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Deglobalization and the value of geographic diversification: Evidence from Brexit

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Abstract

Purpose

This paper explores the value of geographic diversification in the context of deglobalisation, drawing evidence from a quasi-natural experiment — the Brexit referendum that took place on 23 June 2016 in the United Kingdom (UK).

Design/methodology/approach

We apply an event study methodology to estimate the impact of the Brexit vote on a cross-section of firms with varying levels of geographic diversification — undiversified UK firms, UK firms with significant operations in the European Union (EU) and globally diversified UK firms. We deploy a Heckman two-stage regression approach to address sample selection bias.

Findings

We find that undiversified UK firms experienced negative cumulative abnormal returns around the Brexit referendum. The value of UK firms with majority sales within the UK declined by 0.9 percentage points, on average, in the three days centered on the Brexit referendum. In contrast, UK firms that are globally diversified, with the majority of sales within the EU are unaffected, while diversified firms in the rest of the world generated positive cumulative abnormal returns of 1.8 percentage points over the same period. These results are robust to firm characteristics, selection bias, as well as alternative measures of cumulative abnormal returns and diversification.

Originality/value

We show that a certain group of globally diversified firms earned significantly higher returns from the prospect of the UK leaving the European Union (EU), thereby highlighting the value of geographic diversification in a time of deglobalization.

Keywords: Deglobalisation, Geographic diversification, Brexit referendum, Event studies, European union.

1 Introduction

Deglobalisation, protectionism and nationalism are emerging trends with significant implications for international business (Garg et al., 2021; He et al., 2020). Key events in the last decade, such as the election of President Donald Trump in the United States of America (USA), the Brexit Vote in the United Kingdom (UK) and the emergence of far-right political movements in several countries (including Germany, Italy, Austria, France, amongst others) exemplify this trend. The Covid-19 global pandemic further fueled protectionist and nationalist perspectives, as several countries quickly closed their borders and restricted the cross-border movement of goods, services and labour, substantially impacting international business. Proponents of deglobalisation prioritize nationalism (James, 2018), anti-immigration (Zhang, 2018) and protectionism (Robinson and Thierfelder, 2019) as globalisation is thought to damage society, culture and domestic industry (Cuervo-Cazurra, 2018; Kobrin, 2017). It is within this context that we explore the value of geographic diversification.

Indeed, prior research has explored whether firms benefit from geographic diversification. Using a large sample of US firms from the 1980's and 1990's, Denis et al. (2002a), for example, find that firm value declines as the extent of diversification increases. This stylized fact—a geographic diversification discount—has been recurrently documented across different samples and time periods (see, for example Lang and Stulz, 1994; Berger and Ofek, 1995; Servaes, 1996; Laeven and Levine, 2007). Given the context of deglobalization, it is interesting to revisit what we know about the importance of geographic diversification. Specifically, in contrast to prior research, we argue that geographic diversification may benefit firms when the movement of goods, services and labour is restricted. To our knowledge, this issue—the role of geographic expansion in the context of deglobalisation—remains unexplored in the literature. Our study attempts to fill this research gap by exploring how the extent of geographic diversification explains the cumulative abnormal returns (CARs) earned by UK firms around the Brexit announce-

ment.

It is important to investigate the role of geographic diversity in business operations because several firms rely on international expansion to boost competitiveness and growth. An important strand of the literature shows that international diversification reduces risk (Delios and Beamish, 1999), can create competitive advantage (Oh and Contractor, 2012) and provides economies of scale and scope (Tallman et al., 2004). Theories such as transaction cost economics (TCE) and resource-based view (RBV) posit that diversification enhances firm performance and builds cost-complementarities and capabilities (Teece et al., 1997; Teece, 2014). On the flip side, some scholars contend that geographic diversification increases coordination, administrative and financing costs (Hitt et al., 2006; Garrido-Prada et al., 2019), and creates monitoring problems (Contractor et al., 2007).

Empirically, we measure geographic diversification by looking at the countries where firms own assets and generate sales and the level of assets and sales owned or generated in these countries. We employ a combination of manual collection and Stata coding techniques to derive this dataset from qualitative segment data sourced from Refinitiv (Thomson Reuters). In the process, recognize all the nations in which a firm operates (i.e., its geographic segments) and then group these segments into three key categories: the United Kingdom (UK), the European Union (EU), and the Rest of the World (ROTW). Our classification is based on the last available data for UK-listed firms prior to the June 2016 Brexit referendum (i.e., 2005 financial year). Using an event study approach, we then explore whether the nature of geographic diversification explains the cross-section of abnormal returns around the referendum.

If companies derive benefits from geographic diversification, we would expect to observe that firms lacking diversification (specifically, firms predominantly operating in the UK, which solely export to the EU without having subsidiaries there) are the most affected by restrictions on the movement of goods and services. Meanwhile, their counterparts with operations around the world (beyond the EU) should be least affected. Our results corroborate our hypotheses. We find that UK firms primarily operating within the UK

earn negative returns (0.9 percentage points), UK firms with significant operations in the are unaffected, and UK firms with global operations (ROTW) earn significant positive returns (1.8 percentage points) around the Brexit vote. The results hold even after controlling for sample selection bias and using alternative measures of diversification. Our results highlight the importance of geographic diversification in a rapidly deglobalising world by showing that firms with a more global reach are insulated from the negative impacts of restrictions in the movement of goods, services and labour.

Our study makes two major contributions to the existing literature. First, to the best of our knowledge, we are the first to show that globally diversified firms earned significantly higher (positive) returns from the prospect of the UK leaving the European Union (EU). This outcome could be attributed to the potential for the UK to negotiate trade agreements with various nations globally, thereby amplifying the advantages that companies may attain from their existing operations in these countries. In contrast to prior work (Bowen and Sleuwaegen, 2017; Delios and Beamish, 1999; Garrido-Prada et al., 2019; Oh and Contractor, 2012; Tallman et al., 2004), our results highlight a scenario—deglobalization—where diversification plays a positive role and creates value for firms. Second, we contribute to the debate on Brexit (Hudson et al., 2020; Luo, 2017; McGrattan and Waddle, 2020) by explaining heterogeneity among returns based on the level of geographic diversification. Existing studies attribute the variability of returns around Brexit to industry factors (Davies and Studnicka, 2018; Ramiah et al., 2017). In contrast, we show that firms' geographic diversification strategy partly explains the cross-section of returns after controlling for industry-related factors.

The remainder of the study is organized as follows; Section 2 discusses the literature and develops hypotheses, Section 3 describes the data and methodology, Section 4 presents our results and Section 5 concludes the study.

2 Literature review and hypothesis development

2.1 Deglobalization around the world

The last two decades have witnessed an increasing trend towards deglobalisation marked by the rise of far-right political parties and populist movements (in countries like the Netherlands, the UK, France, Hungary, Italy, Germany and Poland), restrictions to cross-border movements of goods, services and labour, restrictions in foreign investment, policies against immigrants, the increase in trade tariffs and the disassembling of free trade agreements, to name a few (He et al., 2020; Warburton et al., 2017; Kobrin, 2017). Populist leaders such as Hugo Chavez in Venezuela and Evo Morales in Bolivia suppressed imports and foreign investments in their countries (Cuervo-Cazurra, 2018). Other populist movements in Europe, such as "Podemos" in Spain and the "Five Star Movement" in Italy, have furthered an agenda consistent with nationalism and deglobalization (Garg et al., 2021). Similarly, the Victory of President Donald Trump in the USA, on an agenda of protectionism ("America first") reflects this trend (James, 2018). More recently, to encourage domestic manufacturing, Indian Prime Minister Narendra Modi, used the slogan of "self-reliant India" (Garg et al., 2021). This context of deglobalisation presents a novel context to re-examine previous findings. Our work draws on the unique context of the Brexit vote—a referendum on the UK's EU membership. This referendum saw almost 52% of British electorates opt to exit the EU on an agenda of "taking back" control and reinstating Britain's sovereignty or independence in making its own laws(Zhang, 2018). Importantly, this single action signalled an end to the free movement of goods, services and labour.

2.2 Geographic diversification and financial performance

Firms frequently explore cross-border expansion or geographic diversification when seeking to gain a competitive advantage as it allows them to access several benefits (Tall-

man et al., 2004). Firstly, geographic diversification enhances access to new markets while allowing firms to extend economies of scope and scale (Li and Yue, 2008). Secondly, geographic diversification may lead to a reduction in the overall risk (Rugman and Verbeke, 2008) as it increases the number of potential suppliers and clients, provides stable cash flows and access to new resources. Thirdly, geographic diversification provides the opportunity for knowledge transfer (Vega-Jurado et al., 2008). Fourthly, geographic diversification strengthens a firm's market power by reducing the input and output costs and improving competitiveness (Li and Yue, 2008; Contractor et al., 2007). Besides these strengths, diversified companies encounter several problems. Initially, firms encounter new institutional and environmental barriers stemming from legal requirements, capital market, labour conditions, governance standards, and culture, which may increase coordination and administrative costs (Hennart, 2007; Ciabuschi et al., 2015). International diversification also requires significant investments in production networks, export licenses, distribution, and foreign market research, which are costly and time-consuming (Garrido-Prada et al., 2019).

2.3 Brexit and outcomes

Some recent work has identified the importance of changes in firms' external business environment that affect all firms to understand corporate diversification (Ahuja and Novelli, 2017; Hautz et al., 2014). The existing studies show how Brexit adversely affected financial markets (Pástor and Veronesi, 2013), international trade (Dhingra et al., 2016), different sectors of the UK market (Davies and Studnicka, 2018; Ramiah et al., 2017), and the country's GDP growth (Hantzsche et al., 2018). However, the benefits of Brexit range from the avoidance of EU policies to skilled-based migration (Ramiah et al., 2017). Despite the significant literature on Brexit and its consequences, we still do not know the role of geographic diversification around the Brexit announcement.

2.4 Hypotheses development

Existing empirical evidence suggests that political changes, such as elections, adversely affect stock markets. For instance, Santa-Clara and Valkanov (2003), find negative stock returns around the US presidential elections. Also, Nippani and Medlin (2002) document negative stock market reaction emerging from delay in the declaration of the US presidential election winner in 2000. Although most studies examine the effect of political changes on returns in the US market, some studies investigate the impact of political changes in other parts of the world. Białkowski et al. (2008) examine the effect of national elections in 27 OECD countries on stock market volatility and report that stock market volatility increases around national elections. Brexit was largely perceived as being bad for industry due to the frictions and restrictions to international trade it was going to create (Pástor and Veronesi, 2013; Dhingra et al., 2016; Davies and Studnicka, 2018; Ramiah et al., 2017). Our starting point is, therefore that, overall, Brexit has a negative impact on aggregate (average) stock (abnormal) returns. However, we argue that the cross-section of returns will partly be explained by firms' nature of geographic diversification.

We contend that UK firms without operations (subsidiaries) in specific EU countries (i.e., undiversified firms) were most affected by Brexit. Pre-Brexit, these firms produced their goods (e.g., agricultural products) and services (e.g., consulting, research and development) in the UK and simply exported them to clients and customers across different EU countries based on demand. Brexit increases the cost of exporting these goods and services, necessitating an increase in prices and thus reducing the ability of undiversified firms to compete in this foreign market (EU). We expect, therefore, that Brexit will negatively impact these firms.

We present our first hypothesis as follows:

Hypothesis1(H1): Undiversified firms with more operations within the UK earn negative cumulative abnormal returns around the Brexit referendum.

On the contrary, firms with significant operations outside the UK will be less impacted by Brexit for several reasons. Firstly, diversified firms have operations and customer bases spread across multiple countries, allowing them to access a broader range of markets (Beaulieu et al., 2005). This diversification thus reduces their dependence on a single market, such as the European Union (EU), and helps mitigate potential disruptions caused by changes in trade agreements and regulatory frameworks resulting from Brexit. Secondly, diversified firms can benefit from tariff-free access and preferential trade agreements that the UK has with other countries outside the EU. While Brexit has resulted in new trade barriers between the UK and the EU, diversified firms can offset any negative impact by focusing on markets with more favourable trade conditions. Thirdly, Brexit has led to increased volatility in the British pound, and companies heavily reliant on the UK market may face challenges due to currency fluctuations. However, geographically diversified firms can offset this risk by operating in different currencies and economies, reducing their vulnerability to exchange rate fluctuations and potential financial losses (Hill et al., 2019). Fourthly, geographically diversified firms can adjust their operations and supply chains to adapt to the changing business environment. For example, these firms can strategically allocate resources, relocate production facilities, or establish new subsidiaries in countries with more favourable trade conditions. This flexibility enables them to navigate regulatory complexities and maintain efficient operations. Finally, Brexit has raised concerns about the availability of skilled labour in the UK, particularly if immigration policies become more restrictive. Geographically diversified firms can tap into talent pools in various countries, attracting skilled workers from different regions to support their operations. This ensures a continued supply of talent, reducing the impact of potential labour shortages in the UK.

However, Brexit has wide-ranging implications, and even geographically diversified firms may face some challenges. Factors such as regulatory changes, increased administrative burdens, and potential disruptions to supply chains can still affect these companies to some extent. Nonetheless, their diversified nature provides them with a stronger posi-

tion to adapt and mitigate the overall impact of Brexit compared to firms solely dependent on the UK market.

Based on the discussion, we develop our second hypothesis as follows:

Hypothesis2(H2): Diversified firms with significant operations outside the UK (both EU and rest of the world (ROTW)) earn higher cumulative abnormal returns around the Brexit referendum.

3 Data and Methodology

3.1 Data

The referendum on Brexit took place on 23 June 2016, and the results were announced on 24 June 2016. Before the vote took place, there was a notable level of ambiguity regarding the potential outcomes, relying on polls. Ultimately, the "leavers" emerged victorious, albeit by a slim margin (52% to 48%). Given that the results were unpredictable and a surprise to the market, we adopt an event study approach by exploring stock market reactions around the announcement of the results. We begin our analysis by creating a list of all publicly traded UK firms as of the end of 2015 together with their tickers and DataStream codes. Thomson Reuters' DataStream provides qualitative data on the segments/regions/countries in which our sample of firms operate along with estimated sales generated from assets owned in these different segments. We deploy different utilities for textual analysis in Stata to recode this qualitative data into standardized names of Countries in which firms operate. We then generate a new variable to capture a firm's geographical diversification by regrouping our UK-based public firms into three segments: United Kingdom (UK), European Union (EU), and Rest of the World (ROTW). Finally, we calculate total sales and assets held by UK firms in each of these geographic segments.

3.2 Measures of geographic diversification

Following the existing studies (Schmid and Walter, 2012; Denis et al., 2002b; Goldberg and Heflin, 1995; Hoechle et al., 2012; Krapl, 2015; Olibe et al., 2008; Reeb et al., 1998), we adopt two proxies for the extent of geographic diversification. Our first measure is based on sales; a dummy variable which takes a value of 1 if a firm generates a majority of its sales in the UK (Majority (UK)), the EU (Majority (EU)) or the rest of the world (majority (ROTW)). This measure captures the firm's biggest or most important market. Secondly, we compute the proportion of sales generated by UK firms in the UK (proportion (UK)), EU (proportion (EU)), and rest of the world (proportion (ROTW)). Thirdly, instead of sales, we use assets held by UK firms within UK (UK asset ratio), within EU (EU asset ratio), and in rest of the world (ROTW asset ratio). Our approach to measuring the extent of a firm's diversification is consistent with prior researchers (Krapl, 2015; Olibe et al., 2008; Schmid and Walter, 2012) who use the ratio of foreign sales (assets) to total sales (assets). We used figures for assets held in each segment as a measure of production – i.e., to identify where major plants are held and where production takes place.

3.3 Cumulative abnormal returns (CARs)

As previously noted, an event study approach is specifically suited for our study as the results of the Brexit referendum were unanticipated prior to the announcement. stock market reactions upon the announcement capture investors' evaluation of the impact of the event on the focal firm. Following previous studies deploying similar techniques (Tunyi, 2021), we calculate cumulative abnormal returns (CAR) around the Brexit referendum using the market model as follows:

$$CAR[t,n]_i = \sum_{t=0}^{n} AR_{it} \tag{1}$$

where CAR[t,n]$_i$ is the cumulative abnormal return for firm i for the event days t to n. ARit, the abnormal return and calculated as follows:-

$$AR_{it} = R_{it} - [\hat{\alpha}_i + \hat{\beta}_i R_{mt}] \tag{2}$$

where AR_{it} is the abnormal return for firm i on event day t, R_{it} is the actual return for firm i on event day t, R_{mt} is the market return on event day t, $\hat{\alpha}_i$ and $\hat{\beta}_i$ are parameters estimated from the following market model:-

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it} \tag{3}$$

The estimation window is the pre-event period from day -269 to -20. We recognise that the pre-event window is not universal in the literature and may affect inferences. To address this concern, we also present results using different pre-event window periods. Following MacKinlay (1997); Tunyi and Machokoto (2021), we used short-run event windows to minimise noise resulting from confounding events. The main assumption of MacKinlay (1997) is that even if there is some noise, this will be random and, on average, the noise will cancel out if we use a large enough sample. In our study, we used a sample of 834 (see, for instance, Tables 1 and 2) firms allowing us to attribute any significant changes in firm returns to the Brexit referendum results.

3.3.1 Economic model

We use the following model to test the effect of geographical diversification on cumulative abnormal returns:

$$CAR_{it} = \beta_0 + \beta_1 Diversification_{it} + \beta_k Controls_{it} \quad (4)$$

where CAR_{it} is the cumulative abnormal return of firm i around the Brexit announcement over the 3-day event window; $Diversification_{it}$ is the level of geographic diversification of firm i at time t. $Controls_{it}$ is a vector of firm-specific controls for firm i at time t. Following prior studies (Danbolt et al., 2016; Tunyi et al., 2019; Tunyi, 2019; Tunyi and Ntim, 2016), we use controls including; profitability, ratio of earnings before interest and tax to total capital employed; Tobin's Q, sum of the book value of debt and the market value of equity scaled by the book value of assets; liquidity, ratio of cash and short-term investments to total assets; leverage, long-term debt scaled by total assets; firm size, natural logarithm of total assets; firm age, natural logarithm of the number of years since listing; capital investment divided by total assets; capital expenditure divided by total assets.

To control for omitted factors, we used industry (Fama-French 48 industry) fixed effects. Robust standard errors are used to control for heteroskedasticity. To mitigate the effect of outliers, we winsorized CARs and firm-specific controls by 1 percent at the top and bottom of distributions.[1]

[1]To find whether there is an issue of heteroskedasticity, we used Breusch–Pagan test that proposes constant variance under the null hypothesis. The results from our baseline models in Table 4 show that we have the issue of heteroskedasticity as reported in Appendix B. That's why we always use White (1980) robust standard errors in all our regression analyses.

4 Results and discussions

4.1 Descriptive statistics

Table 1 shows descriptive statistics of all variables in the study. In the full sample of diversified and non-diversified firms, the average 3-day abnormal return is -2.5%, consistent with studies documenting negative returns around Brexit (Davies and Studnicka, 2018; Ramiah et al., 2017). On average, UK firms generate (hold) 72% (83%) of their sales (assets) in the UK firms, 9% (3%) in the EU and 19% (14%) in the ROTW. Among control variables, the average values for Tobin's Q, liquidity, leverage, firm size, firm age, capital investment, and capital expenditures are 2.14, 0.18, 0.17, 18.37, 2.70, 0.22, and 0.05, respectively.

[Insert Table 1 here]

4.2 Trends in returns around Brexit

Figure 1 shows abnormal and cumulative abnormal returns earned by UK firms around the Brexit referendum. We use a 41-day event window (-20, +20) to observe the behaviour of the stock market around Brexit. As shown in the figure, we find a sharp decline in abnormal returns around the event date, although there appears to be some reversal in the days following the event. This suggests that deglobalization (as characterised by Brexit) is, on average, value-destructive for shareholders as the stock market negatively reacts to the event. This finding is consistent with prior research looking at the impact of Brexit (Pástor and Veronesi, 2013).

[Insert Figure 1 and 2 here]

In Figure 2, we explore abnormal returns around the vote for firms with different levels of geographic diversification; undiversified firms (i.e., UK) and diversified firms (i.e.,

EU and ROTW). We find significant variation in the cross-section of abnormal returns contingent on firms' level of geographic diversification. Specifically, we find that the negative impact of Brexit on the UK market was mainly driven by undiversified firms and those with significant operations in the EU. Interestingly, we find that firms with significant operations around the world were largely insulated from the Brexit effect. In our subsequent analysis, we go beyond these general trends by deploying further univariate and cultivate analyses to shed more light on these preliminary findings.

4.3 Univariate analysis

In Panel A of Table 2, we show abnormal returns earned by UK firms around Brexit using different event windows for diversified and non-diversified firms. Note that 521 out of 834 UK firms (62%) involve in diversified operations, while 313 (38%) firms are categorized as non-diversified by our framework. On average, diversified firms earn negative abnormal returns from -1.7% to -4.2% and their non-diversified counterparts also earn negative returns from -0.5% to -1.6%, albeit mostly insignificant. The returns, however appear to vary across different event windows.

We further split our sample into three segments of diversification based on majority sales (Panel B) and assets (Panel C). We find that average 21-day and 41-day returns to diversified firms in ROTW appear to be positive and statistically significant, while diversified firms in EU earn significantly negative returns in most of the event windows. These findings suggest that UK and EU firms are more exposed to deglobalization — Brexit, and the nature of diversification (UK, EU, and ROTW) partly explains differences in returns to UK firms around Brexit. We further explore this in a multivariate setting in which we are able to control for other factors that influence abnormal returns.

[Insert Table 2 here]

4.4 Diversification and cumulative abnormal returns

We start our multivariate analysis by computing correlations. Table 3 shows the correlation among variables used in the study. We observe a high correlation among our diversification proxies. Hence, in subsequent analysis, we use one proxy at a time to gauge the impact of diversification on returns. The percentage of sales by UK firms within the UK (Proportion UK) is negatively and significantly correlated with both percentages of sales by UK firms in EU (Proportion EU) and ROTW (proportion ROTW). A similar trend is observed when we used asset ratio instead of sales ratio. Importantly, we find a low correlation amongst our control variables, alleviating concerns around multicollinearity (Tunyi et al., 2022).

[Insert Table 3 here]

In Table 4, we explore the relationship between geographic diversification and cumulative abnormal returns around the Brexit announcement as specififed in Eq.(4). Our models include firm-level controls and use industry-fixed effects. In Models (1) and (4) of Table 4, we find that UK firms operating in UK earn significant negative returns of 0.9 to 1.2 percentage points (pp). We also show that UK diversified firms operating in EU earn negative returns, albeit insignificant (Models (2) and (5)). Finally, in Models (3) and (6), we find that UK firms operating in other parts of the world earn significant positive returns of 1.7 to 1.8 pp. The reported results corroborate our first hypothesis. For both measures of geographic diversification, we show that diversified firms operating outside the UK and EU earn higher returns than their EU and UK counterparts. Among controls, most of the estimated parameters are qualitatively similar to what other authors find (Contractor et al., 2007; Li and Yue, 2008), and importantly we find that firm age positively affects CARs.

[Insert Table 4 here]

Consistent with the literature on the benefits of geographic diversification (Rugman and Verbeke, 2008; Tallman et al., 2004; Vega-Jurado et al., 2008) in general and Brexit effect in particular (Davies and Studnicka, 2018; Dhingra et al., 2016; Hantzsche et al., 2018; Hudson et al., 2020; Pástor and Veronesi, 2013; Ramiah et al., 2017), our results show that geographic diversification is an important strategy that can play a positive role in deglobalized events. The theoretical support of our results is derived from the different exposure of diversified firms (Davies and Studnicka, 2018) that could benefit the UK firms operating in other territories than UK and EU. The findings suggest that an important source of higher returns is the level of diversification, which we suggest, permit firms to manage effectively during deglobalized events like Brexit.

The results also support the resource-based view (RBV) and transaction cost economics (TEC) that postulate diversification as a strategy to improve firm performance and reduce associated costs (Teece, 2014), create a competitive advantage (Oh and Contractor, 2012), and provides economies of scale (Tallman et al., 2004). In the case of our study, we argue that although diversification is an important firm strategy to diversify risk, in a deglobalizing world, the benefits from diversification are even higher.

4.5 Robustness checks

We conduct a series of robustness checks, including alternative event windows, alternative measures of returns and diversification, controlling for endogeneity — selection bias, and a comparative analysis of CARs to undiversified and diversified firms operating in different segments of the world. We first use longer event windows of 21-day and 41-day CARs in place of the short event window of 3-days used in our baseline models. We show the results in Panel A of Table 5. In panel B of Table 5, we use the market-adjusted returns model in place of the market model to generate our abnormal returns value. Overall, we find similar results as reported in Table 4. Specificall, our findings that undiversified UK firms earn negative returns, diversified UK firms operating in EU

earn negative but insignificant returns, and UK diversified firms operating in ROTW earn significant positive returns, continue to hold. These results show that the reported association between diversification and CARs is not sensitive to a particular measure of CARs.

[Insert Table 5 here]

Secondly, our results so far document a positive (negative) association between geographic diversification in ROTW (UK) and returns. However, Campa and Kedia (2002) argue that selection bias may explain the diversification discount, hence, any assessment of the value of diversification must take account of the fact that firms choose to diversify when the benefits of diversification outweigh the costs of diversification. Our study addresses selection bias by using the Heckman two-stage model, where the selection hazard (inverse Mills ratio) derived from a first-stage probit regression model is included as an additional control variable in the second stage — our base model. The results presented in Panel A of Table 6 show that the reported association between diversification and returns is persistent after controlling for possible selection bias.

Thirdly, we used the Propensity Score Matching technique (PSM) to minimize observable selection bias. We use two comparable groups of UK undiversified firms and UK diversified firms in ROTW. We match firms by industry and firm characteristics used in the baseline model and define a UK firm as non-diversified (control group) if it is only operating in UK and diversified (treatment group) when it is operating in ROTW. Using a one-to-one matching with 0.01 caliper distance, these two comparable groups of diversified ROTW and non-diversified UK firms enable us to compare firms in both groups based on the industry and firm characteristics. We also compare UK non-diversified firms with EU diversified firms using one-to-one matching based on the industry and firm characteristics and with 0.01 caliper distance. Panel B of Table 6 reports that the results from baseline models in Table 4 are unchanged for matched group of firms.

[Insert Table 6 here]

Fourthly, the location of firm assets may also matter irrespective of sales. For instance, firms with majority assets (e.g., production facilities) in the EU may still have greater access to the EU market relative to their counterparts that do not have access to EU market. Indeed, several firms moved manufacturing to the EU following Brexit, for this reason, we used asset ratio as a proxy for diversification and find similar results as before and report them in Table 7.

[Insert Table 7 here]

Finally, consistent with prior studies (Goldberg and Heflin, 1995; Schmid and Walter, 2012; Krapl, 2015), our main analyses use foreign sales and assets in different regions to capture the nature of the firm's diversification. For robustness, consistent with Olibe et al. (2008), we explore whether our results are robust when we use an alternative measure of diversification — the number of foreign subsidiaries. Segment data from DataStream on foreign operations covers the 10 most important geographic segments for each firm. We count the total number of foreign segments located in the EU and in the ROTW. We then explore the relationship between number of segments in each region and CAR. Our results are presented in Table 8. Our conclusions remain robust. Specifically, we find that CAR increases with the extent of diversification in the ROTW (code 2 and 4) but not in the EU (model 1 and 3).

[Insert Table 8 here]

5 Conclusion

This study contributes to the literature on deglobalization, taking the example of the Brexit referendum, and examines how geographic diversification affects cumulative abnormal returns around deglobalization events. As a proxy for geographic diversification, we use total sales or assets held by the UK firms in three segments of the world, i.e., UK, EU and ROTW. We use Thomson Reuters' DataStream to get information on a firm's

country of operations and document that the level of diversification partly explains the heterogeneity of cumulative abnormal returns to UK firms. UK firms operating in ROTW before Brexit earn positive returns, firms operating in the EU are unaffected, and firms operating in the UK record significant value declines due to Brexit. This variability of returns among firms operating in different regions of the world can be attributed to the impact of the deglobalization event — Brexit.

This work offers some insights for policymakers and regulators around the impact of deglobalisation on local firms. Our finding suggests that these trends significantly negatively impact the most vulnerable firms (smaller firms with less global reach) while their larger counterparts with significant global reach might be insulated. This finding is important for determining the nature of support needed by different firms in times of deglobalisation. The work also offers insights to managers of firms operating in countries where there are real prospects of deglobalisation. Specifically, the work highlights the importance of geographic diversification when free movement of goods, services and people is restricted.

Our study is subject to some limitations that open avenues for future work. There are a few available proxies of diversification and further work on developing other proxies is much needed. Further work may also examine the long-term impact of diversification on UK firms. We considered Brexit as a quasi-natural experiment, and our study could be applied to other deglobalization events like Covid-19 and can enhance the generalizability of diversification strategy in the deglobalized world. Our findings may stimulate future work to explore how another form of diversification — product diversification — has affected firm returns around Brexit. Finally, we have focused on the UK as our base case. It may be interesting to corroborate our findings by exploring the impact of Brexit on European firms, who hitherto Brexit, had some operations in the UK.

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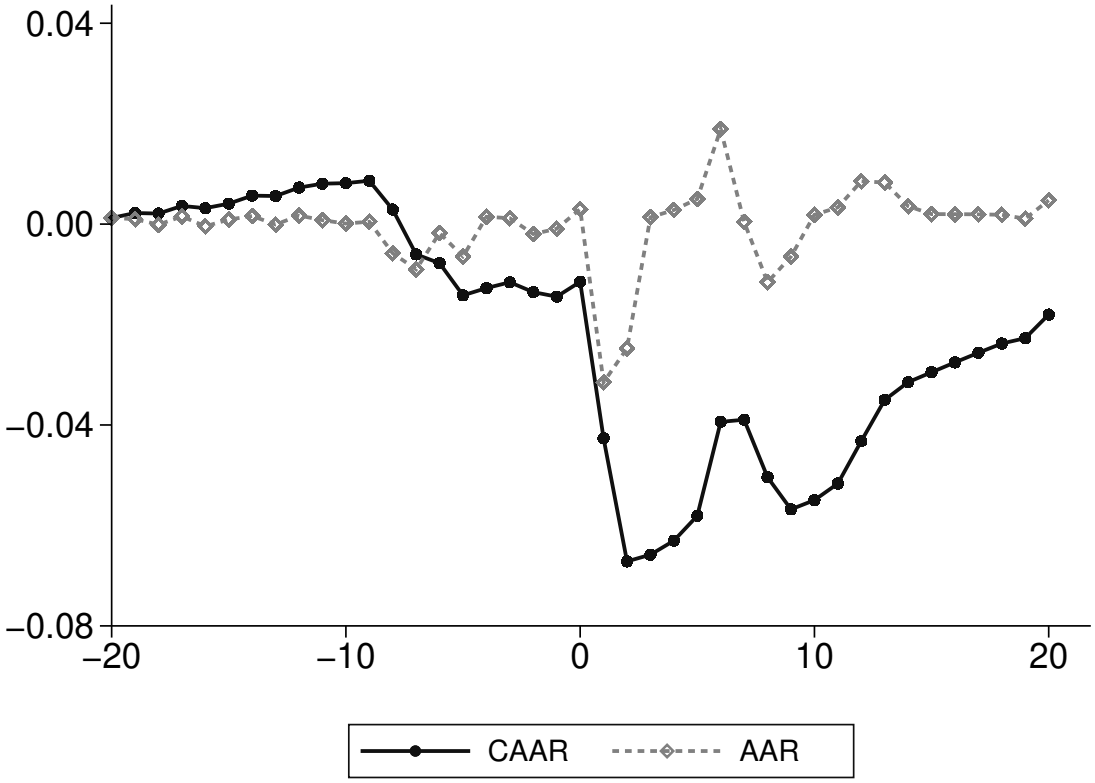

Figure 1 Abnormal returns of UK firms around the Brexit announcement

The figure presents the average abnormal returns (AAR) and cumulative average abnormal returns (CAAR) of all listed UK firms around the Brexit vote. The period spans 20 days before and 20 days after the vote which took place of 23 June 2016.

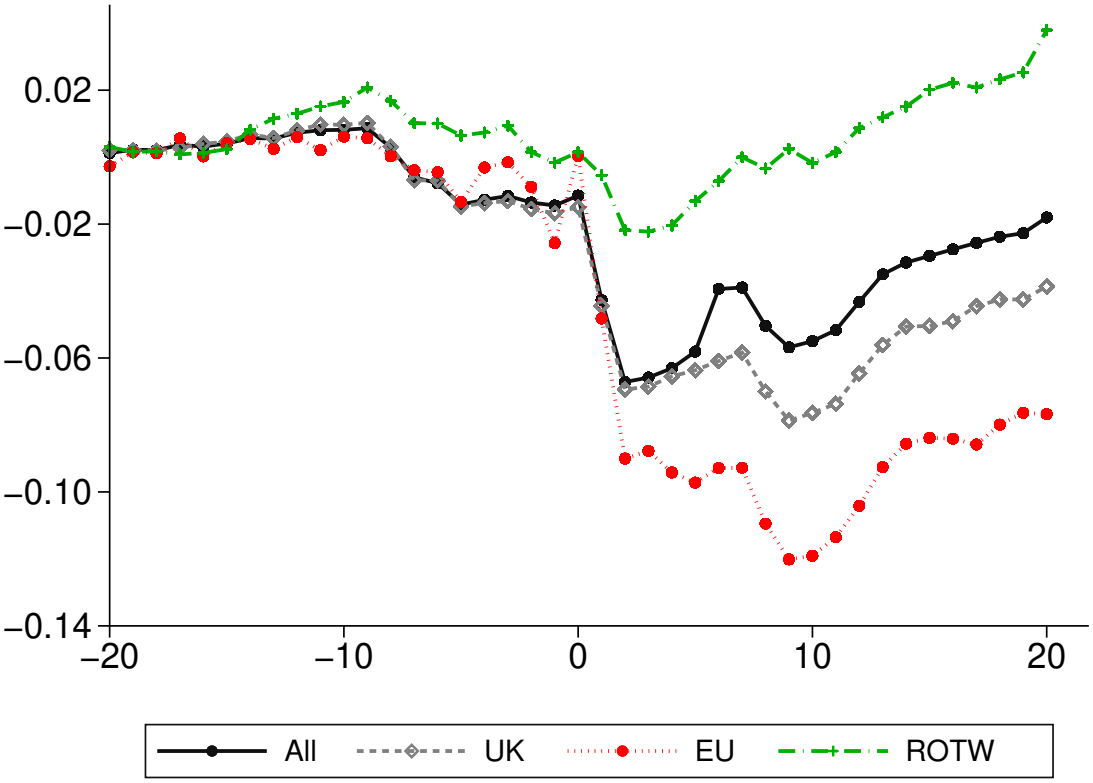

Figure 2 Geographic diversification and CARs around the Brexit announcement

The figure presents cumulative abnormal returns (CARs) around Brexit. "All" refer to a complete set of UK-based public firms, "UK" refers to UK-based firms with no reported foreign sales while "EU" and "ROTW" refer to UK firms generating a majority of their revenue from the EU and ROTW, respectively. The period for computing CARs spans 20 days before and 20 days after the Brexit vote, which took place on 23 June 2016.

Table 1 Descriptive Statistics

The table reports descriptive statistics of all variables used in the study. All variables are defined in Appendix A.

Variable	N	Mean	SD	p25	p50	p75
CAR[-20, -1]	834	-0.015	0.148	-0.074	-0.019	0.030
CAR[-1, +1]	834	-0.025	0.082	-0.059	-0.024	0.007
CAR[-1, +20]	834	-0.015	0.164	-0.106	-0.018	0.057
CAR[-20, +20]	834	-0.028	0.240	-0.144	-0.030	0.064
Proportion(UK)	737	0.722	0.391	0.390	1.000	1.000
Proportion(EU)	737	0.094	0.199	0.000	0.000	0.102
Proportion(ROTW)	737	0.188	0.312	0.000	0.000	0.313
UK_asset_ratio	834	0.834	0.288	0.745	1.000	1.000
EU_asset_ratio	834	0.035	0.133	0.000	0.000	0.000
ROTW_asset_ratio	834	0.147	0.325	0.000	0.000	0.168
Profitability	795	-0.066	0.322	-0.127	0.034	0.098
Tobin's Q	834	2.140	2.360	0.997	1.475	2.332
Liquidity	834	0.182	0.206	0.045	0.105	0.246
Leverage	801	0.174	0.206	0.000	0.119	0.268
Firm size	834	18.378	2.556	16.586	18.168	20.100
Firm age	834	2.709	0.816	2.303	2.639	3.296
Capital investment	795	0.227	0.257	0.028	0.114	0.330
Capital expenditure	795	0.053	0.266	0.008	0.022	0.055

Table 2 Diversification and CARs around Brexit vote

The table reports CARs earned by UK firms around the Brexit vote. We report CARs for different event windows. The window, [-20,-1] indicates CARs for the period starting 20 days before the vote and ending 1 day before the vote. [-1, +1] shows CARs for the period starting a day before the vote and ending a day after the vote. [-1, +20] documents CARs for the period starting a day before the vote and ending twenty days after the vote. [-20, +20] reports CARs for the period starting twenty days before the vote and ending twenty days after the vote. In Panel A, Diversified (Non-diversified) firms represent those with (without) sales or assets outside of the UK. Panels B and C report results for firms with majority sales (panel B) and majority assets (panel C) in the UK, EU, and the Rest of the World (ROTW). ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

	N	CAR[-20,-1]	CAR[-1,+1]	CAR[-1,+20]	CAR[-20,+20]
Panel A: All firms					
Non-diversified	313	-0.012	-0.016***	0.006	-0.005
		(0.212)	(0.009)	(0.562)	(0.734)
Diversified	521	-0.017***	-0.030***	-0.028***	-0.042***
		(0.003)	(0.000)	(0.000)	(0.000)
Panel B: Majority sales					
UK	285	-0.022***	-0.043***	-0.055***	-0.075***
		(0.006)	(0.000)	(0.000)	(0.000)
EU	47	-0.026	-0.039***	-0.068***	-0.077***
		(0.178)	(0.000)	(0.000)	(0.000)
ROTW	147	-0.002	-0.007*	0.036***	0.038**
		(0.849)	(0.088)	(0.000)	(0.017)
Panel C: Majority assets					
UK	409	-0.027***	-0.034***	-0.039***	-0.063***
		(0.000)	(0.000)	(0.000)	(0.000)
EU	17	-0.003	-0.026**	-0.071**	-0.072*
		(0.898)	(0.039)	(0.023)	(0.095)
ROTW	95	0.020**	-0.018***	0.029**	0.053***
		(0.046)	(0.000)	(0.022)	(0.005)

Table 3 Correlation Matrix

The table reports correlations among variables used in the study. All variables are defined in Appendix A. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Proportion(UK)	1							
(2) Proportion(EU)	-0.66*	1						
(3) Proportion(ROTW)	-0.85*	0.20*	1					
(4) UK_asset_ratio	0.83*	-0.48*	-0.74*	1				
(5) EU_asset_ratio	-0.40*	0.62*	0.11*	-0.53*	1			
(6) ROTW_asset_ratio	-0.64*	0.18*	0.70*	-0.80*	0.13*	1		
(7) CAR[-1, +1]	-0.12*	0.00	0.15*	-0.04	0.00	0.04	1	
(8) CAR[-1, +20]	-0.10*	-0.06	0.15*	-0.07	-0.06	0.11*	0.47*	1
(9) CAR[-20, +20]	-0.10*	-0.03	0.15*	-0.10*	-0.02	0.12*	0.36*	0.83*
(10) Profitability	-0.17*	0.17*	0.10*	-0.20*	0.11*	0.16*	-0.02	-0.02
(11) Tobin's Q	0.08	-0.06	-0.07	0.05	-0.04	-0.02	0.00	0.02
(12) Liquidity	0.16*	-0.10*	-0.14*	0.16*	-0.08	-0.12*	0.01	0.04
(13) Leverage	-0.06	-0.03	0.09	-0.09	0.03	0.07	0.08	0.02
(14) Firm size	-0.27*	0.17*	0.23*	-0.26*	0.15*	0.19*	0.03	0.00
(15) Firm age	-0.29*	0.20*	0.23*	-0.33*	0.16*	0.27*	-0.03	-0.04
(16) Capital investment	0.03	-0.04	-0.01	0.08	-0.05	-0.07	0.07	0.07
(17) Capital expenditure	0.00	0.01	0.00	0.03	-0.02	-0.02	0.04	0.04
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(10) Profitability	0.01	1						
(11) Tobin's Q	0.02	-0.39*	1					
(12) Liquidity	0.02	-0.36*	0.34*	1				
(13) Leverage	0.02	-0.06	0.08	-0.28*	1			
(14) Firm size	-0.01	0.50*	-0.29*	-0.35*	0.20*	1		
(15) Firm age	0.00	0.27*	-0.09	-0.23*	0.06	0.29*	1	
(16) Capital investment	0.11*	0.12*	-0.17*	-0.28*	0.28*	0.28*	0.04	1
(17) Capital expenditure	0.05	-0.06	0.26*	-0.04	0.18*	-0.10*	-0.01	0.50*

Table 4 Abnormal returns and Diversification

The table reports results exploring the relationship between geographic diversification and abnormal returns around the Brexit vote. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. All variables are defined in Appendix A.

	Dependent var: CAR[-1, +1]					
	Location of majority sales			**Proportion of sales**		
	UK	EU	ROTW	UK	EU	ROTW
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Majority (UK)	-0.009*					
	(0.080)					
Majority (EU)		-0.013				
		(0.126)				
Majority (ROTW)			0.018***			
			(0.003)			
Proportion (UK)				-0.012*		
				(0.080)		
Proportion (EU)					-0.006	
					(0.584)	
Proportion (ROTW)						0.017*
						(0.063)
Profitability	-0.003	-0.004	-0.004	-0.001	-0.000	-0.001
	(0.693)	(0.634)	(0.621)	(0.907)	(0.982)	(0.942)
Tobin's Q	0.002	0.002	0.002	0.002	0.002	0.002
	(0.174)	(0.204)	(0.206)	(0.164)	(0.179)	(0.171)
Liquidity	-0.002	-0.003	-0.001	-0.009	-0.010	-0.008
	(0.906)	(0.865)	(0.932)	(0.623)	(0.562)	(0.636)
Leverage	0.006	0.006	0.004	0.010	0.011	0.008
	(0.691)	(0.691)	(0.806)	(0.563)	(0.519)	(0.612)
Firm size	0.003**	0.004**	0.003*	0.003*	0.004**	0.003*
	(0.035)	(0.015)	(0.057)	(0.057)	(0.025)	(0.059)
Firm age	0.001	0.003	0.001	0.001	0.002	0.001
	(0.643)	(0.325)	(0.709)	(0.865)	(0.525)	(0.858)
Capital investment	-0.018	-0.020	-0.017	-0.017	-0.020	-0.016
	(0.194)	(0.151)	(0.216)	(0.317)	(0.233)	(0.350)
Capital expenditure	0.064	0.071	0.063	0.052	0.062	0.054
	(0.146)	(0.101)	(0.151)	(0.333)	(0.239)	(0.309)
Constant	-0.076**	-0.094***	-0.082**	-0.069*	-0.089**	-0.083**
	(0.041)	(0.008)	(0.022)	(0.094)	(0.025)	(0.034)
Observations	738	738	738	684	684	684
R-squared	0.175	0.174	0.181	0.188	0.185	0.190
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 5 Panel A: Alternative measures of abnormal return — Alternative event windows

The table reports results exploring the relationship between geographic diversification and abnormal returns using 21-day and 41-day CARs. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. We define all variables in Appendix A.

	CAR[-1,+20]			CAR[-20,+20]		
	(1)	(2)	(3)	(4)	(5)	(6)
Proportion (UK)	-0.035**			-0.054**		
	(0.045)			(0.034)		
Proportion (EU)		-0.043			-0.035	
		(0.125)			(0.443)	
Proportion (ROTW)			0.064***			0.090***
			(0.009)			(0.007)
Profitability	0.015	0.018	0.016	0.038	0.042	0.039
	(0.586)	(0.512)	(0.557)	(0.365)	(0.317)	(0.340)
Tobin's Q	0.002	0.001	0.002	0.004	0.004	0.004
	(0.770)	(0.800)	(0.782)	(0.611)	(0.631)	(0.621)
Liquidity	0.069	0.063	0.070	0.052	0.044	0.054
	(0.178)	(0.226)	(0.166)	(0.478)	(0.549)	(0.459)
Leverage	0.029	0.032	0.024	0.004	0.009	-0.003
	(0.536)	(0.499)	(0.611)	(0.963)	(0.910)	(0.970)
Firm size	0.002	0.003	0.001	-0.001	0.002	-0.002
	(0.637)	(0.267)	(0.752)	(0.814)	(0.749)	(0.736)
Firm age	-0.004	0.001	-0.005	0.003	0.010	0.003
	(0.597)	(0.844)	(0.525)	(0.754)	(0.343)	(0.799)
Capital investment	-0.018	-0.028	-0.012	0.054	0.039	0.061
	(0.690)	(0.519)	(0.792)	(0.370)	(0.520)	(0.310)
Capital expenditure	0.128	0.167	0.128	0.324	0.373	0.328
	(0.646)	(0.543)	(0.642)	(0.601)	(0.543)	(0.593)
Constant	-0.041	-0.109	-0.080	-0.089	-0.184*	-0.152
	(0.597)	(0.124)	(0.289)	(0.425)	(0.073)	(0.170)
Observations	684	684	684	684	684	684
R-squared	0.162	0.159	0.170	0.156	0.150	0.161
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 5 Panel B: Alternative measures of abnormal return — Market adjusted model

This table shows association between diversification and returns around Brexit. We used market adjusted model (firm return minus market return) for calculating returns. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. We define all variables in Appendix A.

	UK	EU	ROTW	UK	EU	ROTW
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Majority (UK)	-0.021*					
	(0.076)					
Majority (EU)		-0.004				
		(0.176)				
Majority (ROTW)			0.025***			
			(0.002)			
Proportion (UK)				-0.028*		
				(0.056)		
Proportion (EU)					-0.002	
					(0.081)	
Proportion (ROTW)						0.020*
						(0.019)
Profitability	-0.003	-0.002	0.004	-0.003	0.004	0.013
	(0.153)	(0.103)	(0.423)	(0.158)	(0.186)	(0.330)
Tobin's Q	0.001	0.001	0.002	0.004	0.000	0.001
	(0.158)	(0.125)	(0.458)	(0.236)	(0.182)	(0.028)
Liquidity	-0.007	-0.014	-0.026	0.007*	-0.011	-0.013*
	(0.330)	(0.132)	(0.537)	(0.093)	(0.294)	(0.858)
Leverage	0.002	0.005	-0.012	0.028*	-0.001	-0.003
	(0.090)	(0.045)	(0.698)	(0.249)	(0.097)	(0.941)
Firm size	0.002**	0.002**	0.001**	0.003	0.010	0.024
	(0.252)	(0.122)	(0.349)	(0.259)	(0.185)	(0.136)
Firm age	0.013	0.051	0.001	0.002	0.013	0.042
	(0.109)	(0.210)	(0.599)	(0.656)	(0.056)	(0.145)
Capital investment	0.108	0.005	0.012	0.159	0.037	0.027
	(0.323)	(0.110)	(0.244)	(0.306)	(0.464)	(0.599)
Capital expenditure	0.706	0.700	0.002	0.004	0.239	0.172
	(0.011)	(0.017)	(0.105)	(0.300)	(0.406)	(0.480)
Constant	-0.072*	-0.085**	-0.081**	0.028	-0.011	-0.003
	(0.070)	(0.015)	(0.328)	(0.125)	(0.096)	(0.642)
Observations	738	738	738	684	684	684
R-squared	0.205	0.201	0.190	0.198	0.190	0.195
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 6 Panel A: Abnormal returns and Diversification — Heckman two-stage regression

Panel A reports Heckman two-stage results exploring the relationship between geographic diversification and abnormal returns around the Brexit vote. Panel B shows results of the association between diversification and returns for matched sample of firms using PSM. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

	Location of majority sales				**Proportion of sales**			
	First stage	**Second stage**			**First stage**	**Second stage**		
VARIABLES	**Diversified (1)**	**CAR (2)**	**CAR (3)**	**CAR (4)**	**Diversified (5)**	**CAR (6)**	**CAR (7)**	**CAR (8)**
Majority (UK)		-0.078**						
		(0.012)						
Majority (EU)			0.005					
			(0.917)					
Majority (ROTW)				0.086***				
				(0.006)				
Proportion (UK)						-0.099***		
						(0.009)		
Proportion (EU)							0.027	
							(0.677)	
Proportion (ROTW)								0.115***
								(0.008)
Merger intensity	0.171*				0.192*			
	(0.085)				(0.058)			
Prop. of diversified firms	2.731***				2.751***			
	(0.000)				(0.000)			
Inverse Mill's		-0.145	-0.161	-0.150		0.021	0.010	0.024
		(0.454)	(0.412)	(0.440)		(0.912)	(0.958)	(0.902)
Profitability	0.160	-0.096	-0.129**	-0.116*	0.685**	-0.106	-0.135	-0.096
	(0.520)	(0.143)	(0.049)	(0.074)	(0.026)	(0.322)	(0.208)	(0.372)
Tobin's Q	-0.006	-0.007	-0.009	-0.009	0.029	-0.008	-0.009	-0.009
	(0.860)	(0.366)	(0.301)	(0.267)	(0.427)	(0.325)	(0.299)	(0.288)
Liquidity	-1.908***	0.369*	0.405*	0.379*	-1.923***	0.231	0.257	0.243
	(0.000)	(0.099)	(0.073)	(0.089)	(0.000)	(0.312)	(0.266)	(0.286)
Leverage	-0.040	0.016	0.030	0.007	0.069	-0.008	0.018	-0.004
	(0.906)	(0.851)	(0.722)	(0.937)	(0.850)	(0.927)	(0.836)	(0.964)
Firm size	-0.023	0.009	0.015*	0.008	-0.009	0.003	0.011	0.005
	(0.533)	(0.327)	(0.095)	(0.357)	(0.813)	(0.723)	(0.213)	(0.603)
Firm age	0.612***	-0.065	-0.062	-0.064	0.583***	-0.015	-0.012	-0.014
	(0.000)	(0.291)	(0.321)	(0.299)	(0.000)	(0.794)	(0.841)	(0.808)
Capital investment	-0.287	0.245***	0.227***	0.225***	-0.231	0.325***	0.309***	0.330***
	(0.356)	(0.003)	(0.006)	(0.005)	(0.484)	(0.000)	(0.000)	(0.000)

Table 6 Panel A: Cont'd

	Location of majority sales				Proportion of sales			
	First stage	Second stage			First stage	Second stage		
VARIABLES	Diversified (1)	CAR (2)	CAR (3)	CAR (4)	Diversified (5)	CAR (6)	CAR (7)	CAR (8)
Capital expenditure	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.491)	(0.478)	(0.463)	(0.554)	(0.471)	(0.301)	(0.285)	(0.300)
Constant	-2.251***	0.017	-0.140	-0.037	-2.604***	-0.076	-0.284	-0.192
	(0.003)	(0.947)	(0.573)	(0.882)	(0.001)	(0.779)	(0.277)	(0.459)
Observations	487	487	487	487	470	470	470	470
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	487	487	487	487	470	470	470	470
chi2	212.34	40.03	32.99	41.39	225.51	48.79	41.16	49.15
p-value	(0.000)	(0.051)	(0.197)	(0.038)	(0.000)	(0.006)	(0.040)	(0.006)
Pseudo R square	0.320				0.350			

Table 6 Panel B: Abnormal returns and Diversification — Propensity score matching (PSM)

	Dependent var: CAR[-1, +1]			
	Location of majority sales		Proportion of sales	
	ROTW	EU	ROTW	EU
	(1)	(2)	(3)	(4)
Majority (ROTW)	0.112*			
	(0.059)			
Majority (EU)		0.238		
		(0.182)		
Proportion (ROTW)			0.144*	
			(0.075)	
Proportion (EU)				0.267
				(0.318)
Profitability	0.100	0.001	0.124	-0.003
	(0.004)	(0.120)	(0.007)	(0.118)
Tobin's Q	0.005*	0.303	0.006*	0.245
	(0.011)	(0.260)	(0.010)	(0.290)
Liquidity	-0.126	-1.659	-0.115	-1.328
	(0.283)	(1.700)	(0.281)	(1.875)
Leverage	-0.324*	-0.240	-0.314	-0.260
	(0.194)	(0.509)	(0.191)	(0.722)
Firm size	0.025*	0.032	0.028*	0.025
	(0.015)	(0.070)	(0.015)	(0.076)
Firm age	-0.001	-0.004	-0.001	-0.003
	(0.002)	(0.004)	(0.002)	(0.005)
Capital investment	0.251	-0.857	0.268	-0.621
	(0.195)	(0.687)	(0.201)	(0.721)
Capital expenditure	0.545	4.290*	0.470	4.200
	(0.731)	(2.371)	(0.724)	(2.916)
Constant	0.131	0.210	0.135	0.215
	(0.122)	(0.110)	(0.125)	(0.105)
N	261	83	261	83
R2	0.700	0.910	0.704	0.889
Industry FE	Yes	Yes	Yes	Yes

Table 7 The importance of asset location

The table reports results examining the relationship between geographic diversification and abnormal returns around the Brexit vote using asset location instead of sales. Panel B shows results for relationship between diversification and returns using alternative measure of diversification — number of foreign segments. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. All variables are defined in Appendix A.

	CAR[-1,+1]			CAR[-20,+20]		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
UK asset ratio	-0.015*			-0.115***		
	(0.062)			(0.000)		
EU asset ratio		0.005			-0.011	
		(0.678)			(0.804)	
ROTW asset ratio			0.009			0.093**
			(0.174)			(0.036)
Profitability	-0.005	-0.004	-0.005	0.030	0.034	0.026
	(0.584)	(0.630)	(0.562)	(0.433)	(0.374)	(0.501)
Tobin's Q	0.002	0.002	0.002	0.005	0.005	0.005
	(0.188)	(0.190)	(0.209)	(0.499)	(0.510)	(0.559)
Liquidity	-0.001	-0.002	-0.002	0.057	0.046	0.051
	(0.959)	(0.897)	(0.912)	(0.393)	(0.489)	(0.443)
Leverage	0.005	0.007	0.005	-0.017	-0.000	-0.014
	(0.757)	(0.658)	(0.719)	(0.809)	(0.998)	(0.842)
Firm size	0.004**	0.004**	0.004**	-0.003	-0.000	-0.002
	(0.033)	(0.018)	(0.023)	(0.509)	(0.956)	(0.669)
Firm age	0.001	0.002	0.002	0.003	0.013	0.004
	(0.665)	(0.401)	(0.569)	(0.767)	(0.231)	(0.677)
Capital investment	-0.018	-0.020	-0.018	0.051	0.031	0.050
	(0.208)	(0.153)	(0.193)	(0.315)	(0.542)	(0.330)
Capital expenditure	0.066	0.068	0.065	0.267	0.284	0.253
	(0.134)	(0.119)	(0.140)	(0.576)	(0.550)	(0.597)
Constant	-0.068*	-0.090**	-0.087**	0.032	-0.148	-0.103
	(0.073)	(0.011)	(0.015)	(0.772)	(0.140)	(0.311)
Observations	738	738	738	738	738	738
R-squared	0.175	0.172	0.174	0.146	0.131	0.147
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 8 Alternative measure of diversification — The number of foreign segments

The table reports results for relationship between diversification and returns using alternative measure of diversification — number of foreign segments. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. All variables are defined in Appendix A.

	CAR[-1,+1]		CAR[-20,+20]	
Variables	EU **(1)**	ROTW **(2)**	EU **(3)**	ROTW **(4)**
Number of foreign segments	-0.032	0.035***	-0.040	0.046**
	(0.147)	(0.001)	(0.023)	(0.019)
Profitability	-0.001	-0.002	-0.003	-0.001
	(0.863)	(0.881)	(0.005)	(0.008)
Tobin's Q	-0.006*	-0.006*	-0.006	-0.005
	(0.774)	(0.776)	(0.003)	(0.019)
Liquidity	0.205**	0.207**	0.145**	0.148**
	(0.978)	(0.001)	(0.069)	(0.025)
Leverage	0.014	0.015	0.053	0.051
	(0.142)	(0.150)	(0.182)	(0.180)
Firm size	-0.001	-0.001	-0.004	-0.005
	(0.103)	(0.176)	(0.005)	(0.004)
Firm age	0.001	0.001	-0.002	-0.002
	(0.820)	(0.755)	(0.014)	(0.026)
Capital investment	0.165*	0.167*	0.091	0.096*
	(0.912)	(0.935)	(0.041)	(0.056)
Capital expenditure	0.305	0.306	0.467	0.463
	(0.625)	(0.626)	(0.410)	(0.530)
Constant	0.105*	0.122*	0.101*	0.115*
	(0.128)	(0.101)	(0.114)	(0.098)
Observations	698	698	698	698
R-squared	0.451	0.452	0.250	0.353
Industry FE	Yes	Yes	Yes	Yes

Appendices

Appendix A: Variable descriptions

Variable	Definition
Panel A: Diversification attributes	
Proportion (UK)	Ratio of sales by UK firms within the UK.
Proportion (EU)	Ratio of sales by UK firms in EU .
Proportion (ROTW)	Ratio of sales by UK firms in the rest of the world .
UK˙assets˙ratio	Ratio of assets held by UK firms within the UK.
EU˙asset˙ratio	Ratio of assets held by UK firms in EU.
ROTW˙(assets˙ratio	Ratio of sales by UK firms in the rest of the world.
Panel B: cumulative abnormal returns	
CAR[-1,+1]	Cumulative abnormal returns for the period starting 1 day before and ending 1 day after the Brexit announcement.
CAR[-20,-1]	Cumulative abnormal returns for the period starting 20 days before and ending a day before the Brexit announcement.
CAR[-1,+20]	Cumulative abnormal returns for the period starting a day before and ending 20 days after the Brexit announcement.
CAR[-20,+20]	Cumulative abnormal returns for the period starting 20 days before and ending 20 days after the Brexit announcement.
Panel C: Firm variables	
Profitability	Ratio of earnings before interest and tax to total capital employed.
Tobin's Q	Sum of the book value of debt and the market value of equity, scaled by the book value of assets.
Liquidity	Ratio of cash and short-term investments to total assets.
Leverage	Ratio of long-term debt to total assets.
Firm size	Natural log of total assets.
Firm age	Natural log of the number of years since listing (plus 0.0001).
Capital investment	capital investment divided by total assets.
Capital expenditures	capital expenditures divided by total assets.
Panel D: 2SLS Instruments	
Merger intensity	Number of mergers in a firm's 2 digit SIC code industry as a proportion of total number of mergers announced.
Proportion of diversified firms	Number of diversified firms in a firm's 2 digit SIC code industry as a proportion of total number of diversified firms.

Appendix B: Breusch–Pagan test for heteroskedasticity

The table reports the results of Breusch-Pagan test of our baseline models.

Models	F statistics	P value
(1)	12.27	0.000
(2)	12.35	0.000
(3)	12.43	0.000
(4)	12.40	0.000
(5)	12.28	0.000
(6)	12.58	0.000