMEs lack sufficient collateral to offset inherent informational asymmetries (Avery et al, 1998). As a consequence, SMEs are unable to access traditional forms of finance such as bank loans (Cosh et al, 2009) and instead may seek alternatives (Robb and Robinson, 2014).

Berger and Udell (1998) introduce the financial growth cycle to explain small business financing decisions. The authors contend that the needs and options for financing change as firms grow and evolve. Under the financial growth cycle the founders of new firms seek insider finance from family and friends before and at inception. Insider finance is often required at the very early stage of a firm's development when entrepreneurs are "*still developing the product or business concept and when the firm's assets are mostly intangibles*" (Berger and Udell, 1998, p.622). As firms grow, they gain access to

intermediated debt finance from banks and finance companies, or equity finance from business angels and venture capitalists. This theoretical model helps explain why small firms encounter credit constraints and the interconnectedness between different sources of finance.

However, the model fails to adequately explain the manner in which SMEs obtain and utilise insider finance during the early stages of development. This is important because many entrepreneurs may not have sufficient levels of insider finance to help launch and grow their business. Internal sources of finance are sometimes limited and can constrain firm growth (Binks and Ennew, 1996; Carpenter and Peterson, 2002; Beck and Dermirguc-Kunt, 2006). Eventually firms are likely to use external sources of finance as a complement to existing internal sources to fund growth (Rostamkalaei and Freel, 2016). The model also downplays the alternative financing strategies used to fund expansion. Due to the innate heterogeneity across borrowers financing by SMEs is not standardized (Gregory et al, 2005; Udell 2015). For example, low growth SMEs may be able to rely on internally generated resources to fund expansion (Baker and Nelson, 2005), while growth-oriented firms may resort to innovative forms of "bootstrapping" to overcome financing constraints (Bhide, 1992; Winborg and Landstrom, 2001; Brush et al 2006; Ebben and Johnson, 2006).[8]

Another crucial aspect of borrower heterogeneity concerns geographic location. It is now increasingly recognised by economic geographers that where a firm is located fundamentally shapes their ability to obtain finance (Martin and Sunley, 2015). Owing to organisational and technological changes which have reduced the relational proximity between SMEs and banks, small firms located in peripheral areas encounter a "liability of distance" (Lee and Brown, 2016, p. 23). While this is germane to all SMEs (Degryse et al, 2015; Zhao and Jones-Evans, 2016) it appears that innovative SMEs located in peripheral areas are particularly disadvantaged (Lee and Brown, 2016).[9] Others note large national banks have a "home bias" which constrains local branches from lending to "*soft-information intensive borrowers, such as small innovative enterprises*" (Presbitero et al, 2014, p. 57). Evidence suggests that many of these aforementioned issues relate to a structural problem associated with so-called "thin markets" where investors and entrepreneurs find it difficult connect with each other outside core geographic areas (Nightingale et al, 2009). Recent

[8] Bootstrapping refers to a collection of financing methods which minimise the need for debt and equity financing from lenders and investors (Harrison et al, 2004;Ebben and Johnson, 2006).

[9] Similarly, other studies also observe spatial variations in access to finance for SMEs in other EU economies (Alessandrini et al, 2010; Donati and Sarno, 2015).

research suggests that thin markets spillover into other forms of SME lending markets in peripheral regions (Lee and Brown, 2016). Overall, geographical issues strongly determine the availability of different types of finance to SMEs.

2.2 Empirical Literature on Credit Cards and Small Businesses

There are two strands of relevant empirical literature (which are discussed in this section). The first draws on large scale national small business surveys (mostly in the UK and US) to explore the volume of use of credit cards. The second explores the characteristics of start-ups and SMEs which utilise credit cards within the domain of the entrepreneurial bootstrapping literature.

Credit Card Usage by Small Business

Much of the evidence base centres on the use of credit cards by entrepreneurs and SMEs. Using data from the 1998 US Survey of Small Business Finances (SSBF), Blanchflower and Evans (2004) find that 46% of small firm owners use personal credit cards to finance business activities.[10] These users are predominantly small firms recently denied credit, or small firms discouraged from applying for a bank loan for fear of being rejected. Furthermore, the 34% of SMEs that had business credit cards grew twice as fast as counterparts without credit cards. The authors conclude that credit cards enable small firms to circumvent liquidity constraints.

Using data collected from the 2003 SSBF, Mach and Wolken (2006) report that the use of personal credit cards by SMEs remained largely unchanged between 1998 and 2003. Personal credit card use is highest among the smallest firms in the survey (averaging around 50%) compared to the largest firm counterparts (averaging 33%). Since 1998, the percentage of SMEs using business credit cards increased substantially from 34% to 48%. The authors conclude that small firms with limited credit history, may rely on credit cards as a substitute for other types of financing (Mach and Wolken, 2006).

Evidence collected via the Kaufman Firm Survey finds that 29% of US entrepreneurs used a credit card to finance a start-up in 2004, and at least 22% used credit cards to make additional injections of capital in 2008 (Robb et al, 2010). Interestingly, this data set was used

[10] The SSBF classifies SMEs as firms with less than 500 employees. This exceeds the standard European Union definition, where an SME is defined as a business employing less than 250 employees.

to assess the types of insider finance used within US start-ups. The findings suggest that between 2004 and 2011 the overall average of credit card debt used to finance start-ups was $5,037 (Robb and Robinson, 2014) twice the amount reported (for 2001) in prior research (Blanchflower and Evans, 2004). Another survey of US high-tech entrepreneurs in 2004 finds that credit cards were the third most important source of start-up finance (13%) after bank or individual loans (21%) and earnings from a second job (58%) (Elston and Audretsch, 2011). More recently, survey evidence compiled for individual consumers finds that only seven percent of respondents report using personal and business credit cards to finance start-ups in both 2010 and 2013 (Miller et al, 2016).

Wescott et al (2010) utilises the US Federal Reserve Survey of Small Business Finances (a nationally representative sample of small firms) to investigate the relationship between credit card use and firm performance. The authors find strong statistical evidence linking the use of credit cards with growth in employment and sales revenue. For example, a one percent increase in credit card credit use by start-ups is associated with a 0.116% increase in firm revenue. In other words, on average, an extra $1,000 of credit card use is associated with approximately $5,500 increase in revenue. At an aggregate level, the authors contend that the expansion of credit card lending to small businesses over the period 2003 to 2008 resulted in the creation of 1.6 million jobs (Wescott et al, 2010). Not all evidence paints such a positive picture however. For example, a study by the Kaufmann Foundation finds that a continuously high level of credit card debt is associated with an increase in the probability of default (Scott, 2009).

Entrepreneurial characteristics of SMEs using credit cards

Evidence suggests that entrepreneurial characteristics play an important role in determining the extent to which small businesses use credit cards. For example, Mach and Wolken (2006) find that female entrepreneurs use credit cards more than males (Mach and Wolken, 2006). Bates (1997) finds that start-ups owned by black entrepreneurs were more likely to use credit cards to finance formation (15.7%) than white counterparts (6.4%). In contrast, Mach and Wolken find that Hispanic, white-owned SMEs are most likely to use credit cards. In a study of the New Enterprise Scholarship programme (a programme designed to promote disadvantaged and under-represented entrepreneurs in the UK), Rouse

and Jayawarna (2006) find that disadvantaged entrepreneurs (including ethnic minorities) are more likely to use credit cards (17.2%) compared to typical start-ups (3.3%).

Within the entrepreneurial *bootstrapping* literature, credit cards are viewed as a key method of leveraging finance within resource-constrained SMEs (Winborg and Landström, 2001; Harrison et al, 2004; Brush, 2006). Bootstrapping through the use of credit cards is an easy way to obtain financing without pledging collateral (Brush et al, 2006). The bootstrapping literature tends to draw on a larger number of smaller scale bespoke empirical studies of entrepreneurs. It is estimated that some 85% to 90% of small firms utilise some form of bootstrapping (Bhide, 1992; Harrison et al, 2004). Examples of include: renting rather than buying equipment; withholding the managerial salaries; delaying payment to suppliers; hiring temporary employees; and using personal credit cards to finance business operations.

In a survey of bootstrapping techniques across Swedish start-ups, Winborg and Landström (2001) find that private credit cards are used for business purposes by around a third of entrepreneurs. However, other techniques such as: buying second-hand equipment (78%); extracting better conditions from suppliers (74%); and withholding the salaries of managers (45%) were more commonly used strategies (Winborg and Landström, 2001). Drawing on a survey of retail and service firms in the Mid-West of the US, Ebben and Johnson (2006) find that the use of a personal credit card as a form of bootstrapping was more common than loans from friends and family, and second most prevalent bootstrapping strategy after withholding salaries of managers. In a survey of technology-based and non-technology start-ups, Van Auken (2005) finds that bootstrapping methods, including the use of personal credit cards, were more prevalent in technology firms than in non-technology counterparts.

In one of the only comparative studies, Harrison et al (2004) find significant geographical variations between bootstrapping approaches in software firms in Northern Ireland, south-east England and Massachusetts. Compared to the core region of the south-east of England, firms in Northern Ireland appear to draw upon bootstrapping techniques to a larger degree to overcome financing constraints (Harrison et al, 2004). The use of credit cards is an important aspect of bootstrapping especially for small firms located in Northern Ireland. The authors contend that the local operating environment in peripheral geographic areas such

as Northern Ireland heightens opportunities to leverage access to finance for small firms (Harrison, 2004).

Overall, the available evidence suggests that using bootstrap techniques such as credit cards and withholding managerial salaries are effective mechanisms for alleviating financing constraints, especially for growth-oriented and innovative SMEs. Despite the strong prevalence of these types of alternative resource building strategies in SMEs, evidence on bootstrapping techniques such as the use of credit cards has been limited in the salient literature (Winborg and Landström, 2001). Indeed, an important area identified for further research is the need to explore why particular bootstrapping strategies are deployed by SMEs (Malmström, 2014). Another notable omission in the literature is the paucity of spatially disaggregated research. The scant evidence which does exist suggests that there are marked differences in bootstrapping strategies across different geographic areas (Harrison et al, 2004). This suggests a need for further disaggregated analyses to investigate whether there are spatial differences in the use bootstrapping. The overall paucity of analysis on credit cards as source of finance for SMEs points strongly towards the need for further empirical work on this issue. In the remainder of this paper we examine use of credit cards by UK SMEs, and the extent to which this varies by geographic area.

2.3 Research Hypotheses

In this section we present four testable hypotheses, which are based upon our prior analysis of existing evidence. The first hypothesis relates to the types of firms most likely to use credit card financing. Given the importance of informational opacity in lending decisions, it appears to be the case that growth-oriented and innovative SMEs are often the most credit constrained (Mina et al, 2013; Lee et al, 2015; Rostamkalaei and Freel, 2016). While less work has examined the correlation between financing constraints and export intensity, researchers have noted that many firms aim to grow via international expansion (Mason and Brown, 2013). As a consequence, we would expect riskier and more informationally opaque SMEs (in other words those that are growth-oriented, innovative and export-oriented) to be more likely to seek alternative sources of finance than typical SMEs. Given the problems accessing external finance, riskier growth-oriented firms may also to be more pre-disposed toward costlier “opportunistic” forms of finance such as credit cards. Based on this, we contend:

H1: Innovative, growth and export-oriented SMEs have a greater use of credit cards than typical SMEs.

The lack of spatial research is often cited as a key weakness of the small business finance literature (Cassar, 2004). Indeed, to our knowledge no research to date has examined specifically spatial variations in the use of credit cards by SMEs in the UK or elsewhere. This seems an important omission especially as traditional sources of bank and equity finance are harder to obtain by SMEs located in remote geographical locations (Martin et al, 2005; Lee and Drever, 2014; Presbitero et al, 2014; Zhao and Jones-Evans, 2016). While this is now firmly established in the literature, it begs the question where credit-constrained peripheral SMEs turn to for finance in these "thin markets". Accordingly, some researchers have identified an urgent need to examine "*the entire range of funding institutions constituting thin markets*" (Lee and Brown, 2016, p.23). That being the case, it would seem feasible that credit constrained peripheral SMEs would be inclined to experiment with alternative sources of finance such as credit cards. As these constraints are most marked within riskier growth-oriented and innovative SMEs, we would expect that these firms to be particularly amenable to this type of finance in peripheral regions. Therefore we contend that:

H2: SMEs in peripheral regions have greater usage of credit cards than counterparts located in core regions

H3: Peripheral growth-oriented, peripheral innovative-oriented and peripheral export-oriented SMEs will have a stronger propensity to use credit cards compared to *typical* SMEs.

The use of credit cards has implications for the longer-term capital structure of SMEs located in peripheral areas. The entrepreneurial bootstrapping literature portrays credit cards as a key stop-gap financing measure. However, most of this literature is cross-sectional and as such fails to capture how financing evolves over time. What happens post-bootstrapping is important because eventually growth-oriented SMEs will seek additional external finance to fund expansion (Carpenter and Petersen, 2002; Freel, 2007). This would correspond with prior evidence which emphasises the interconnectedness between insider and external sources of finance (Berger and Udell, 1998). Therefore, we might expect that more dynamic firms located in peripheral areas view this form of finance as a springboard to obtaining longer-term external finance. Therefore we posit that:

H4: Peripheral growth-oriented, peripheral innovative and peripheral export-oriented SMEs using credit cards will have a stronger propensity to apply for further external finance compared to typical SMEs.

3. Data and Methods

3.1 Data and Variables

We compile a dataset from a nationally representative sample of SMEs in the UK covering the period quarter 3,2013 through quarter 4,2015. The data comes from the UK SME Finance Monitor (BDRC, 2016). This survey contains quarterly data related to prior borrowing and future intentions to borrow of UK SMEs (which employ up to 249 employees). The survey of SMEs spans 9 industry categories and 12 economic regions (at NUTS 1 level).[11] Since the financial crisis in the UK, the survey has been used extensively as a means of monitoring SME access to finance (Bank of England, 2015; British Business Bank, 2016; Lee and Brown, 2016).

In order to qualify for inclusion in the survey, SMEs must satisfy the following criteria (in addition to size, sector and locational requirements). First, the SME should be independent (and not have 50%+ of equity owned by another company). Second, the SME should not operate as a social enterprise or a not-for-profit organisation. Third, the SME should have an annual turnover of less than £25 million. The main respondent for each SME is the person in charge of managing finances.

The survey is comprehensive and includes (at SME level) detailed information relating to the use of credit cards as a source of funding. Financial information and information on sentiment relating to current and future financing is also reported. One of the main advantages of the survey is that it contains spatial information at postcode level. This allows us to identify the exact location of SMEs, and differentiate between those located in peripheral areas and those located close to London in terms of the time to travel by road, rail and air (Lee and Brown, 2016). The survey also includes credit ratings relating to the overall financial health of firms.

Table 1 provides summary statistics and variable definitions. Our key dependent variables capture SME use of credit cards and whether the SME is "very likely" or "fairly

[11] The broad industry categories comprise: agriculture and hunting, manufacturing, construction, wholesale retail, hotels and restaurants; transport; real estate; health social work and other sectors.

likely" to apply for more external finance in the next three months. Both variables are binary and time varying. On average 15.8 per cent of our sample of SMEs use credit cards, while seven per cent are planning to apply for additional funding in the near future. Our key independent variable is an indicator variable which captures whether a SME is located in a 'core' or 'peripheral' region. Following Lee and Brown (2016) peripheral regions are defined as those in bottom 10 per cent in the UK in terms of geographical accessibility from London according to travel time using road, rail and air. On average, 11.7 per cent of SMEs in our sample are located in peripheral regions.[12]

We also classify SMEs based upon their respective orientation towards innovation, growth and exporting. An SME is innovative if it has developed a new product or service in the past three years. This group represents 15.3 per cent of the sample. SMEs with a growth orientation are those which aim to grow substantially or moderately over the next year. This group represents 46.2 percent of the sample. An SME is export-orientated if it sells goods or services abroad. Export oriented SMEs represent 9.6 per cent of the sample. A series of covariates are used to account for other differences (which are likely to influence the use of credit card financing) across SMEs. These include size, profitability, gender and race of main owner, establishment age, extent of strategic planning, risk and legal structure. Firm size measured by total employment across four size categories: 0 employees; 1 to 9 employees; 10 to 49 employees and 50 to 249 employees. The population of SMEs in the UK is characterized by a large proportion of firms with zero employees (74.1%) and 1-9 employees (22.1%). Profitability is measured using two indicator variables which capture whether a firm has made a profit (71%) or a loss (10%) in last financial year. We control for whether 50 per cent or more of the SME is owned by a female. This group represents 25 per cent of our sample. The owners of the SMEs in the survey are predominantly white (91.6%) and between 31-50 years old (48%). 20% of the sample are 'start-ups' defined as SMEs younger than two years. 31 per cent of the SMEs in our sample declared having a business plan in place.

In addition, a set of controls are used for capturing the credit rating of an SME. Since credit scoring is likely to be endogenous to the financing decision, we use an instrumented credit score (Han et al, 2009; Lee and Brown, 2016). We estimate the instrumented credit scores for each SME by estimating ordered logistic models on SME characteristics. One

[12] The postcode areas included are: Northern Ireland (BT), Carlisle (CA), Dumfries and Galloway (DG), Dorchester (DT), Exeter (EX), the Outer Hebrides (HS), Inverness (IV), Kilmarnock (KA), Orkney (KW), Northern Lancashire (LA), Llandudno (LL), Perth (PH), Plymouth (PL), Taunton (TA), Galashiels (TD), Torquay (TQ), Truro (TR) and Shetland (ZE).

instrumented credit score follows a categorical scale from 1 to 4, where 1 is 'minimal', 2 is 'low risk', 3 is 'average risk', and 4 is 'above average risk'. This score is recorded to a specific category where the sample firm has the highest probability of falling into this category. Around 88 per cent of SMEs are classified into the "average" and "above average category". Finally, we control for four types of legal structure: sole proprietorship, partnership, limited-liability partnership and limited-liability company. Sole proprietorship (single owner) SMEs represent around 63 per cent of our sample.

[Insert Table 1 around here]

3.2 Methods

We use a probit model to investigate the contribution of our explanatory variables to the probability of using credit card as a source of funding. We assume that SMEs obtain a certain level of utility (y^*) by using credit cards as a source of funding. This utility captures the benefit that SMEs experience from using credit cards. This includes access to a line of credit without collateral and the wide level of acceptance of credit cards as a mean of payment. However, instead of providing y^*, the database only reports information on the actual choice / use of credit cards by SMEs. If $y = 1$, a credit card is used by a SME. This implies that the net benefit of using credit cards is positive($y^* > 0$). Otherwise, if: $y = 0$, SMEs are better off without credit card financing.

If the utility function is of the form:

$$y^* = X'\beta + \epsilon \quad (1)$$

with an unobservable component (ϵ) that follows a normal distribution ($\Phi(\epsilon)$), and ($X'\beta$), which includes observable characteristics that modify SMEs' utility depending on the unknown parameters (β), then the probability that the SME chooses a credit card as a source of funding is:

$$\Pr(y = 1|X) = \Pr(y^* > 0|X) = \Pr(\epsilon > -X'\beta) = \Phi(X'\beta) \quad (2)$$

Equation 2 is estimated using maximum-likelihood techniques. Results are reported in terms of average marginal effects of the explanatory variables on the probabilities of the

occurrence of $y = 1$. The average marginal effects indicate the change in probability when the independent variable switches from the reference category to the category in question. The probit model is estimated with the standard errors being clustered at the size / region level. In addition to the control variables discussed above, the model includes dummy variables to account for the industry where the SME operates. Dummy variables to account for the quarter of the survey in which the firm was sampled allow for seasonal factors affecting the operations of the SMEs.

4. Results

4.1 The impact of location and SMEs' characteristics on credit card use

We test H1 and H2 by investigating whether peripheral, innovative, growth and export-oriented SMEs have a greater use of credit cards than *typical* SMEs. Results reported in Table 2 are based on a model in which being located in a peripheral region is the only variable, and an extended model which incorporates additional independent variables. Since the reported results are robust across models 1 through 4, our discussion is based on Model 4 (full model), which includes all control variables and clustered standard errors at the region (NUTS 1) and firm size level. Models are estimated as probit regressions with weights.

A positive marginal effect is found for innovation-, growth- and export-oriented SMEs, which have a 2.6%, 2.9% and 5.5% higher probability respectively of using credit cards than their counterparts. Relative to typical SMEs, our results suggest that peripheral SMEs have a 2.6% higher probability of using credit cards compared to counterparts located in "core" regions. This provides strong support to our first and second hypotheses.

As for control variables, our results suggest that small SMEs are less likely to use credit cards than larger counterparts (50-249 employees). Both profitable and net loss SMEs are likely to use credit cards, but the marginal effect is particularly high for SMEs which had net losses in the previous financial period. Start-ups are 5% less likely to use credit cards compared to more established SMEs. Owner age is also found to affect the use of credit cards with older owners more likely to use credit cards compared to younger counterparts (18-29 year olds). We also find that having a business plan increases the probability of using a credit card by 2% compared to SMEs without a business plan. Finally, SMEs with an "above average" credit score are less likely to use credit cards compared to counterparts with a minimal credit score.

[Insert Table 2 around here]

4.2. The interaction between location and SMEs' characteristics and their effect on credit card use

We use the full model 4 described above, and add effects which capture the interaction between the location of the SME and firm-specific characteristics (such as innovation- growth- and export-orientation). For the sake of brevity, Table 3 reports the estimated coefficients of the interaction terms.[13]

Our results suggest that location matters, and can affect the impact of SME characteristics on the propensity to use credit cards as source of funding. The results obtained from estimating Model 1 suggest that growth-oriented firms located in peripheral geographic areas are 7.3% more likely to use credit cards than non-growth counterparts in core geographic areas. The economic effect is also significant (given that the coefficient is more than double the other interaction terms, even after controlling for other characteristics such as financial and risk profile). The results derived from estimating Model 2 suggest that innovative firms in peripheral regions are 4.1% more likely to use credit cards than non-innovative counterparts located in core geographic areas. This effect is pronounced relative to the marginal effects for the other interactions terms. Finally, we find export-oriented SMEs located in peripheral regions have a 7.8% higher probability of using credit cards compared to non-export orientated counterparts located in core geographic areas. This effect is also economically significant being more than twice the size of that obtained for non-export orientated SMEs located in peripheral regions. Overall, these results provide strong empirical support for our third hypothesis (H3), that innovation-, growth- and export-oriented firms in peripheral regions are more likely to use credit cards to finance their operations.

[Insert Table 3 around here]

4.3. Credit Cards as a Bootstrapping tool for SMEs

Table 5 provides the results of testing our hypothesis H4 related to the use of credit cards as a bootstrapping tool. We use the full model 4 described above, but now the key dependent (indicator) variable captures whether a SME is "very likely" or "fairly likely" to apply for more external finance in the next 3 months. Similar to Table 3, Table 4 only reports

[13] Full results are available from the authors upon request.

the estimated coefficients of the interaction terms between being a SME that uses a credit card, SME location and its characteristics (innovation-, growth- and export-orientation).[14]

Our results suggest that being a credit card user matters and can indeed affect the probability of seeking additional funding by SMEs. In particular, the results for Model 1 suggest credit-card using SMEs located in peripheral geographic areas are 2.9% more likely to apply for additional funding than non-credit card using counterparts located in core geographic areas. The results derived from estimating Model 2 suggest that growth SMEs using credit cards are 11.1% cent more likely to apply for further finance than non-growth/non-credit card using counterparts. The economic effect is particularly significant as the coefficient is twice as large in some cases relative to the other interaction terms (even after controlling for other SME characteristics including risk). Model 3 shows that innovative SMEs which are also credit card users have an 8.9% greater probability of applying for additional funding in the near future. The marginal effect is almost four times higher than the effect for innovative SMEs which are not credit card users. Finally, we find export-oriented SMEs which are credit card users have a 4.4% greater probability of considering applying for additional funding in the near future compared to their non-export/non-credit card user counterparts. The marginal effects provide strong empirical grounds to accept our fourth hypothesis (H4), that innovative, growth and export-oriented SMEs located in peripheral geographic areas that rely on credit cards as a source of funding are likely to seek additional funding sources in the future.

[Insert Table 4 around here]

5. Discussion and Conclusions

Drawing on detailed firm-level data, this paper examines the under-researched issue of credit card financing of SMEs. Despite being largely neglected by small business finance scholars, credit cards appear to play an important role in the capital structure of UK SMEs. The literature has also overlooked the demand for this relatively accessible, but risky and costly form of finance. In this regard, it appears that certain types of SMEs have a greater

[14] Full results are also available from the authors upon request.

affinity with credit card finance than others. Furthermore, to the best of our knowledge this is the first study examining regional variations in the use of credit cards within different types of SMEs. In this respect, geography matters. The location of SMEs plays an important role in determining the use of credit cards.

Our first hypothesis examines the nature of the demand for credit card finance by investigating whether innovative-, growth-, and export-oriented SMEs are more inclined to use this form of finance. In line with our expectations, we find support for this hypothesis. Firms with the highest level of informational opacity are those likeliest to utilise this form of funding. We can only speculate whether this owes to being previously declined by a bank or due to being "discouraged" borrowers (Kon and Storey, 2003)[15]. What we can say with greater certainty is that export-oriented SMEs had the highest probability of using credit cards. Given that internationally oriented small firms are generally quite a small part of the SME population (Acs et al, 1997) and possibly the most growth-oriented and ambitious SMEs (Moen, 1999; Mason and Brown, 2013), it seems that the riskiest and most growth-oriented firms have the strongest predilection towards credit card financing.

Our second hypothesis introduces a spatial dimension to our work and finds strong support for the contention that SMEs located in peripheral geographic areas have greater usage of credit cards than counterparts located in "core" regions. Furthermore, our results suggest that peripheral SMEs have a 2.6% higher probability of using credit cards than those in counterparts in core regions, thereby providing support for our second hypothesis. This being so, it may be the case that credit constrained peripheral SMEs are inclined to experiment with alternative sources of finance such as credit cards. These results also provide strong empirical grounds to accept our third hypothesis that innovative, growth and export-oriented firms in peripheral geographic areas are more likely to use credit card financing. Once again the findings reveal that the most ambitious and risky SMEs located in peripheral geographic areas have the greater predisposition towards credit card financing. The strong proclivity towards credit card financing by SMEs located in peripheral areas may arise due to a lack of other more suitable or available alternatives

We also find evidence to support our final hypothesis that innovative-, growth- and export-oriented SMEs located in peripheral geographic areas who rely on credit cards as a

[15] The research examined whether being declined an overdraft or a loan increased the likelihood of SMEs applying for a credit card in the future but found no evidence for this relationship. However, perhaps discouraged borrowers may be particularly predisposed to credit cards. The results of this analysis are available from the authors.

source of funding are likely to seek additional funding sources in the future. This connects to the assessment of credit cards as a "bootstrapping" technique within SMEs which eventually leads to a progression towards more sustainable (longer-term and lower cost) forms of finance. We also find strong empirical support for this hypothesis. While peripherally located SMEs are marginally more inclined to use credit cards, growth-oriented and innovative SMEs have the strongest probability of seeking further forms of alternative finance. This suggests that credit cards can act as a core bootstrapping technique for informationally opaque SMEs (that traditionally encounter the largest difficulties obtaining finance). In other words, this form of funding may be an important temporally mediated form of finance for risk-oriented SMEs to utilise before turning to other external sources of finance.

Ultimately, these interesting findings raise important theoretical questions, both in terms of the demand and supply of finance for SMEs. In terms of demand, credit cards may be an important form of "improvisational" finance used by innovative entrepreneurial firms. Resource-constrained entrepreneurs are deemed likely to heavily improvise in parsimonious circumstances through a process of entrepreneurial bricolage (Baker and Nelson, 2005). Bricolage behaviours are commonly associated with entrepreneurial strategies such as "making do with what you've got", "creating something from nothing" and experimenting by "combining resources for new purposes" (Baker et al, 2003; Baker and Nelson, 2003; Fisher, 2012). Based on the evidence presented in the current study, it appears on this evidence that innovative SMEs use credit cards as a form of financial bricolage to overcome temporal resource constraints with a view towards leveraging further additional sources of external finance. Therefore, this form of finance needs to be more closely scrutinised to properly assess its role in the financial escalator within growth-oriented and innovative SMEs.

The spatial findings also have theoretical implications. It appears to be the case a lack of supply of finance in certain areas has a substitutive impact on the alternative sources of finance being sought. In other words, a lower probability of obtaining bank credit (or being a discouraged borrower) may force credit-constrained SMEs to seek alternative funding sources such as credit cards. Therefore the outcome of the so-called "liability of distance" faced by some SMEs may be to turn to credit cards as a "creditor of last resort" (Lee and Brown, 2016). Credit card use may therefore be part of the wider systemic process in which "thin markets" (Nightingale et al, 2009) encompass a wider array of funding instruments that purely conventional debt and equity finance. It also confirms the results of prior research suggesting the use of entrepreneurial bootstrapping strategies varies spatially (Harrison et al, 2004). This further suggests that the nature of resource parsimony is geographically bounded

and that "entrepreneurial bricolage" may also be a geographically mediated concept. Clearly, where you are located affects how your business is funded.

From a policy perspective the findings endorse others who have highlighted the need for a regionalised network of banks to increase lending to innovative SMEs in the UK (Lee and Brown, 2016). As well as trying to increase the sources of finance for SMEs in peripheral areas, policy organisations, such as the British Business Bank, may wish to highlight the potential problems SMEs could encounter from being too reliant on this risky form of finance.

Inevitably, the results of our investigation raise a number of additional issues which open up important avenues for further research. For example, and somewhat surprisingly, our results suggest that **s**tart-ups are 5% less likely to use credit cards compared to more established SMEs. This was an unexpected finding and one worthy of further investigation. The data also has some important limitations. Whilst providing some important insights into the nature of the demand-side for credit cards in SMEs much remains unknown. Given the data it was not possible to ascertain whether these riskier growth-oriented and innovative SMEs encountered high interest levels on credit cards than typical SMEs. As other work suggests higher growth firms tend to be penalised through higher interest rates (Rostamkalaei and Freel, 2016). Interestingly, evidence suggests higher risk consumers shop around more intensively for credit cards seeking the best available terms to mitigate this kind of "risk penalisation" (Liñares-Zegarra and Wilson, 2014). Exploring this relationship in SMEs seems a logical line of further enquiry.

In conclusion, this research underlines the importance of unravelling the complexities of different financial instruments and capital structures within different types of SMEs. Therefore, examining exactly "why", "how" and "where" SMEs use credit cards are key questions worthy of further examination. In terms of "why" questions, more work needs to done to unpack the cognitive and motivational rationale within entrepreneurs who use this form of finance. In terms of "how" questions, some may use it to balance out their cash-flow and pay off their balance at the end of the month; others may use it to finance their activities over longer period whilst incurring high interest payments[16]. In order to get underneath some of these "how" and "why" questions different methodological approaches to the one adopted

[16] In December 2014, the mean nominal interest rate on SME loans was estimated to be 3.42% in the UK while the Bank of England base rate was set at 0.5% (BIS, 2016). In December 2016, the average variable rate of interest charged on credit cards is 16.2% (Source:www.bankrate.com/finance/credit-cards/current-interest-rates.aspx).

in this study will be needed. Further research can also usefully explore "where" questions by examining the substitutive effects in different types of spatial finance markets, especially "thin markets". Given the volume of SMEs who use credit cards, clearly more needs to be known about those who "stick it on plastic" and how geographical location mediates the types and costs of finance SMEs obtain.

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Table 1. Description of Variables and descriptive statistics

Variable	Details	Observations	Mean (survey weighted)
Credit Card Use	SME is currently using a credit card	50,137	0.157768
Apply for more finance	SME is "very likely" or "fairly likely" to apply for more external finance in the next 3 months	50,136	0.075781
Peripheral SME	SME located in peripheral postcode area	50,136	0.116579
Innovative	SME has developed a new product or service in the past 3 years	50,137	0.153385
Aims to grow	SME aims to grow substantially or moderately over the next year.	50,137	0.461828
SME exports	SME sells goods or services abroad	50,137	0.096306
Employment size:			
0 employees		50,137	0.740892
1-9 employees		50,137	0.221606
10-49 employees		50,137	0.031702
50-249 employees		50,137	0.005801
Profit	SME made profit in last financial year	50,137	0.718808
Loss	SME made loss in last financial year	50,137	0.107194
Women owned	50% or more of the SME owned by women	50,137	0.252802
Start-up	SME is 2 years old or younger	50,137	0.200000
Owner's ethnic background: White	Owner's ethnic background is white (British, Irish or any other white background)	50,137	0.916758
Owner's age:			
18-30		48,048	0.059086
31-50		48,048	0.480221
51+		48,048	0.460694
Business Plan	SME has business plan	50,137	0.316528
Instrumented credit score:			
Minimal		45,649	0.002357
Low		45,649	0.093903
Average		45,649	0.281165
Above average		45,649	0.622575
Legal Status of SME:			
SP	Sole Proprietorship (single owner)	50,137	0.635706
Partnership	Partnership	50,137	0.050026
LLP	Limited Liability Partnership	50,137	0.023192
LLC	Limited Liability Company (private limited company, public)	50,137	0.291076

Table 2. The impact of location and SME characteristics on credit card use

	Dependent Variable: Pr (Credit Card use)			
	Model 1	**Model 2**	**Model 3**	**Model 4**
SME located in peripheral postcode area	0.025***	0.026***	0.022**	0.026**
	(0.01)	(0.01)	(0.01)	(0.01)
SME has developed a new product or service in the past 3 years		0.035***	0.029***	0.026***
		(0.01)	(0.01)	(0.01)
SME wants to grow substantially or moderately over the next year.		0.024***	0.031***	0.029***
		(0.01)	(0.01)	(0.01)
SME sells goods or services abroad		0.094***	0.063***	0.055***
		(0.01)	(0.01)	(0.01)
Zero employees [(a)]			-0.155***	-0.129***
			(0.01)	(0.01)
1-9 employees [(a)]			-0.111***	-0.099***
			(0.01)	(0.01)
10-49 employees [(a)]			-0.052***	-0.049***
			(0.01)	(0.01)
SME did net loss			0.049***	0.046***
			(0.01)	(0.01)
SME did net profit			0.025***	0.024***
			(0.01)	(0.01)
50% or more of the firm owned by women			-0.014*	-0.012
			(0.01)	(0.01)
Start-ups: SME is 2 years old or younger			-0.052***	-0.050***
			(0.01)	(0.01)
Owner's ethnic origin: White [(a)]			0.013	0.014
			(0.02)	(0.02)
Owner's age: 31-50 [(a)]			0.044**	0.042**
			(0.02)	(0.02)
Owner's age: 51+ [(a)]			0.044**	0.044**
			(0.02)	(0.02)
SME has a formal written business plan			0.024***	0.021***
			(0.01)	(0.01)
Instrumented credit score: 2 – Low [(a)]			0.009	0.008
			(0.01)	(0.01)
Instrumented credit score: 3 – Average [(a)]			-0.014	-0.014
			(0.01)	(0.01)
Instrumented credit score: 4 - Above Average [(a)]			-0.041***	-0.043***
			(0.02)	(0.02)
Observations	50,136	50,136	43,658	43,658
Wave Dummies	NO	NO	NO	YES
Sector and legal status controls	NO	NO	NO	YES
Clustered Standard Errors	NO	NO	YES	YES
Pseudo-R-squared	0.001	0.012	0.039	0.045
Log-likelihood	-1982.030	-1960.051	-1595.804	-1587.237

Note: The Probit estimation utilizes the weight provided by SME Finance Monitor. Figures reported are average marginal effects. We estimate the instrumented credit scores by conducting ordered logistic models on the SME's characteristics. One instrumented Credit Score follows the categorical nature of the underlying score from 1 to 4, where 1 is 'minimal', 2 is 'low risk', 3 is 'average risk', 4 is 'above average risk'. The score is recorded to a specific category where the sample firm has the highest probability of falling into this category. [(a)] The excluded variables for the demographic categories above are as follows: 50-249 (employees), other ethnic origin (owner's ethnic origin), 18-30 years old (owner's age), minimal (instrumented credit score). Standard errors clustered at the size * region level in parentheses.***, ** and * refer to the significant level of 1%, 5% and 10%, respectively.

Table 3. The interaction between location and SME characteristics and their effect on credit card use

	Dependent Variable: Pr (Use of Credit Cards)		
	Model 1	**Model 2**	**Model 3**
Base category: Core/Non-growth			
Core/Growth	0.024***		
	(0.01)		
Peripheral/Non-Growth	0.008		
	(0.01)		
Peripheral/Growth	0.073***		
	(0.02)		
Base category: Core/Non-innovative			
Core/Innovative		0.028***	
		(0.01)	
Peripheral/Non-innovative		0.029***	
		(0.01)	
Peripheral/Innovative		0.041**	
		(0.02)	
Base category: Core/Non-Export			
Core/Export			0.055***
			(0.01)
Peripheral/Non-Export			0.027**
			(0.01)
Peripheral/Export			0.078***
			(0.03)
Observations	43,658	43,658	43,658
Full set of control variables	YES	YES	YES
Pseudo-R-squared	0.045	0.045	0.045
Log-likelihood	-1587.235	-1586.768	-1587.171

Note: The Probit estimation utilizes the weight provided by SME Finance Monitor. Figures reported are average marginal effects. Standard errors clustered at the size * region level in parentheses.***, ** and * refer to the significant level of 1%, 5% and 10%, respectively.

Table 4. Credit Cards as a Bootstrapping tool

	Dependent Variable: Pr (Apply for more external finance)			
	Model 1	**Model 2**	**Model 3**	**Model 4**
Base category: Core/Non-Credit Card user				
Core/Credit Card user	0.050***			
	(0.01)			
Peripheral/Non-Credit card user	0.004			
	(0.01)			
Peripheral/Credit Card user	0.029***			
	(0.01)			
Base category: Non-growth/Non-Credit Card user				
Non- Growth/Credit Card user		0.042***		
		(0.01)		
Growth/Non-Credit card user		0.057***		
		(0.01)		
Growth/Credit Card user		0.111***		
		(0.02)		
Base category: Non-innovative/Non-Credit Card user				
Non- Innovative/Credit Card user			0.043***	
			(0.01)	
Innovative/Non-Credit card user			0.024***	
			(0.01)	
Innovative/Credit Card user			0.089***	
			(0.02)	
Base category: Non-Export/Non-Credit Card user				
Non-Export/Credit Card user				0.050***
				(0.01)
Export/Non-Credit card user				0.009
				(0.01)
Export/Credit Card user				0.044***
				(0.01)
Observations	43,658	43,658	43,658	43,658
Full set of control variables	YES	YES	YES	YES
Pseudo-R-squared	0.106	0.106	0.106	0.106
Log-likelihood	-903.953	-903.918	-903.716	-903.909

Note: The Probit estimation utilizes the weight provided by SME Finance Monitor. Figures reported are average marginal effects. Standard errors clustered at the size * region level in parentheses.***, ** and * refer to the significant level of 1%, 5% and 10%, respectively.

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