

The Impact of Brexit on SME Lending in the UK

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ABSTRACT

Using a difference-in-differences model, we find a significant 1.2% (4.8%) quarterly (annual) lending contraction to Small and Medium-Sized Enterprises (SMEs) in the UK following the Brexit vote compared to similar European countries. This impact persisted in several quarters, particularly during key Brexit milestones, reflecting the prolonged uncertainty induced by Brexit. Within-country analysis, using postcode-level data, reveals severe loan contractions in rural and peripheral areas, as well as in regions with high EU export proportions, highlighting regional disparities in Brexit's impact on SME lending. Our findings emphasize the importance of economic geography and the role of local conditions in shaping access to finance during shocks. These results call for regionally tailored policies that specifically address the resilience and financial challenges faced by SMEs in rural and peripheral regions, to foster economic recovery across the UK in the post-Brexit era. Our research contributes to the literature on regional resilience and finance, with implications for policymakers aiming to mitigate the unequal impacts of economic shocks.

Key words: Brexit; Small and Medium-Sized Enterprises (SMEs); SME Lending; Regional Resilience; Regional Inequalities.

JEL classifications: G21, R11, R58

Acknowledgements: We are indebted to the Editor and anonymous reviewers for their insightful suggestions.

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1. INTRODUCTION

The United Kingdom's withdrawal from the European Union (EU)—Brexit—stands as one of the most consequential political shocks of the last decade, with far-reaching effects across the UK, Europe, and beyond (Hassan et al., 2024). Brexit has created uncertainty in various markets, emphasizing the need for further research to understand its implications and guide policymakers (Cowling and Brown, 2024). The initial impacts, such as the plummeting pound and stock market, were immediate; however, the medium- and long-term effects at country and regional levels remain uncertain. This paper analyses the impact of Brexit on lending to small and medium-sized enterprises (SMEs) in the UK, with a particular focus on regional disparities in rural, peripheral, and EU-exporting areas.

Our study links to the growing literature on regional resilience (Bailey et al, 2023a; Brown et al., 2020a; Christopherson et al., 2010; Roberts et al., 2017). SMEs form the backbone of the global economy, including the UK, accounting for the majority of businesses and jobs (BEIS, 2023). Given the importance role of SMEs in the British economy, and particularly in peripheral and rural areas, it is necessary to understand how SMEs contribute to regional resilience in the wake of substantial economic and political shocks, such as Brexit. Recognizing their crucial role in innovation and economic growth, policymakers prioritize their support. Following the Global Financial Crisis (GFC), governments and International Financial Institutions (IFIs) have introduced new policies to facilitate SME growth (OECD, 2020). Improved access to finance for SMEs can drive their resilience, economic growth, create jobs, and foster a stable economy. However, many SMEs face challenges in securing loans due to their size, limited collateral, and perceived risk (Berger et al., 2024). SMEs located in rural and peripheral areas often encounter greater difficulties in accessing finance, despite evidence that rural SMEs can perform similarly or better than their urban counterparts in terms of operational

performance, innovation capacity, and export capabilities (Phillipson et al., 2019; Tiwasing et al., 2023). Recent research highlights that regional SMEs' resilience during shocks is closely tied to their resourcefulness, which depends on behaviours like social networking and strategic use of available resources (Malekinezhad et al., 2024).

This paper investigates Brexit's impact on SME lending in the UK, exploring regional resilience and disparities and the trade shock effect. It first compares SME lending across the UK and similar European countries, then examines uneven impacts across Local Authority Districts (LADs), particularly in rural and peripheral areas. Finally, it assesses how Brexit's trade shock has affected SME lending in LADs with high EU exports per capita. We aim to provide valuable insights for IFIs and policymakers addressing access to finance challenges.

The uncertainty generated by Brexit has become a focal point of research, demonstrating adverse effects on various economic indicators, such as investments, inflation, and aggregate output (Bloom et al., 2019; Born et al. 2019), particularly in rural areas and the agricultural sector in the UK (Gittins and McElwee, 2023; Neal et al., 2021). Our study extends the Brexit literature by focusing on SME lending, a vital pillar of economic stability and growth. Our study also contributes to our understanding of regional resilience by examining Brexit's effects on SMEs lending, providing hard empirical evidence on the adverse and unequal impact of Brexit on SMEs' access to finance, and the challenges faced by rural and peripheral SMEs in securing funding during periods of economic uncertainty.

There is limited research examining resilience to Brexit at SMEs level, even though Brown et al. (2020a) emphasise that SMEs are an appropriate 'unit of analysis' and an effective indicator for measuring resilience. They illustrate how Brexit uncertainty strongly challenge the resilience in Scottish SMEs. Brown et al. (2019a) also find that SMEs engaged in export and import activities express greater concerns about Brexit, particularly those in peripheral areas. Sun et al. (2020) argue that SMEs relying on EU trade face stringent financial conditions

due to Brexit. Cowling and Brown (2024) analyse regional disparities in SMEs' export resilience post-Brexit, revealing that while some regions maintained strong export activity, many others experienced significant disengagement, threatening long-term productivity.

Our paper contributes significantly by utilizing previously unexplored postcode-level data to conduct detailed analyses at the LAD level. Unlike earlier studies that relied on SME surveys measuring expectations, we provide empirical insights into the actual outcomes of Brexit. We explore diverse LAD variations, including rural, peripheral, and EU-exporting areas, offering a comprehensive understanding of Brexit's impact across different geographic contexts.

This paper advances the literature by leveraging a pioneering dataset from 'UK Finance', detailing SME lending data across more than 10,000 postcode sectors. This extensive dataset enhances our understanding of Brexit's impact on SME lending and expands the body of knowledge in this field. Previous studies have often focused on SMEs' financial expectations rather than actual lending flows. The granularity of our dataset, published at the postcode sector level, allows us to analyse LADs, revealing regional heterogeneity and the availability of economic variables for sophisticated regional analysis. Our first dataset spans from Q3 2011 to Q4 2019, consisting of quarterly country-level SME lending data for 10 European countries (including the UK), supported by macroeconomic control variables. Our second dataset, based on UK Finance's postcode-sector level data, has been transformed into a yearly LAD-level dataset (2013–2019) using meticulous geographical conversion metho

To our knowledge, this study is the first to examine Brexit's impact using a difference-in-differences model, considering both country-level and within-country effects. Our findings reveal a substantial decline in SMEs lending in the UK compared to similar European countries following Brexit. The contraction in lending to SMEs is significant across three key quarters, including Q2 2018, indicating lasting impacts beyond the referendum's immediate aftermath.

Expanding the control group to include non-European countries with similar economic conditions but distinct Brexit exposures yields consistent results.

Our results reveal important evidence to enhance our understanding of SMEs regional resilience. We find an unequal impact of Brexit across the UK, with peripheral and rural LADs experiencing a more significant contraction in SME lending than other regions. These LADs saw lending contractions of 5.15%, 3.28%, and 1.97% in 2016, 2017, and 2018, respectively. These findings align with previous studies highlighting the pessimistic financial resilience outlook of SMEs in peripheral regions post-Brexit (Brown et al., 2019a; Brown et al., 2020a, b) and may indicate increased borrower discouragement in these areas (Lee and Brown, 2017). LADs with high EU exports per capita also faced a disproportionate decline in SME lending, establishing a strong link between the trade shock triggered by Brexit and the small business loan market, consistent with Sun et al.'s (2020) findings. In comparison to rural areas, we illustrate that SMEs lending in peripheral regions are more adversely affected by the Brexit shock as prior studies expected (e.g. McCann, 2018). Our empirical results remain consistent across various robustness tests and using different identifications for peripheral and rural areas.

Our results provide substantial contributions to the economic geography literature. First, we shed light on the post-Brexit contraction of SMEs lending, revealing an unprecedented adverse impact on SME financing compared to other European countries. Our analysis spans multiple quarters beyond the referendum, including significant events such as Article 50 and the EU Withdrawal Bill. By emphasizing the prolonged and staggered nature of Brexit's uncertainty, we enhance understanding of the complexities surrounding SME financing in the post-Brexit landscape. Second, we focus on regional resilience exploring how Brexit has impacted SME lending across various LADs, highlighting regional inequalities that demand tailored policy interventions. These disparities underscore the challenge of regional economic divergence, which threatens economic progress and political stability in Europe (Iammarino et

al., 2019). Our insights indicate the importance of economic geography and regional resilience in understanding access to finance, advocating for targeted initiatives to support SMEs, especially in rural and peripheral LADs. Such measures are essential for enhancing resilience and maintaining international competitiveness.

Our study engages with multiple strands of literature, aligning with economic geography research that focuses on crises (Martin, 2012) and broader discussions on regional resilience and inequality, which pose a threat to economic development and social cohesion across Europe (Iammarino et al., 2019). It contributes to literature on regional SMEs resilience during economic shocks (Brown et al, 2020a; Malekinezhad et al., 2024). Our findings highlight the urgent need for geographically tailored policies to address regional resilience and disparities, ensuring that SME lending and economic development efforts are responsive to the unique challenges faced by rural and peripheral areas in the post-Brexit era.¹

2. HYPOTHESES DEVELOPMENT

2.1. Brexit's Impact on SME Lending in the UK

We explore resistance to Brexit focusing on SMEs lending. The concept of resilience indicates the ability of an organisation or a region to maintain effective functioning even while facing significant disruption. Regional resilience metaphor encompasses processes of rebound, adaptation, and recovery, and helps explain these patterns, particularly during economic crises (Christopherson et al., 2010). The heightened uncertainty and external shocks in the recent periods (Global Financial Crisis, Brexit and Covid-19), imply that uncertainty has become the “new normal” (Brown et al. 2020b), making resilience even more important.² Indeed, Brexit is

¹ Our study provides several practical and policy implications to mitigate the unequal impacts of economic shocks (see Section 6 for details).

² Brown et al. (2020a) and Christopherson et al. (2010) provide detailed review for notions of regional resilience and uncertainty.

characterized as a crisis stemming from territorial inequality and uneven development (MacLeavy and Jones, 2021), with the withdrawal of EU fundings have exacerbated the financial fragility and regional inequality in the UK, particularly in deprived areas which were heavily reliant on EU funding (Di Cataldo, 2017).

Credit rationing for SMEs refers to the practice where lenders limit the amount of credit available to these firms, even when they are willing to pay higher interest rates. This phenomenon is often driven by asymmetric information, wherein lenders lack comprehensive knowledge about SMEs compared to larger, more established firms. Research indicates that SMEs typically experience more credit rationing, arising from the credit risk aversion's behaviour among banks (Cenni et al., 2015). Kirschenmann (2016) argues that small and opaque firms face more severe credit constraints, particularly at the start of their banking relationships, due to asymmetric information. During periods of economic uncertainty, banks are less likely to approve new loan requests and may delay loan disbursements to firms (Alessandri and Bottero, 2020). Cerqueiro et al. (2024) show that political uncertainty, such as gubernatorial elections with term limits, leads banks to reallocate credit away from uncertain regions, reducing SME lending locally. Similarly, Kara and Yook (2023) find that banks cut back on mortgage lending during election periods, especially in closely contested races. Heightened risk aversion and capital constraints make banks more cautious in credit markets under political uncertainty, leading to tighter credit supply that particularly affects SMEs. In this context, our first hypothesis posits that Brexit has led to a decline in SME lending, further intensifying the credit rationing issues SMEs face.

The literature on Brexit focuses on its broader negative macroeconomic impacts, such as higher inflation, decreased output, and reduced investment (Bloom et al., 2019; Born et al., 2019). Berg et al. (2021) report a 24% decline in new syndicated loan issuances in the UK post-Brexit compared to other major markets. Prior studies have also investigated Brexit's impact

on the worsening expectations of UK SMEs regarding access to finance after the referendum (Brown et al., 2019a; Calabrese et al., 2022). Following the referendum, the demand for credit has been subdued (Bank of England, 2016). This situation was partly attributed to restrained investment plans, with many smaller companies opting to finance their expenditures internally rather than through borrowing. There is also evidence suggesting that SMEs have been disproportionately influenced by uncertainty due to their lower resiliency to external shocks (Brown et al., 2020a, b; Bailey et al., 2023a, b).

The overall impact of Brexit on aggregate SME lending remains uncertain, despite being a significant shock in the post-GFC era. Therefore, we propose the following hypothesis:

Hypothesis 1 (H₁): *Brexit has a negative impact on aggregate SME lending in the UK.*

This hypothesis aims to contribute to the ongoing debate surrounding the issue of the SMEs funding gap and SMEs resilience. Understanding the dynamics of Brexit's impact on SME lending is critical for policymakers and financial institutions. By illuminating these effects, we can better address the challenges faced by SMEs in securing necessary financing, ultimately supporting their growth, resilience and sustainability in a post-Brexit economy.

2.2. Brexit's Impact on SME Lending in the Rural and Peripheral LADs

Regional resilience research reveals that the influence of economic shocks varies significantly within the country, with rural and peripheral regions often experiencing more severe impacts and recover more slowly (Lee and Brown, 2017; Martin, 2012). The notion of regional resilience is critical, given the variations in firm resiliency to external shocks and how increased uncertainty plays a crucial role in the long-term growth of different regions (Brown, et al., 2020a; Bailey et al., 2023a, b). The literature emphasizes the vulnerability of peripheral regions to shocks in the UK (Martin, 2012), as well as the heightened anxiety experienced by SMEs in these areas after Brexit (Brown et al., 2019a; Brown et al., 2020a). Building upon this

regional resilience literature, we hypothesize that Brexit's impact on SME lending differs among LADs in different locations. We posit that SMEs in peripheral regions and rural areas experience a more pronounced decline in lending following Brexit.

The rationale for the uneven effects of Brexit on SMEs lending across regions in the UK is rooted in the socio-political characteristics of peripheral and rural areas, such as the long-standing development traps, political dissatisfaction, public distrust in local governments and economic fragilities highlighted in prior literature. McCann (2018) identifies a paradox where economically weaker UK regions voted to leave the EU despite receiving significant EU benefits through trade and development funding, highlighting deep-rooted regional neglect. Di Cataldo (2017) quantifies this paradox through causal analysis of Cornwall and South Yorkshire, the UK's largest recipients of EU Objective 1 funds, showing that EU funding significantly reduced unemployment and generated economic growth in these regions. Despite benefits, these regions voted strongly in favour of Brexit. Rodríguez-Pose et al. (2024) show that regions experiencing prolonged economic stagnation tend toward Euroscepticism, reflecting long-term regional underperformance. This trend aligns with Mitsch et al.'s (2021) findings that rural residents consistently report lower political trust than their urban counterparts. Bailey et al. (2023a) also demonstrate Brexit-induced challenges faced by regional industries, particularly the automotive sector in the East and West Midlands. Overall, these socio-political dynamics of regional inequality, structural neglect and political discontent can explain the expected disparities in Brexit's impact on SME lending.

The bank lending literature explores regional resilience and disparities in SMEs' access to financing, suggesting that geographical proximity and regional characteristics play key roles in this regard. Kärnä and Stephan's (2022) find that Swedish SMEs in remote areas face more challenges in accessing financing. On the hand, Bečicová and Blažek (2015), investigating credit rationing for small businesses in peripheral municipalities in Czechia, reveal no direct

evidence of credit discrimination based on location but highlighting issues with undervalued collateral. Regional resilience studies also explore how geography impacts SME financing in the UK. Lee and Brown (2017), using data from the UK SME Finance Monitor, focus on the accessibility of finance for innovative SMEs and highlight significant regional disparities. They find that SMEs in peripheral and less developed regions struggle more to secure bank financing.

Several studies examine regional resilience within the UK to economic shocks. Brown and Cowling (2021) extend this analysis by exploring the impact of the Covid-19 pandemic on business failures and job losses in the UK's 100 largest cities and towns. Their findings underscore the disproportionate effects on poorer northern and peripheral urban areas, highlighting weak regional resilience and widening disparities. Similarly, Malekinezhad et al. (2024) emphasize that UK SME resilience in rural areas during the pandemic is driven by individual behaviours and resource management, suggesting it is shaped by idiosyncratic features rather than solely regional or sectoral contexts. In the context of Brexit and SME financing, Calabrese et al. (2022), using the 2016 British Business Bank survey, show the relationship lending mitigates financial constraints facing SMEs post-Brexit. Brown et al. (2019a) also illustrate that SMEs involved in export and import activities, particularly those in peripheral areas, express heightened concern and have scaled back investment, innovation, and export activities, due to Brexit-related uncertainty.

In comparison to peripheral regions, we expect SMEs lending in rural areas to be more resilience to Brexit. Although rural SMEs may lag in digital adoption (Morris et al., 2022), regional resilience studies comparing rural and urban SMEs highlight comparable performance across key areas such as innovation and exporting. Tiwasing et al. (2023) demonstrate that SMEs in England's North and Midlands perform similarly in these metrics, challenging the notion that cities inherently foster better business innovation. Laurin et al. (2020) emphasize

that geographic remoteness and industrial base, rather than rurality alone, better explain regional resilience, with some rural areas even outperforming urban ones.

The relationship between regional resilience and economic shocks, such as Brexit, highlights the compounded challenges faced by peripheral regions, in particular, and rural areas, emphasizing the importance of targeted policy interventions. Our second hypothesis investigates the implications of Brexit on rural and peripheral areas, given their heightened vulnerability and lack of resilience to economic shocks.

***Hypothesis II (H_{II}):** The adverse impact of Brexit is more significant in rural or peripheral LADs than urban and central LADs.*

This hypothesis has implications for credit market efficiency and the ongoing debate on economic geography's role. If credit markets are efficient and regional disparity is not found in SMEs' access to finance, it suggests geography may not affect credit allocation. Our results could inform policymakers in enhancing SME financing policies for peripheral and rural areas facing greater financing gaps, as strengthening regional resilience through a healthy SME ecosystem can help local economies to recover from economic shocks.

2.3. Brexit's Impact on SME Lending in the LADs with Higher EU Exports per capita

The third research question examines SME lending from the standpoint of international trade. Brexit naturally prompted concerns about the UK's trade relations. The UK's departure from the EU led to the abolition of the free movement of goods and services between the UK and the EU, creating a policy gap where the terms of trade, such as tariffs and quotas, became ambiguous for exporters and importers. Bloom et al. (2019) find that highly productive firms with international exposure have experienced greater adverse effects compared to less productive domestic firms. Sun et al. (2020) find that businesses engaged in exports and

imports, particularly those operating within industries heavily reliant on EU trade, encounter more stringent financial conditions surrounding Brexit.

SMEs, being financially constrained and lacking human capital, business capacity and resilience, are particularly vulnerable to economic shocks that disrupt international trade. The House of Lords European Affairs Committee report (2021) has emphasised the disproportionate burden borne by SMEs amid the shrinking UK-EU trade. Our third hypothesis examines SME lending from the standpoint of international trade and regional resilience:

***Hypothesis III (H_{III}):** Brexit's adverse impact on SME lending is more prominent in the LADs that have a higher EU Exports per capita.*

H_{III} links to the evidence of regional resilience studies. Wai et al. (2022) highlight the important role of external finance for UK SMEs' exports. SMEs which are more inclined to seek external resources or possess stronger managerial capacity are more likely to enter export markets, often through new product development and new market entry as key parts of their export strategies. Cowling and Brown (2024) investigate the impact of Brexit on exporting SMEs and find that SMEs, particularly in regions with high trade activity, face significant challenges due to the uncertainties arising from Brexit. While London and Northern Ireland remain resilient in their export focus due to their unique characteristics, many other regions experience notable disengagement from exporting, which may result in long-term productivity challenges. These findings align with our hypothesis that the negative effects of Brexit on SME lending are more pronounced in LADs with greater trade activity.

The resilience literature has also delved into Brexit's trade shock and its repercussions on UK SMEs. Brown et al. (2019b) show increased apprehensions among UK SMEs, which indicated an intention to reduce future capital investment and export plans. These findings are consistent with Brown et al.'s (2020a) results which focus on Scottish SMEs. Bailey et al. (2023b) discuss the challenges facing EU-exporting small manufacturing firms emphasizing

the necessity for policy support for smaller firms involved in EU-wide supply chains. This evidence suggests that LADs heavily dependent on EU trade may face reduced regional resilience due to Brexit's impact on their SMEs' ability to access finance and maintain international trade relationships.

3. METHODOLOGY

To examine the resilience of SMEs lending in the UK to Brexit (H_I), we build a DiD model with fixed effects, which is a robust method in event studies focusing on regulatory changes and market shocks, including Brexit (Berg et al. 2021; Bloom et al., 2019). UK is the treatment group as it is the only unit that received treatment (Brexit). Then, we strategically choose our control units, European countries, based on their trade relationship scale with the UK, focusing on the 'Top 10 European Trading Partners'. Despite the potential for milder Brexit effects, the relatively minor and less significant impacts expected for these countries, coupled with their economic similarities to the UK, highlight their relevance to our study. This method mirrors a prevalent strategy in the international trade literature, which advocates for examining the closest trading partners to gauge policy or shock repercussions (Korovkin and Makarin, 2023). Due to data unavailability for Norway, nine countries are selected in control units, for which SME lending data are sourced from central banks or supervisory authorities (see Table A1 in the Appendix). The following module is estimated:

$$Lending_{i,t} = \alpha + \beta Post_i + \delta_j(Post_t * Brexit_i) + \xi Gdp_{i,t} + \gamma Infl_{i,t} + \lambda r_{i,t} + \Omega Unemp_{i,t} + \gamma_i + \Theta_t + \varepsilon_{it} \quad (\text{Eq.1})$$

$Lending_{i,t}$ is the SME lending growth for country i in quarter t . $Post$ is the quarters after the Brexit shock, whereby the following events are considered: (i) the Referendum Date (Q2 2016), (ii) Triggering of Article 50 (Q1 2017), and (iii) EU (Withdrawal) Bill receives Royal Assent (Q2 2018). $Brexit_i$ is the treatment variable, which takes the value of 1 for the UK and

0 for other countries. Quarterly control variables are included, including GDP growth $GDP_{i,t}$, inflation $Infl_{i,t}$ long-term interest rates $Ir_{i,t}$ and unemployment $Unemp_{i,t}$. γ_i is the country fixed effects while Θ_t is time fixed effects. Country-fixed effects control for time-invariant unobserved heterogeneity specific to each country. This mitigates risks arising from country-specific structural characteristics, such as banking systems, institutional frameworks, and regulatory environments, which could affect SMEs lending and otherwise bias the estimated impact of Brexit. Time fixed effects control for global trends and external factors that could affect all countries simultaneously. Standard errors ε_{it} are clustered at the country level to account for within-country error correlation and ensure robust statistical inference.

Selecting Q2 2017 as a milestone is justified by the pivotal triggering of Article 50 on March 29th, 2017, marking the official start of the United Kingdom's exit from the European Union. This process might further amplify the Brexit uncertainty, which in turn might affect lending activities. Designating Q2 2018 as a milestone is justified by the reception of Royal Assent for the EU (Withdrawal) Bill, marking a pivotal moment in the Brexit's legislative process.

Exploring regional resilience, we estimate Eq. (2), a DiD model, to investigate Brexit's impact on SMEs lending in the rural and peripheral LADs in the UK (H_{II}). The DiD model allows us to identify causal effects by comparing the changes in outcomes before and after the intervention (Brexit) between the treatment group (rural and peripheral LADs) and the control group. We define "peripheral" and "rural" LADs within the UK context following Lee and Brown (2017) who employ ESPON multimodal accessibility statistics, which consider travel time and population, and have been utilized in regional classification by prior studies (e.g., Brown et al., 2019b; Giannakis and Bruggeman, 2020). This method identifies not only areas near London but also industrial hubs with strong transport links, like Birmingham and Manchester, as more accessible. We use ESPON data to assign multimodal accessibility scores to each LAD, classifying those in the bottom 15th percentile as the most peripheral. This

classification is based on the proven vulnerability of these areas to economic shocks, suggesting they face unique challenges and should be specifically considered in analyses, particularly concerning SME financing.³

$$Lending_{l,t} = \alpha + \beta Post_t + \delta_j(Post_t * RuralPeripheral_l) + \xi Gdp_{LAD_t} + Unemp_{LAD_t} + \gamma_l + \Theta_t + \varepsilon_{it} \quad (\text{Eq. 2})$$

$Lending_{l,t}$ is the SME lending growth for LAD l in year t . $RuralPeripheral_l$ indicates the treatment variable, taking the value of 1 for the top 15th peripheral or rural LADs, and 0 otherwise.⁴ $Post_t$ refers to the three years following the referendum, including the referendum year of 2016, and the subsequent years 2017 and 2018. Gdp_{LAD_t} and $Unemp_{LAD_t}$ denote the GDP growth and unemployment at the LAD level in year t . γ_l and Θ_t represent respectively LAD and time fixed effects. Standard errors ε_{it} are clustered at LAD level.

³ Robustness tests are conducted utilizing alternative measures to identify peripheral and rural areas based on socio-economic perspectives. The data is sourced from ONS. First, we explore the role of Population Density (persons per hectare), which is a key characteristic of peripheries and rural areas, as they typically exhibit lower population concentration (Fischer et al., 2024; OECD, 2016). LADs in the bottom quartile of population density are defined as treatment areas. Second, we focus on peripheral and rural areas with higher unemployment, whereby LAD-level unemployment rates for 2014 are employed. The treatment group consists of rural and peripheral areas at or above the 70th percentile in the unemployment distribution within rural and peripheral areas, while those with lower unemployment levels are added to the control group. Third, we focus on areas with higher GDP per capita, whereby GDP per capita values for 2014 are used. The treatment areas are defined as those within the 70th percentile GDP per capita among rural and peripheral regions, excluding richer rural and peripheral areas which are assigned to the control group. Unemployment and GDP per capita are main indicators of economic well-being. High unemployment reflects economic distress and limited labour market opportunities, while lower GDP per capita signals weaker economic performance, higher poverty rates, and reduced public and private investment. They are central to regional development policies aimed at fostering economic resilience and reducing spatial inequalities (OECD, 2016). Results of Eq. (2), reported in Table A5, are consistent, confirming the stronger, negative effect of Brexit in rural and peripheral areas across all years.

⁴ In the main analysis in Section 5 (Tables 5-7), rural and peripheral areas are aggregated into a single treatment group to ensure sufficient statistical power. Aggregation is necessary due to a relatively small number of treatment units in each group when analyzed separately. By combining these areas, we are able to enhance the precision of our estimates and reduce the likelihood of Type II errors, ensuring that the broader patterns of Brexit's impact on SME lending are captured with greater reliability. However, we conduct additional analysis in Section 5.3 for rural and peripheral areas separately, with caution due to smaller samples' size.

Eq. (3) is estimated to examine Brexit's impact on SMEs lending with higher EU exports per capita (H_{III}). The unit of analysis remains LADs. NUTS-3-level trade data (with EU and Non-EU classifications) from HM Revenue and Customs (HMRC) is utilised. For each LAD, EU exports per capita and total trade per capita is calculated (see Eq. (4) and Eq. (5)). The treatment group consists of LADs with high EU exports per capita, given the heightened concerns and greater challenges faced by SMEs engaging in trade, particularly with the EU (Bailey et al., 2023b; Bloom et al., 2019; Brown et al., 2019a; Sun et al., 2020).

$$Lending_{l,t} = \alpha + \beta Post_t + \delta_j (Post_t * EU_Exports_{pc_l}) + \xi Gdp_{LAD_T} + \theta Unemp_{LAD_t} + \gamma Infl_{i,t} + \lambda r_{i,t} + \gamma_i + \Theta_t + \varepsilon_{it} \quad (Eq. 3)$$

$Lending_{l,t}$ is the annual SME lending growth for local authority l in year t . $EU_Exports_{pc_l}$ is the treatment (see Section 4), and takes the value of 1 for the areas that belongs to top 25th percentile of UK areas in terms of individual share of EU trade, and 0 otherwise. $Post_t$ indicates the years after Brexit for analysing the yearly effects in 2016, 2017 and 2018. Θ_t is time fixed effects while γ_i is LAD fixed effects.

Using LAD-level fixed effects for time-invariant unobserved heterogeneity specific to each LAD, e.g. cultural factors and regional characteristics, that are specific to each peripheral, rural and urban areas. This prevents these factors, such as differences in access to skilled labour, innovation adoption, or infrastructure development, from delivering biased results. Further, they account for any differences in banking presence, such as in peripheral areas where larger banks, which relatively dominant in our sample source, have a smaller lending presence in peripheral areas. This ensures that the regression estimates capture only the within-LAD variation over time, reducing any potential bias from differences in bank representation across regions. This ensures robust, reliable findings across different geographical scopes.

All variables' definitions are reported in Table 1.

4. DATA AND DESCRIPTIVE STATISTICS

The dataset is collected from various sources (see Table A1 in the appendix), with two different panel datasets being constructed. For H_I , aggregate quarterly SME lending data from Q3 2011 to Q4 2019 sourced from central banks and supervisory authorities are collected. “Top 10 European Trading Partners”, excluding Norway due to data unavailability, are selected. Table A2 reports the Top 10 European Trading Partners of UK that are ranked by trading volume. The control variables (Ir , GDP , $Infl$, and $Unemp$) are collected from OECD.⁵

Table 2 presents summary statistics for variables with country breakdowns. Italy and Ireland show the smallest loan growth, while Poland and Switzerland demonstrate the highest. The UK exhibits a relatively high mean of quarterly SME lending growth (0.4%) above the sample average of -0.9%. Figure 1 illustrates the historical trend of SME loans, which declines steadily from nearly £169 billion in March 2012 to £149 billion three months before the Brexit referendum in March 2016. Subsequently, there is a modest uptick until December 2019, though outstanding loans never return to pre-Brexit levels.

To examine H_{II} and H_{III} , data is collected from UK Finance, covering SME lending in the UK for each postcode sector from Q3 2013 to Q4 2019. UK Finance, previously known as British Bankers’ Association (BBA), provides comprehensive quarterly data on SME lending that has been used in previous studies (e.g., Szumilo and Vanino, 2021; Zhao et al., 2021) and serves as the primary source of SME lending data in the UK. The data includes not only the four largest banks (HSBC, Barclays, Lloyds Banking Group, and RBS Group) but also other significant institutions such as Co-operative Bank, Santander UK, Virgin Money (CYBG), Clydesdale & Yorkshire Bank. For Northern Ireland, our sample includes Bank of Ireland, Danske Bank, and First Trust. The Competition and Markets Authority (2016) highlights that

⁵ *Lending* is winsorsized at the 1% and 99%.

the four largest banks account for 85% of business accounts and 80% of SME loans, ensuring that our sample reflects the majority of SME lending activity in the UK.⁶

Quarterly SME loans is published by postal geography (postcode sector and postal area). The GB data includes 120 postal areas which contains over 10,000 sector postcodes. We merge the GB dataset with the NI (Northern Ireland) dataset to build the UK dataset. Since the unit of analysis is LADs, we undertake a geographic data conversion from postal geography to administrative geography, by matching postcode sectors to LADs with the most recent ONS Postcode Lookup. Each postcode sector is assigned to a LAD and in cases where a postcode sector has multiple matching LADs, it is allocated to the LAD that has the highest postcode share. As a result, we construct a panel dataset of yearly SME loans at LAD-level. The LAD-level controls, including yearly unemployment and GDP growth, are sourced from the ONS.⁷

‘Eurostat’s degree of urbanization’ classification is used to identify rural LADs to examine H_{II} . There are three degrees of urbanization according to Eurostat’s methodology: Urban, Towns and Suburbs, and Rural areas. To identify the peripheral areas, we use potential multimodal accessibility index⁸, similar to Lee and Brown (2017), and match them with the LADs. Multimodal accessibility refers to the combination of accessibility of various modes of transportation such as roads, rails, and air travel. Higher levels of this index indicate that a LAD

⁶ To rigorously address potential bias from any underrepresentation of smaller lenders in peripheral areas, we implement methodological safeguards using LAD fixed effects in our empirical analysis (see Section 3, Eq. (2) and Eq. (4)), which absorb all time-invariant heterogeneity specific to each LAD. This includes systematic differences in banking presence, historical lending relationships, economic structure, and institutional characteristics that might affect lending patterns. By controlling for the LAD-specific effects, our estimates capture only the within-LAD variation over time, effectively neutralizing any potential bias from cross-sectional differences in bank representation.

⁷ ONS’ “Regional gross domestic product: local authorities” dataset is used for LAD-level GDP: <https://www.ons.gov.uk/economy/grossdomesticproductgdp/datasets/regionalgrossdomesticproductlocalauthorities>. LAD-level unemployment data is obtained from ONS’ Nomis: <https://www.nomisweb.co.uk/>.

⁸ This is obtained from ESPON Database Portal, which is sourced from European institutions such as EUROSTAT and EEA. Previous studies have utilized EPSON’s potential multimodal accessibility index (Brown et. al 2019b; Giannakis and Bruggeman, 2020; Lee and Brown, 2017).

is non-peripheral (central) and vice-versa. For instance, LADs in London such as City of London and Camden have the highest scores; while LADs like Gwynedd, Isles of Scilly and Shetland Islands have low scores due to their poor multimodal accessibility. LADs at the bottom 15th percentile are selected as the peripheral areas (treated LADs).⁹

To examine H_{III}, “Regional trade in goods statistics disaggregated by smaller geographical areas” published by HMRC annually is used, starting with the earliest available data in 2016.¹⁰ The dataset contains information about goods trade at NUTS-3 regions and includes exports and imports data with EU and Non-EU classifications. For identifying the LADs with high EU export per capita ($EU_Exports_{pc}$), we follow an identification strategy that weights each LAD according to their relative economic size with respect to its parent NUTS area (LAD GDP / NUTS-3 GDP). Then, EU Exports within a NUTS-3 region are assigned to the LAD in proportion with its economic output and divided by LAD population. We divide the 2016 trade data by the population for each LAD that is available from the ONS, as follows:

$$EU\ Exports\ per\ capita_{lAD_l} = \frac{(GDP_{lAD_l} \div GDP_{NUTS3p}) * EU_EXPORTS_{NUTS3p}}{Population_{lAD_l}} \quad (Eq. 4)$$

where l represents the ID of each LAD and p represents its matching parent NUTS-3 area.

The exports per capita indicator has been employed in several studies (e.g., Oster, 2012).¹¹ The treatment group is the LADs that are identified as top 25th EU exporters per capita. As robustness test, we test it for top 20th EU exporters per capita. We perform an additional robustness test using the ‘total trade per capita’ ($TotalTrade_{pc}$) instead of ‘EU exports per capita’, whereby total trade is defined as the sum of exports and imports, as follows:

⁹ As robustness test, LADs at the bottom 25th percentile are selected as treatment group. Results are consistent.

¹⁰ This dataset is available from: <https://www.gov.uk/government/statistics/regional-trade-in-goods-statistics-disaggregated-by-smaller-geographical-areas-2016>.

¹¹ Exports serve as a pivotal economic indicator, unveiling spatial variance critical for regional analysis and informed policymaking (Oster, 2012).

$$Total\ Trade\ per\ capita_{LAD_i} = \frac{(GDP_{LAD} \div GDP_{NUTS3p}) * TOTAL_TRADE_{NUTS3p}}{Population_{LAD_i}} \quad Eq. (5)$$

The summary statistics of the dataset for H_{II} and H_{II} are displayed in Table 3. The average lending growth in rural or peripheral LADs is higher than that of the control group. While they exhibit similar GDP growth, the unemployment rate is slightly lower in rural or peripheral areas compared to the control unit. The average lending growth in the Top 25th EU Exporters is slightly lower than that of the control group, while there is no significant difference in GDP growth and unemployment rate. Figure 2 illustrates the treated LADs in the UK. The rural or peripheral LADs are evenly distributed across the UK. The Top 25th EU exporting LADs exhibit a homogeneous distribution, as each region contains a fair number of EU exporting LADs within its own boundaries, except for London.

5. EMPIRICAL RESULTS

The results of Eq. (1) are reported in Table 4. The coefficients of $Post_t * Brexit_i$ are negative and significant at 1% level for Q2 2016 (Referendum), Q2 2017 (Article 50 process) and significant at %5 level for Q2 2018 (Royal Assent for Withdrawal Bill). The results provide evidence of adverse impact of Brexit on SME loans in the UK, supporting H_I, highlighting SMEs' lack of resilience to the increased uncertainty associated with Brexit.¹² There is a quarterly lending contraction of 1.49%, 1.48% and 1.14% in Q2 2016, Q2 2017, and Q2 2018 respectively. This can be transformed to an annual impact equal to 6.09% in Q2 2016, 6.05% in Q1 2017 and 5.92% in Q2 2018, indicating that the economic impact is highly significant.

¹² We estimate Eq. (1) using a sub-sample excluding Switzerland (non-EU country) and Poland (has the smallest GDP and trade volume among the Top 10). The results, in Table A3- Panel A, remain consistent. In addition, we extend the control countries to include Australia, Canada, New Zealand and USA, which have similar levels of economic and industrial development to the UK while they are not exposed to Brexit-induced uncertainty. The data for SMEs lending for these countries is collected from OECD. The results of Eq. (1), reported in Table A3- Panel B, are consistent. These confirm the robustness of our counterfactual analysis.

The most pronounced negative effect is observed in Q2 2016, indicating that the outcome of the referendum was surprising and had a significant impact on uncertainty. A similar effect is observed in Q2 2017, suggesting that the finalization of the Article 50 process triggered a larger contraction in SMEs loan market. In Q2 2018, $Post_t * Brexit_i$ coefficient is significant and negative, aligning with a significant event in the Brexit timeline - the Royal Assent of the Withdrawal Bill. This implies that Brexit uncertainty has persisted over time and is sensitive to milestone events, consistent with Bloom et al.'s (2019) findings. These results align with previous findings that revealed a decrease in syndicated lending (Berg et al., 2021) and reduced levels of investments in the UK (Bloom et al., 2019). Our findings highlight the challenges faced by SMEs in post-Brexit Britain, which is in-line with the economic performance' fall observed following the withdrawal of EU fundings, particularly in areas that were dependent on EU funding (Di Cataldo, 2017).

Increased policy uncertainty can reduce bank lending and diminish banks' risk appetite due to concerns over financial and economic stability. Soto (2021) finds that higher uncertainty at the bank level leads to reduced lending and greater liquidity in the future, as banks become more cautious during volatile periods. Alessandri and Bottero (2020) show that uncertainty reduces loan approval rates, while Correa et al. (2023) argue that trade-related uncertainty leads banks to hold back lending, particularly to firms that rely heavily on bank financing. Political uncertainty, such as during gubernatorial elections, leads to fall in mortgage lending (Kara and Yook, 2023), with local banks reducing small business lending in uncertain regions and reallocating resources to stable areas (Cerqueiro et al., 2024). These studies show that uncertainty impacts banks' lending behaviour across regions, forcing banks to cut back on lending and limit their risk exposure. The bank behaviour and lending dynamics during uncertainty offer rationale for the observed SMEs lending contractions in the aftermath of Brexit in this study.

The findings of Eq. (2) for peripheral or rural LADs (H_{II}) are displayed in Table 5. The $Post_t * RuralPeripheral_l$ coefficient are negative and significant for all estimations. The magnitude and significance of the coefficient declines in 2018, despite remaining significant, suggesting a fading economic impact.¹³ The findings indicate that Brexit had an uneven impact on SME lending in rural or peripheral LADs, which have witnessed a decline of 5.15%, 3.28% and 1.97% in 2016, 2017 and 2018, respectively. These are consistent with the regional resilience literature which illustrated the disadvantaged position of SMEs located in peripheral regions regarding access to finance (Lee and Brown, 2017), and the disproportionate financial concerns of SMEs in these regions due Brexit-induced uncertainty (Brown et al., 2019a).

The results of Table 5 highlight structural inequalities in SMEs' access to finance in the aftermath of Brexit shock, which can be linked to the long-standing struggle of rural and peripheral areas with development traps (Rodríguez-Pose et al., 2024). These areas are caught in persistent socio-economic stagnation, demographic decline, and economic vulnerabilities. Their populations increasingly perceive themselves as ignored by local governments, particularly after external shocks like Brexit (Mitsch et al, 2021). These inequalities foster political dissatisfaction and distrust in government, which recent studies identified as the revenge of the "places that don't matter" and "geography of discontent" (Rodríguez-Pose et al., 2024; Rodríguez-Pose, 2018; Rodríguez-Pose et al., 2021). These not only fuel the economic difficulties faced by SMEs in these areas but also weaken the effectiveness of policies aimed at addressing financial inequalities (Mitsch et al, 2021). It is apparent that Brexit-induced financial troubles have worsened pre-existing regional inequalities in the UK. Hence, our

¹³ A robustness test is conducted using the 25th percentile peripheral LADs. The results, presented in Table A4, are consistent with the baseline estimates. The consistency of the results across various specifications suggests that our findings are not driven by potential sampling biases (explained in Footnote 6) in specific geographic areas.

evidence highlights the importance of strengthening regional resilience to safeguarding SMEs in rural and peripheral areas against external shocks.

Table 6 reports the results of Eq. (3) that examines the Brexit impact for the top 25th EU exporting per capita LADs (H_{III}). $Post_t * EU_{exports_{pc}}$ coefficients are negative but their significant levels vary. The most significant effect is observed in 2016 (-2.39%), implying a SME lending contraction in the top 25th EU exporting LADs in the year of referendum. The coefficients for 2017 and 2018 are negative but with less magnitude and not statistically significant. This finding coincides with the results of H_I and H_{II} that demonstrate the strongest impact was observed after the 2016 referendum rather than the following quarters or years.¹⁴

Table 7 presents the results for Eq. (3), whereby the treatment group being the top 25th total trading LADs, as defined in Eq. (5). $Post_t * EU_Exports_{pc}$ coefficients are statistically insignificant across all years, suggesting the lack of a discernible impact on trading LADs compared to EU exporting LADs. This finding provides further evidence supporting the existence of an economic channel; while Brexit's trade uncertainty affects LADs trading with the EU, those not engaged in EU trade remain unaffected by this uncertainty.

Consistent with prior literature, our findings substantiate the notion that EU exporting LADs are disproportionately affected by Brexit. Brown et al. (2019a) argue that SMEs which export to the EU are more worried about Brexit. The uneven decline in SME lending in these areas indicates a strong link between the trade shock triggered by Brexit and the small business loan market. Promoting regional resilience through diversified trade and financial strategies is critical to alleviate such adverse impacts, ensuring more stable SME financing conditions. Persistent and high levels of policy uncertainty could be transmitted to firms' borrowing costs,

¹⁴ A robustness test is performed by altering the treatment group to the top 20th EU Exporting LADs. The results in Table A6 confirm robustness

resulting in a lower loan demand. Lenders might perceive EU exporting SMEs as being at a higher risk due to business model disruption caused by Brexit's trade policy uncertainty.

5.2 Parallel Trends

This section presents the tests that assess the validity of the parallel trends assumption. Parallel trends' tests help mitigating concerns about endogeneity, as it provides evidence that any observed differences in outcomes between the treatment and control groups post-treatment can be attributed to the treatment itself rather than to pre-existing differences in trends.

The first parallel trends test examines the validity of H_I (Table 8). The first column displays the results for Q2 2016 (referendum), which we have selected as the intervention date and tested with two prior and subsequent quarters. $Post_t * Brexit_i$ coefficients are negative and significant at 10% level. The pre-treatment variables are all insignificant suggesting that there were no significant differences between the countries' trajectories before 2016. Similarly, the results for Article 50 event in Q2 2017 shows that $Post_t * Brexit_i$ coefficient is negative and significant.¹⁵ The absence of statistically significant differences in trends between the treatment and control groups prior to the treatment suggests that any subsequent changes in the outcome variable can be plausibly attributed to the treatment.

Table 9 presents the parallel trends test results for H_{II} (Panel A) and the results for H_{III} (Panel B). The 2016 Brexit referendum is tested alongside one prior and subsequent year to assess the parallel trends assumption. Findings reveal a consistent pattern of parallel trends between the treatment and control groups across the pre-treatment period, as evidenced by the insignificant pre-treatment variables' coefficients. The coefficients for the intervention date are negative and significant at the 1% level. The consistency of parallel trends and the significant

¹⁵ The insignificant parallel trend results for Q2 2018 are anticipated. The significant results in the first two quarters generate a ripple effect, indicating that the impact of the treatment had already materialized by that stage.

effect of the treatment period support the validity of the research design and the credibility of the estimated treatment effects.

5.3 Disaggregated Analysis of Rural Areas and Peripheral Regions

To explore regional heterogeneity, we disaggregate the treatment effects of Brexit on SME lending, distinguishing between rural areas and peripheral regions for each year, and present the results of Eq. (2) in Table 10. This allows us to identify more specific impacts of Brexit on these distinct regions, providing a clearer picture of how regional characteristics influence the observed outcomes. While disaggregation introduces challenges due to smaller samples' size, it offers additional context to the analysis.

Panel A of Table 10 focuses on rural areas, while Panel B focuses on peripheral regions. The results highlight the differences in the effects of Brexit across rural area and peripheral regions, while confirming that Brexit has a negative effect on SME lending in both locations. For rural area, the negative effects are statistically significant for 2016 and 2017, but statistically insignificant in 2018. In peripheral areas, the negative effects remain significant and robust across 2016 and 2017, while diminishing slightly in magnitude and becoming statistically insignificant in 2018. SMEs lending in peripheral regions are more adversely affected by the Brexit shock as many predicted (e.g. McCann, 2018), with their coefficients approximately 88% (52%) larger in 2016 (2017) compared to rural regions. This is consistent with prior evidence that SMEs in peripheral regions are disproportionately influenced by chronic uncertainty due to their lower resilience to unexpected shocks such as Brexit (Brown et al., 2022). This can also be linked to persistence neglect of peripheral regions, with evidence from prior literature (e.g., MacLeavy and Jones, 2021) suggesting that the neoliberal economic policies have entrenched regional inequalities, particularly in the UK, prompting calls for urgent policy interventions targeting equitable regional development.

The less pronounced effects observed in rural areas compared to peripheral regions can be partially explained by the distinctive dynamics of rural areas. Laurin et al. (2020) suggests that regional economic performance is driven more by factors such as geographic isolation and industrial composition than by rural characteristics alone, with certain rural regions demonstrating stronger economic outcomes than urban areas. Similarly, Phillipson et al. (2018) find that rural SMEs across England demonstrate greater profitability levels and stronger engagement in export markets. These characteristics may help to mitigate the adverse financial impacts of Brexit in rural areas, explaining the weaker effects observed in the analysis.

Overall, the results of Table 10 align with the broader patterns observed in the aggregated analysis (in Tables 5-7), though the reduced number of treatment units in the disaggregated analysis may contribute to the lower statistical significance in some cases. Presenting both aggregated and disaggregated results offers a comprehensive analysis that balances statistical rigor with transparency. The disaggregated findings highlight the importance of considering regional heterogeneity in the analysis of Brexit's impacts, while the aggregated results ensure that the broader patterns are captured with greater reliability.

6. POLICY IMPLICATIONS

Our paper offers a novel contribution to the literature on regional resilience, providing hard empirical evidence on the adverse impact of Brexit on SMEs lending in UK and revealing severe loan contractions in rural and peripheral areas, and in regions with high EU export proportions. Our findings have significant implications for place-based economic policy, particularly in addressing inter-regional inequalities and enhancing regional resilience.

The UK economy has been facing challenges, with its real GDP only 1.0% above its pre-pandemic level (measured from 2019 Q4 to 2023 Q4), ranking it as the second-worst performer among G7 economies. Prospects appear dim, as the OECD projects it to be the

second-slowest growing G7 economy in 2024 and the worst in 2025 (Harari, 2024). These challenges are compounded by the UK's status as having one of the highest interregional inequalities among developed countries (McCann, 2020), with the economic divide between the North and South remaining persistent and deeply ingrained (Martin, 2012). Also, the UK government's "Levelling Up" agenda, introduced in 2020 which aims to address regional resilience and inequalities, are facing significant Brexit-related disruptions. The long-standing regional inequalities, and economic fragilities, political discontent and persistent neglect of peripheral and rural areas (e.g., Rodríguez-Pose et al., 2021, 2024; Di Cataldo, 2017) have been exacerbated by Brexit-induced challenges, which amplified existing problems and creating new barriers hampering the UK economy (Bailey et al., 2023a). This aligns with broader trends observed across Europe, where regional economic divergence threatens economic progress, social cohesion, and political stability, while fostering political dissatisfaction, public distrust in local governments and economic vulnerabilities (Iammarino et al., 2019; Rodríguez-Pose et al., 2024). Such findings highlight the importance of developing regionally tailored approaches to mitigate the long-term impacts of Brexit, preventing further widening of the economic gap in peripheral and rural regions in the UK.

Related to the notion regional resilience, SMEs play a pivotal role in addressing these disparities (Brown et al., 2020a). As key drivers of job creation, innovation, and economic dynamism, SMEs are essential for enhancing regional resilience and mitigating the long-term impacts of economic shocks. The British Business Bank survey (2024) find that 60% of smaller businesses cited a lack of awareness of finance options as their main barrier to accessing finance, followed by supply constraints and the cost of finance. This demonstrates the need for comprehensive policies addressing both supply- and demand-side issues in SME financing.

Loan guarantee schemes (LGSs) represent an important supply-side solution to support SMEs, particularly during periods of uncertainty in the aftermath of Brexit. By reducing the

risks for lenders, these schemes encourage banks to extend credit to SMEs that might otherwise face challenges accessing financing. Cowling et al. (2023) argue that such programs have been effective in supporting UK SMEs during times of uncertainty, due to their simplicity and clarity, making them easily understood by both lenders and borrowers. LGSs directly address a recognized market failure by facilitating access to credit for SMEs that might otherwise struggle to secure financing, enhancing their resilience. Furthermore, Cowling et al. (2023) highlight how local and regional not-for-profit lending institutions, known as responsible finance providers, have played an important role in regional guaranteed lending, particularly during crises, due to their expertise in relational lending practices and their focus on informationally opaque small businesses. Thus, their role might be critical in developing regionally tailored LGSs. Local and regional not-for-profit lenders can enhance regional resilience by leveraging their deep understanding of local market dynamics and ability to provide targeted financial support to SMEs with unique regional challenges.

However, even well-calibrated supply-side solutions, such as LGS, may not be sufficient if SMEs are unaware of their availability or discouraged from applying due to various barriers. Thus, demand-side policies should focus on raising awareness, addressing borrower discouragement, and reducing the perceived complexity of financing. Borrower discouragement remains a significant challenge for UK SMEs (Lee and Brown, 2017), with Brexit seemingly exacerbating these issues, particularly for EU exporter SMEs. Cowling and Brown (2024) illustrate that high levels of discouragement among these firms and recommend reinforcing efforts to increase SME export activity with EU markets. To address these challenges, peer-to-peer learning opportunities can help demystify export activities by enabling discouraged exporters to gain insights from experienced peers, thereby building confidence in international trade processes (Cowling and Brown, 2024). As suggested by Brown et al. (2022), targeted financial advice can support new start-up SMEs in understanding and accessing

appropriate financial resources. These distinct but interconnected approaches can help mitigate the complex barriers facing SMEs in accessing and understanding financial support mechanisms, enhancing their resilience particularly during uncertain time.

For these measures to be effective, it is crucial to ensure widespread adoption. Addressing informational gaps requires banks to collaborate closely with Local Enterprise Partnerships (LEPs) and regional agencies, taking proactive steps to promote and raise awareness about these financial instruments among prospective borrowers (Cowling et al., 2024). Too often, the promotional aspect of business support initiatives is overlooked during the development of new schemes. Simplifying the application process and reducing their cost could also encourage greater participation, as many SMEs are discouraged by the time and cost involved in applying for financing (Brown et al., 2022), improving their resilience.

Policymakers should also focus on bespoke financial support packages, like the Scottish Government's Brexit Support Grant, which have proven effective in helping SMEs resilience. Expanding such programs to include innovative and export-oriented SMEs, particularly in peripheral areas, could foster resilience and mitigate the uneven impacts of economic shocks like Brexit (Brown et al., 2020a).

The financial services sector can play a key role by designing resilient financial products tailored to diverse regional needs, mitigating uncertainty shocks like Brexit. Supervisory authorities must also ensure that the SME financing market is competitive and fair, preventing discrimination or discouragement. Further, establishing a comprehensive network of regional mutual banks could serve as a critical strategy for addressing inter-regional inequalities. By creating localized financial institutions focused on understanding and supporting regional economic needs, the UK could more effectively channel capital into underserved areas, thereby providing a structural mechanism for achieving the "Levelling Up" agenda and supporting regional resilience. Finally, devolving responsibilities across UK regions and administrations

in areas such as immigration and industrial policy will be essential for enhancing firm-level resilience and long-term economic stability (Brown et al., 2020a).

7. CONCLUSIONS

This study makes a novel contribution to the literature on Brexit's economic impact, providing hard empirical evidence of its detrimental effects on regional resilience and inequality, by focusing on SMEs lending in the UK. To the best of our knowledge, this is the first study that evaluates Brexit's impact focusing on both country-level effects and within-country effects, which allow us to get a comprehensive picture of the impact of Brexit. It is the first study that explores SME lending resistance to Brexit utilizing economic data, rather than survey data, for better illustrating the actual outcomes instead of SMEs' future expectations.

We employ a DiD with FEs modelling approach, and a novel dataset compiled from several sources and central banks, offering a comprehensive national-level SME lending data not commonly utilized before. Our analysis integrates a unique postcode sector-level SME lending data, providing insights into lending patterns at the local level. This level of detail has been underutilized in prior research.

Our findings reveal a sustained and significant contraction in SME lending across the UK after Brexit, compared to similar European countries. This contraction persisted across all quarters of interest, highlighting the prolonged uncertainty caused by Brexit, consistent with Bloom et al.'s (2019) findings. These results also align with Berg et al.'s (2021) evidence of a post-Brexit contraction in the syndicated lending market. Importantly, we show that the effects of Brexit are unevenly distributed across the UK. Peripheral and rural LADs and regions with high EU exports per capita experienced a disproportionate decline in SME lending, indicating a strong link between Brexit-related trade shocks and small business financing. In particular, peripheral regions are disproportionately influenced by chronic uncertainty due to their lower

resilience to unexpected shocks. These findings demonstrate how Brexit has intensified the UK's entrenched issue of regional inequality, further disadvantaging already vulnerable areas.

UK's current economic trajectory, characterized by prolonged Brexit uncertainty, persistent interregional inequalities, and subdued growth prospects, highlights the critical importance of fostering regional resilience. SMEs, as drivers of employment, innovation, and local economic dynamism, play a central role in this process. By focusing on SME lending, this study provides a robust indicator of regional resilience and offers insights into how economic shocks exacerbate existing disparities.

Our findings highlight the urgent need for a holistic approach to policy intervention to address these challenges. On the supply side, LGSs and support from regional not-for-profit lenders can play a pivotal role in enhancing SME access to finance, particularly in regions facing the greatest constraints. On the demand side, raising awareness about available financial support, addressing informational gaps, reducing borrower discouragement, and providing targeted financial advice to SMEs are equally critical. Policymakers must also prioritize regionally tailored strategies that account for the unique needs of peripheral, rural, and export-dependent areas. Collaborations between banks, LEPs, and regional institutions can enhance the effectiveness of financial support mechanisms, while simplifying application processes can further encourage participation. These targeted and comprehensive approaches can foster regional resilience, promote inclusive economic growth, and mitigate the long-term impacts of Brexit in the UK. Overall, with the current Labour Government's commitment to addressing regional economic inequalities and boosting growth in the UK, this study provides a foundation for designing effective, evidence-based policies that promote economic stability, regional resilience and cohesion across all areas.

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Table 1 Variable Definitions

Hypothesis	Variable	Description	Expected Sign
Dependent Variables			
H _I	$Lending_{i,t}$	Quarterly growth of Outstanding SME Loans to SMEs in countries (source: central banks and supervisory authorities).	-
H _{II} & H _{III}	$Lending_{l,t}$	Annual growth of Outstanding SME Loans to SMEs for LADs (source: UK Finance).	-
Treatment & Post			
H _I	$Brexit_i$ (Treatment)	Treated is a dummy variable that takes the value 1 if a country has withdrawn from the EU (Brexit) and 0 otherwise (we assume only the UK has affected from the Brexit).	-
H _{II}	$RuralPeripheral_i$ (Treatment)	Treated is a dummy variable that takes the value 1 if a LAD is identified as Top 25 th Peripheral or rural (source: EPSON and EUROSTAT).	-
H _{III}	$EU_{exports_{pc}}$ (Treatment)	Treated is a dummy variable that takes the value 1 if a LAD has a high share of EU trade (source: HMRC).	-
All	$Post$	Post is a dummy variable that takes the value 1 after Q3 2016 (2016 for the 2 nd and 3 rd hypotheses) and 0 otherwise (different treatment dates are also tested).	-
All	$Post * Brexit_i$ $Post$ $* RuralPeripheral_i$ $Post * EU_Exports_{pc}$	The DiD estimator involves the interaction between treatment and post variables for each hypothesis, respectively.	-
Control Variables			
H _I	Gdp	GDP growth for each country (quarterly) (source: OECD).	+
H _I	$Infl$	Inflation level for each country (quarterly) (source: OECD).	+
H _I	Ir	The long-term interest rate which is calculated as the annual yield of 10-year government bond rate (quarterly) (source: OECD).	-
H _I	$Unemp$	Unemployment level for each country (quarterly) (source: OECD).	-
H _{II} & H _{III}	Gdp_{LAD}	Yearly GDP growth in each LAD (source: ONS).	+
H _{II} & H _{III}	$UNEMP_{LAD}$	Yearly unemployment level in each LAD (source: ONS).	-

Table 2 - Country-level Summary Statistics (H1)

	Country										
	Belgium	Switzerland	Germany	France	UK	Ireland	Italy	Netherland	Poland	Spain	Total
N	34	34	34	30	34	34	34	25	34	34	327
	0.002	0.010	-0.009	0.007	0.004	-0.061	-0.056	-0.001	0.014	0.006	-0.009
Lending	(0.029)	(0.011)	(0.040)	(0.007)	(0.011)	(0.024)	(0.043)	(0.010)	(0.026)	(0.095)	(0.047)
	0.004	0.004	0.004	0.003	0.005	0.018	-0.000	0.005	0.009	0.003	0.006
Gdp	(0.003)	(0.004)	(0.005)	(0.003)	(0.003)	(0.044)	(0.005)	(0.003)	(0.006)	(0.006)	(0.015)
	0.017	-0.001	0.013	0.009	0.019	0.006	0.011	0.013	0.013	0.010	0.011
Infl	(0.010)	(0.007)	(0.006)	(0.006)	(0.009)	(0.008)	(0.011)	(0.008)	(0.017)	(0.013)	(0.011)
	0.075	0.047	0.042	0.097	0.057	0.100	0.113	0.065	0.072	0.206	0.088
Unemp	(0.012)	(0.002)	(0.008)	(0.007)	(0.016)	(0.038)	(0.011)	(0.015)	(0.028)	(0.043)	(0.051)
	0.014	0.002	0.007	0.011	0.018	0.025	0.030	0.006	0.035	0.027	0.018
Ir	(0.012)	(0.005)	(0.007)	(0.007)	(0.006)	(0.026)	(0.016)	(0.006)	(0.010)	(0.018)	(0.017)

**Table 3 - Summary Statistics according to Local Authority Districts (LAD)
Characteristics (H_{II} & H_{III})**

	Mean	SD	Min	Max
RuralPeripheral: 0				
Lending	0.023	0.152	-0.233	0.467
Gdp _{PIAD}	0.031	0.035	-0.204	0.353
Unemp _{PIAD}	0.051	0.022	0	0.166
RuralPeripheral: 1				
Lending	0.047	0.161	-0.233	0.467
Gdp _{PIAD}	0.03	0.032	-0.118	0.206
Unemp _{PIAD}	0.044	0.02	0	0.132
Top 25th EU Exporter: 0				
Lending	0.029	0.153	-0.233	0.467
Gdp _{PIAD}	0.031	0.035	-0.204	0.353
Unemp _{PIAD}	0.049	0.022	0	0.166
Top 25th EU Exporter: 1				
Lending	0.023	0.156	-0.233	0.467
Gdp _{PIAD}	0.031	0.031	-0.118	0.173
Unemp _{PIAD}	0.053	0.022	0.013	0.155
See Table 1 for variable definitions.				

Table 4 -The Impact of Brexit on UK SME Lending (H1)

VARIABLES	(1) 2016q2	(2) 2017q2	(3) 2018q2
Post _{2016q2} * Brexit	-0.0149*** (0.00423)		
Post _{2017q2} * Brexit		-0.0148*** (0.00433)	
Post _{2018q2} * Brexit			-0.0145** (0.00494)
Gdp	-0.0295 (0.0639)	-0.0296 (0.0644)	-0.0261 (0.0662)
Infl	-0.0252 (0.291)	-0.0148 (0.289)	-0.0428 (0.310)
Unemp	-0.0708 (0.144)	-0.0630 (0.140)	-0.0624 (0.137)
Ir	-0.122 (0.332)	-0.147 (0.325)	-0.148 (0.323)
Constant	0.000308 (0.00836)	-0.000240 (0.00807)	-0.000165 (0.00800)
Observations	327	327	327
R-squared	0.433	0.433	0.432
Country FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Cluster SE	Yes	Yes	Yes

This table reports Eq. (1) results. The dependent variable is *Lending_{i,t}*. See Table 1 for variable definitions. ***, **, * represent significance at 1%, 5% and 10% levels.

Table 5 -The Impact of Brexit on SME Lending in Peripheral or Rural LADs (HII)

VARIABLES	(1) 2016	(2) 2017	(3) 2018
Post ₂₀₁₆ * RuralPeripheral	-0.0515*** (0.0146)		
Post ₂₀₁₇ * RuralPeripheral		-0.0328*** (0.00994)	
Post ₂₀₁₈ * RuralPeripheral			-0.0197** (0.00864)
Gdp _{IAD}	0.0136 (0.0594)	0.0115 (0.0604)	0.00332 (0.0609)
Unemp _{IAD}	0.147 (0.301)	0.0881 (0.300)	0.0685 (0.301)
Constant	0.0277** (0.0136)	0.0268* (0.0137)	0.0260* (0.0138)
Observations	2,227	2,227	2,227
R-squared	0.750	0.748	0.747
LAD FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Cluster SE	Yes	Yes	Yes

This table reports Eq. (2) results. The dependent variable is $Lending_{i,t}$. See Table 1 for variable definitions. ***, **, * represent significance at 1%, 5% and 10% levels.

Table 6 - Brexit's Impact on High EU Exports per capita LADs (Hm)

VARIABLES	(1) 2016	(2) 2017	(3) 2018
Post ₂₀₁₆ * EU_Exports _{pc}	-0.0239** (0.0113)		
Post ₂₀₁₇ * EU_Exports _{pc}		-0.00841 (0.00892)	
Post ₂₀₁₈ * EU_Exports _{pc}			-0.00913 (0.00822)
Gdp _{IAD}	0.0105 (0.0607)	0.00400 (0.0608)	0.00557 (0.0607)
Unemp _{IAD}	-0.00841 (0.299)	0.0372 (0.299)	0.0426 (0.301)
Constant	0.0321** (0.0139)	0.0272** (0.0138)	0.0266* (0.0139)
Observations	2,227	2,227	2,227
R-squared	0.747	0.747	0.747
LAD FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Cluster SE	Yes	Yes	Yes

This table reports Eq. (3) results. The dependent variable is $Lending_{l,t}$. See Table 1 for variable definitions. ***, **, * represent significance at 1%, 5% and 10% levels.

Table 7- Brexit's Impact on High Total Trade per-capita LADs (Hm)

VARIABLES	(1) 2016	(2) 2017	(3) 2018
Post ₂₀₁₆ * TotalTrade _{pc}	-0.00176 (0.0107)		
Post ₂₀₁₇ * TotalTrade _{pc}		-0.00647 (0.00939)	
Post ₂₀₁₈ * TotalTrade _{pc}			-0.00241 (0.00906)
Gdp _{IAD}	0.00230 (0.0609)	0.00425 (0.0605)	0.00279 (0.0608)
Unemp _{IAD}	0.0648 (0.308)	0.0849 (0.308)	0.0665 (0.305)
Constant	0.0251* (0.0140)	0.0247* (0.0141)	0.0249* (0.0140)
Observations	2,227	2,227	2,227
R-squared	0.746	0.746	0.746
LAD FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Cluster SE	Yes	Yes	Yes

This table reports Eq. (3) results. The dependent variable is $Lending_{l,t}$. See Table 1 for variable definitions. ***, **, * represent significance at 1%, 5% and 10% levels.

Table 8 - Parallel Trends Test for Brexit's Impact on UK SME Lending (H1)

VARIABLES	(1) Q2 2016	(2) Q2 2017
Post _{2015q4} * Brexit	-0.00602 (0.0104)	
Post _{2016q1} * Brexit	0.0236 (0.0191)	
Post _{2016q2} * Brexit	-0.0427* (0.0207)	
Post _{2016q3} * Brexit	0.0224 (0.0184)	
Post _{2016q4} * Brexit	-0.0114 (0.0107)	-0.00906 (0.00938)
Post _{2017q1} * Brexit		0.0107 (0.0108)
Post _{2017q2} * Brexit		-0.0337** (0.0111)
Post _{2017q3} * Brexit		0.0297* (0.0152)
Post _{2017q4} * Brexit		-0.0123 (0.00673)
Gdp	-0.0300 (0.0845)	-0.0306 (0.0855)
Infl	-0.0243 (0.308)	-0.0136 (0.322)
Unemp	-0.0695 (0.136)	-0.0640 (0.128)
Ir	-0.128 (0.308)	-0.145 (0.296)
Constant	0.000225 (0.00532)	-0.000154 (0.00414)
Observations	327	327
R-squared	0.434	0.433
Country FE	Yes	Yes
Time FE	Yes	Yes
Cluster SE	Yes	Yes

This table reports the parallel trends' results for Eq. (1). The dependent variable is $Lending_{i,t}$. See Table 1 for variable definitions. ***, **, * represent significance at 1%, 5% and 10% levels.

Table 9 - Parallel Trends Test for Brexit's Impact on Rural or Peripheral LADs (HII)

VARIABLES	Panel A- Rural or Peripheral LADs (HII)	Panel B- High EU Exports per capita LADs (HIII)
Post ₂₀₁₅ * RuralPeripheral	0.0307 (0.0207)	
Post ₂₀₁₆ * RuralPeripheral	-0.0668*** (0.0236)	
Post ₂₀₁₇ * RuralPeripheral	0.00135 (0.00951)	
Post ₂₀₁₅ * EU_Exports _{pc}		0.0255 (0.0168)
Post ₂₀₁₆ * EU_Exports _{pc}		-0.0468** (0.0182)
Post ₂₀₁₇ * EU_Exports _{pc}		0.0142 (0.00974)
Gdp _{IAD}	0.0166 (0.0585)	0.00902 (0.0603)
UNEMP _{IAD}	0.0969 (0.299)	0.000429 (0.299)
Constant	0.0267* (0.0136)	0.0283** (0.0139)
Observations	2,227	2,227
R-squared	0.751	0.748
LAD FE	Yes	Yes
Time FE		
Cluster SE	Yes	Yes

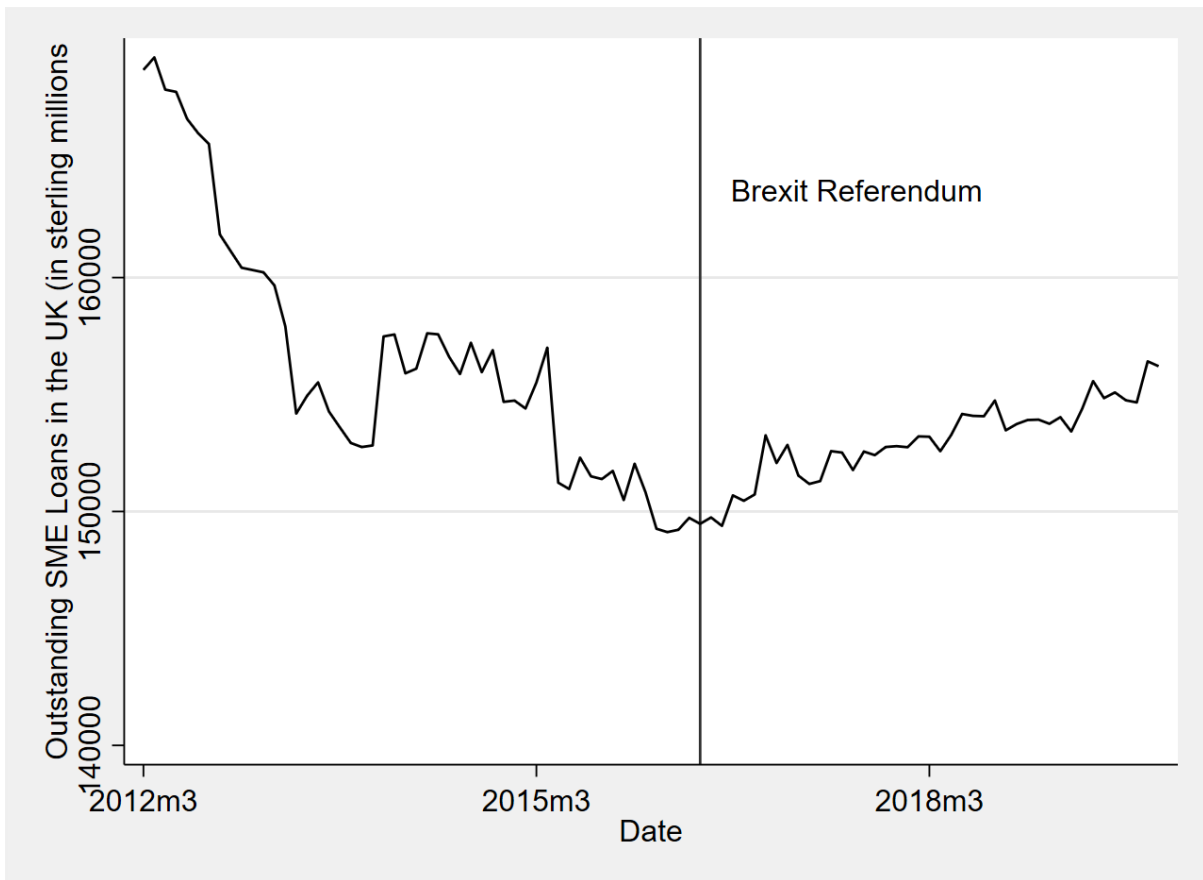
This table reports the parallel trends' results for Eq. (2) in Panel A and Eq. (2) in Panel B. The dependent variable is $Lending_{i,t}$. See Table 1 for variable definitions. ***, **, * represent significance at 1%, 5% and 10% levels.

Table 10 - Disaggregating the Impact of Brexit on SME Lending: Rural vs. Peripheral LADs

VARIABLES	Panel A: Rural			Panel B: Peripheral		
	(1) 2016	(2) 2017	(3) 2018	(4) 2016	(5) 2017	(6) 2018
Post ₂₀₁₆ * Rural	-0.0354* (0.0187)					
Post ₂₀₁₇ * Rural		-0.0259* (0.0135)				
Post ₂₀₁₈ * Rural			-0.0160 (0.0113)			
Post ₂₀₁₆ * Peripheral				-0.0665*** (0.0195)		
Post ₂₀₁₇ * Peripheral					-0.0393*** (0.0130)	
Post ₂₀₁₈ * Peripheral						-0.0162 (0.0109)
Gdp _{IAD}	0.00932 (0.0603)	0.00869 (0.0604)	0.00342 (0.0609)	0.0103 (0.0591)	0.00845 (0.0603)	0.00275 (0.0609)
Unemp _{IAD}	0.158 (0.317)	0.115 (0.309)	0.0773 (0.304)	-0.00247 (0.297)	-0.0108 (0.298)	0.0320 (0.301)
Constant	0.0231 (0.0142)	0.0238* (0.0140)	0.0248* (0.0139)	0.0341** (0.0137)	0.0310** (0.0138)	0.0271* (0.0139)
Observations	2,227	2,227	2,227	2,227	2,227	2,227
R-squared	0.748	0.747	0.747	0.751	0.748	0.747
LAD FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
Cluster SE	YES	YES	YES	YES	YES	YES

This table presents the results of Eq. (2), analysing the disaggregated effects of Brexit on SME lending across rural and peripheral LADs. Panel A reports results for rural LADs, while Panel B presents effects for peripheral LADs. The dependent variable is $Lending_{i,t}$. See Table 1 for variable definitions. ***, **, * represent significance at 1%, 5% and 10% levels.

Figure 1 - Outstanding SME Loans in the UK



The horizontal line marks the referendum date. Data sourced: Bank of England.

Figure 2 - Local Authority Districts (LADs) in the UK



The left-side graph shows the rural or peripheral LADs while the right-side graph demonstrates the top 25th EU Exporters.

ONLINE APPENDIX

Table A1 - Data sources for SME lending data across countries (HI)

Country	Source	Name of the series	Link
UK Finance	UK Finance	SME Lending within UK postcodes.	https://www.ukfinance.org.uk/data-and-research/data/sme-lending-within-uk-postcodes
Bank of England	Bank of England	Monthly amounts outstanding of monetary financial institutions' sterling and all foreign currency loans (excluding overdrafts) and reverse repos to small and medium sized enterprises (in sterling millions) not seasonally adjusted (RPMZ8YB).	https://edu.bankofengland.co.uk/boeapps/database/fromshowcolumns.asp?Travel=NIxAZxS Ux&FromSeries=1&ToSeries=50&DAT=RN G&FD=1&FM=Jan&FY=2010&TD=11&TM=May&TY=2025&FNY=Y&CSVF=TT&html.x=66&html.y=26&SeriesCodes=RPMZ8YB &UsingCodes=Y&Filter=N&title=RPMZ8YB &VPD=Y
National Bank of Belgium	National Bank of Belgium	Credit granted to resident non-financial corporations according to the Central Corporate Credit Register (credit facilities opened), sum of small and medium enterprises.	https://stat.nbb.be/Index.aspx?DataSetCode=CCR#
Bank of France	Bank of France	Corporate loans drawn & undrawn, SMEs, outstanding (LME criteria) (gross).	https://webstat.banque-france.fr/en/#/quickview/SERIES_KEY/DIREN.M.FR.CR.LME.EN.01.N.ZZ.PM/node_EQU__AND_DATASET_EQU_DIREN_AND_periodSortOrder_EQU_DESC
Netherlands Bank	Netherlands Bank	Lending by Dutch large banks to the Dutch SME sector.	https://www.dnb.nl/en/statistics/data-search/#/details/lending-by-dutch-large-banks-to-the-dutch-sme-sector-quarter/dataset/31e3e647-8a79-40b8-ae9b-66f0d8ed2b6b/resource/4504e0e3-5f03-4cb0-9405-3e3164c0a77c
ECB	ECB	Bank business volumes - loans to corporations of up to EUR 1M (new business) – Germany (MIR.M.DE.B.A2A.A.B.0.2240.EUR.N).	https://sdw.ecb.europa.eu/quickview.do?org.apache.struts.taglib.html.TOKEN=ba05a2bdd19d3be958309286af2cb9cf&SERIES_KEY=124.MIR.M.DE.B.A2A.A.B.0.2240.EUR.N&start=&end=&submitOptions.x=0&submitOptions.y=0&trans=YPC
Bank of Italy / OECD	Bank of Italy / OECD	Lending in Italy (Small firms).	https://doi.org/10.1787/888934306395

Polish Financial Supervision Authority	Polish Financial Supervision Authority	Receivables_2 - chosen products (non-financial sector) – All SME Loans (Investment and Operating Loans).	https://www.knf.gov.pl/knf/en/komponenty/img/2022%2011%20-%20Dane%20statystyczne%20EN_80921.xlsx
Bank of Ireland	Bank of Ireland	Table A.14.1 Credit Advanced to Irish Resident Small and Medium Sized Enterprises (Growth Rates).	https://www.centralbank.ie/docs/default-source/statistics/data-and-analysis/credit-and-banking-statistics/business-credit-and-deposits/business-credit-and-deposits-data/table-a-14-1-credit-advanced-to-irish-resident-smes.xls?sfvrsn=f660ab1d_71
Swiss National Bank	Swiss National Bank	Domestic loans (credit lines) for: <ul style="list-style-type: none"> - Companies with up to 9 employees - Companies with 10 to 49 employees - Companies with 50 to 249 employees. 	https://data.snb.ch/en/topics/banken/cube/bakr-edbetgrbm?fromDate=2011-11&toDate=2022-11&dimSel=D1(KC5A,KC5B,KC5C),D2(T1),D3(F,B),D0(AV1,AV10,AV2,AV3,AV4)
ECB	ECB	Bank business volumes - loans to corporations of up to EUR 1M (new business) (non-financial corporations) – Spain. (MIR.M.ES.B.A2A.A.B.0.2240.EUR.N).	https://sdw.ecb.europa.eu/quickview.do?org.apache.struts.taglib.html.TOKEN=8845d6092a2b39e3ff0a58c8f89eeabf&SERIES_KEY=124.MIR.M.ES.B.A2A.A.B.0.2240.EUR.N&start=&end=&submitOptions.x=0&submitOptions.y=0&trans=QF

This table explains the data sources used in this study. The first row (UK Finance) is used for H_{II} and H_{III} while all the other rows are utilized in H_I where we conduct a cross-country analysis.

Table A2 - Top 10 European Trading Partners

Partner Name	SME Lending data	Export	Import	Total Trade
Germany	✓	46.63	94.35	140.98
Netherlands	✓	26.46	47.55	74.01
France	✓	27.28	38.70	65.98
Belgium	✓	17.72	31.40	49.12
Ireland	✓	25.50	19.18	44.68
Switzerland	✓	34.02	10.23	44.25
Italy	✓	12.87	25.06	37.93
Spain	✓	13.54	21.61	35.14
Norway	×	4.84	18.72	23.57
Poland	✓	5.54	12.43	17.97

This table shows the trade statistics for the Top 10 European Trading Partners of UK (source: WIPS, 2015) and includes the information regarding the availability of SME lending data. The trade statistics are displayed in US\$ millions.

Table A3 - Brexit's Impact on the UK - Control Group's tests

VARIABLES	Panel A: Excluding Poland and Switzerland			Panel B: Including AUS, CAN, NZL and USA		
	(1) 2016 Q2	(2) 2017 Q2	(3) 2018 Q2	(4) 2016 Q2	(5) 2017 Q2	(6) 2018 Q2
Post _{2016q2} * Brexit	-0.0177*** (0.00299)			-0.0210*** (0.00422)		
Post _{2017q2} * Brexit		-0.0169*** (0.00339)			-0.0173*** (0.00416)	
Post _{2018q2} * Brexit			-0.0191*** (0.00423)			-0.0182*** (0.00563)
Gdp	-0.00857 (0.0720)	-0.00940 (0.0722)	-0.00579 (0.0729)	-0.0262 (0.0513)	-0.0255 (0.0523)	-0.0221 (0.0540)
Infl	-0.556** (0.211)	-0.528** (0.222)	-0.618** (0.239)	-0.0846 (0.182)	-0.0705 (0.178)	-0.0964 (0.183)
Unemp	-0.140 (0.179)	-0.125 (0.174)	-0.125 (0.172)	-0.0695 (0.159)	-0.0626 (0.158)	-0.0619 (0.157)
Ir	-0.0159 (0.273)	-0.0663 (0.274)	-0.0656 (0.272)	0.230 (0.303)	0.212 (0.305)	0.220 (0.303)
Constant	0.00665 (0.0120)	0.00545 (0.0117)	0.00634 (0.0117)	0.000359 (0.00943)	-0.000245 (0.00931)	-0.000274 (0.00930)
Observations	259	259	259	487	487	487
R-squared	0.429	0.429	0.428	0.400	0.399	0.398
Country FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
Cluster SE	YES	YES	YES	YES	YES	YES

This table reports Eq. (1) results that investigates the impact of Brexit on country-level. The treated unit is UK. In Panel A, the control group consists of seven European countries (excluding Poland and Switzerland). In Panel B, the control group includes nine European countries and Australia (AUS), Canada (CAN), New Zealand (NZL) and the United States of America (USA). The SME lending data for these new additional countries are only available at an annual level during the period of interest. To align with the quarterly data available for other countries, we transform the annual growth rates g into quarterly growth rates q , as follow: $q = (1 + g)^{\frac{1}{4}} - 1$. The dependent variable is SME lending growth in country i in quarter t . See Table 1 for detailed variable definitions. ***, **, * represent significance at the 1st, 5th and 10th percentile levels respectively.

Table A4 - The Impact of Brexit on SME Lending in Peripheral (25th percentile) or Rural LADs (H_{II})

VARIABLES	(1) 2016	(2) 2017	(3) 2018
Post ₂₀₁₆ * RuralPeripheral	-0.0436*** (0.0126)		
Post ₂₀₁₇ * RuralPeripheral		-0.0270*** (0.00889)	
Post ₂₀₁₈ * RuralPeripheral			-0.0206** (0.00824)
Gdp _{IAD}	0.0130 (0.0595)	0.0106 (0.0605)	0.00210 (0.0609)
Unemp _{IAD}	0.149 (0.302)	0.0846 (0.301)	0.0669 (0.301)
Constant	0.0277** (0.0137)	0.0270* (0.0138)	0.0264* (0.0139)
Observations	2,227	2,227	2,227
R-squared	0.750	0.748	0.747
LAD FE	YES	YES	YES
Time FE	YES	YES	YES
Cluster SE	YES	YES	YES

Results for Eq. (2) that explores Brexit's effect on the rural or peripheral LADs (using 25th percentile peripheral LADs instead of 15th). The dependent variable is SME lending growth in LAD i in year t . Each column represents a different year ($Post$) and takes that year into account as the time of intervention. The $Post * RuralPeripheral$ is the interaction between treatment and post variables for each year of interest. See Table 1 for detailed variable definitions. ***, **, * represent significance at the 1st, 5th and 10th percentile levels respectively.

Table A5 - Brexit's Impact on SME Lending in Peripheral or Rural LADs using alternative Identification Strategies: Lower Population Density, Higher Unemployment and Lower GDP per Capita

VARIABLES	Panel A – Lower Population Density			Panel B - Higher Unemployment			Panel C- Lower GDP per Capita		
	(1)	(2)	(3)	(4)	(5)	(6)	(4)	(5)	(6)
Post ₂₀₁₆ * RuralPeripheral	-0.0151** (0.00747)			-0.0682** (0.0296)			-0.0582*** (0.0190)		
Post ₂₀₁₇ * RuralPeripheral		-0.0148** (0.00713)			-0.0509*** (0.0192)			-0.0337*** (0.0124)	
Post ₂₀₁₈ * RuralPeripheral			-0.0256*** (0.00787)			-0.0323** (0.0136)			-0.0225** (0.0109)
Gdp _{IAD}	0.0108 (0.0531)	0.0153 (0.0535)	0.0104 (0.0532)	0.00874 (0.0596)	0.00672 (0.0607)	0.00428 (0.0608)	0.0174 (0.0604)	0.0116 (0.0608)	0.00685 (0.0610)
Unemp _{IAD}	0.0985 (0.314)	0.0849 (0.311)	0.125 (0.306)	-0.0890 (0.314)	-0.0528 (0.311)	0.00423 (0.307)	0.0212 (0.297)	0.0167 (0.298)	0.0343 (0.300)
Constant	0.0239* (0.0143)	0.0237* (0.0143)	0.0222 (0.0142)	0.0345** (0.0148)	0.0317** (0.0145)	0.0282** (0.0142)	0.0320** (0.0139)	0.0292** (0.0138)	0.0272* (0.0139)
Observations	1,896	1,896	1,896	2,227	2,227	2,227	2,227	2,227	2,227
R-squared	0.785	0.785	0.786	0.749	0.748	0.747	0.750	0.748	0.747
LAD FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Cluster SE	YES	YES	YES	YES	YES	YES	YES	YES	YES

This table reports Eq. (2) results, using alternative specifications to identify rural and peripheral areas. Panel A presents the results using Population Density (persons per hectare), with treatment areas are defined as those in the bottom quartile of population density. In Panel A's analysis, we focus on LADs in England and Wales due to data availability. Panel B presents the results using LAD-level unemployment rates for 2014, with the treatment group consisting of rural and peripheral areas at or above the 70th percentile in the unemployment distribution, while those with lower unemployment levels are added to the control group. Panel C presents the results using GDP per capita values for 2014, with treatment areas are defined as those within the 70th percentile GDP per capita among rural and peripheral LADs, while richer rural and peripheral areas are assigned to the control group. The dependent variable is $Lending_{i,t}$. See Table 1 for variable definitions. ***, **, * represent significance at 1%, 5% and 10% levels.

Table A6 - Brexit's Impact on High EU Exports per capita (20th percentile) LADs (HIII)

VARIABLES	(1) 2016	(2) 2017	(3) 2018
Post ₂₀₁₆ * EU_Exports _{pc}	-0.0239** (0.0113)		
Post ₂₀₁₇ * EU_Exports _{pc}		-0.00841 (0.00892)	
Post ₂₀₁₈ * EU_Exports _{pc}			-0.00913 (0.00822)
Gdp _{IAD}	0.0105 (0.0607)	0.00400 (0.0608)	0.00557 (0.0607)
Unemp _{IAD}	-0.00841 (0.299)	0.0372 (0.299)	0.0426 (0.301)
Constant	0.0321** (0.0139)	0.0272** (0.0138)	0.0266* (0.0139)
Observations	2,227	2,227	2,227
R-squared	0.747	0.747	0.747
LAD FE	YES	YES	YES
Time FE	YES	YES	YES
Cluster SE	YES	YES	YES

This table presents the results for Eq. (3) that explores Brexit's effect on LADs with high EU exports per capita (top 20th percentile). The dependent variable is SME lending growth in LAD i in year t . Each column represents a different year ($Post$) and takes that year into account as the time of intervention. The $Post * EU_Exports_{pc}$ is the interaction between treatment and $Post$ variables for each year of interest. See Table 1 for detailed variable definitions. ***, **, * represent significance at the 1st, 5th and 10th percentile levels respectively.