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Abstract

We examine how the Brexit announcement influenced the long-run market performance of British and European listed firms. Using daily data and a sample composed of 3,015 European listed firms (805 UK and 2,210 non-UK), we find that, over a 12-month horizon, the Brexit announcement negatively affected the long-run market performance of UK firms (regardless of their business activities) and European non-British (non-UK hereafter) firms that conduct most of their business activities within the British area. We also provide evidence that, after the Brexit announcement, analysts' earnings forecasts and the realized accounting decreased and the return volatility increased for UK firms.

Keywords: Brexit, Macroeconomic news, Financial market, Buy-and-hold, Event study.

1. Introduction

On 23 June 2016, the British citizens held a referendum about the “British Exit” (Brexit) from the European Union (EU), during which the majority voted in favour of Brexit. Before (and after) the announcement of this outcome, which was largely unexpected by analysts and brokers, most economists agreed that it would exert a harmful effect on the United Kingdom (UK) at the macroeconomic level. However, the long-term consequences of Brexit at the microeconomic level, for UK and non-UK European firms, remain an open question that we address in this paper.

The Brexit announcement can be conceived as a shock of political uncertainty¹ (e.g., Bloom, Bond, and Van Reenen (2007), Bloom (2009)), that is, a shock followed by a sharp increase in political uncertainty. Such an uncertainty jump can follow either an unexpected shock, such as the assassination of President JFK or the September 2001 attack, or an expected shock with an unexpected outcome, such as a presidential election or a referendum. Brexit belongs to the latter category of uncertainty shocks.

Uncertainty shocks have depressive effects on many components of an economy, in particular investment and employment. Investors and employers tend to delay their decisions, preferring to adopt a wait-and-see attitude in anticipation of more favourable future conditions, that is, reduced uncertainty. According to the model by Pastor and Veronesi (2012, 2013) political uncertainty shocks affect stock prices negatively and the prices of options with a life that spans that of the shocks positively. The higher risk premium required to cope with increased political uncertainty is the main reason for such a depression (boom) in stock (option) prices. Pastor and Veronesi (2012) present a general equilibrium model (PV model hereafter) that predicts that a change in government policy depresses stock prices and that the depression is stronger under political uncertainty. Pastor and Veronesi (2013) extend the PV model to show that political

¹ Political uncertainty, such as uncertainty about government or central bank actions, often has domino effects on global financial markets, as was the case during the 1997 Asian financial crisis, the 2008–2009 global financial crisis, the 2011–2013 European debt crisis, the Bo Xilai political scandal in 2012 in China and the late 2015–early 2016 Chinese yuan depreciation.

shocks that are unrelated to economic shocks nevertheless affect stock prices and stock return volatility.² Investors require a higher equity premium, which includes a *political risk premium*, because of the non-diversifiable nature of political uncertainty.

While several studies provide empirical support in favour of the negative effect on stock prices, most of them suffer from an endogeneity issue, which prevents the establishment of clear causality. In contrast, Liu, Shu, and Wei (2017) provide clean evidence about the drop in stock prices following an exogenous unexpected shock in the case of the Bo Xilai political scandal in 2012 in China, which does not suffer from the endogeneity issue. Similarly, Kelly, Pastor, and Veronesi (2016) use the PV model and rely on unexpected shocks to document the existence of a positive impact of political elections and summits on option prices. In the spirit of this literature, we investigate the microeconomic consequences of Brexit by considering that its impact on stock prices is one of an expected shock with an unexpected outcome. We focus mainly on the abnormal returns related to this political uncertainty shock.

Several previous papers establish that the market reactions to the Brexit announcement generated short-term negative abnormal returns for UK firms on the disclosure event date (Schierreck, Kiesel, and Kolaric (2016), Tielmann and Schierreck (2016), Burdekin, Hughson, and Gu (2017), and Oehler, Horn, and Wendt (2017)). However, the impact on abnormal returns for European non-UK firms is not yet clearly documented. Furthermore, to our knowledge, the long-term effects on market performance and on firms' fundamentals (e.g., firm size, book-to-market ratio (B/M), leverage, etc.) have not been studied yet for either UK or non-UK firms.

Our aim is to fill this gap by examining the long-term financial and operational performance of EU firms – UK and non-UK – after the Brexit uncertainty shock. A key variable for that purpose will be the extent of the involvement of UK firms in trade with non-UK firms and vice versa. The potential limitation of labour and capital movements and goods' and services' movements,

² They rely on the Baker, Bloom, and Davis (2016) political uncertainty index to demonstrate empirically the relevance of the predictions of their model.

related to the Brexit announcement, concerns UK firms that carry out business activities with “the EU non-UK area” (EA hereafter) and non-UK firms that carry out business activities with the “British area” (BA hereafter).

We rely on a large sample of 3,105 listed firms across all EU countries (805 UK firms and 2,210 non-UK firms) to address the following questions: (1) Did the Brexit announcement generate short-run abnormal returns for UK (non-UK) firms? (2) To what extent are these (eventual) abnormal returns persistent in the long run? (3) Did the Brexit announcement affect expectations and realized firms’ cash flow? (4) Did the Brexit announcement increase the stock volatility of UK and non-UK firms?

To answer the first question, we analyse the impact of the Brexit announcement on cumulative average abnormal returns (CAAR) and on absolute cumulative average abnormal returns ($|CAAR|$). We find that the Brexit announcement negatively affected the UK firms’ returns (between -1.31% and -8.61%, depending on the length of the event window), in line with the findings of previous studies. In comparison, the returns of the non-UK firms were only slightly negatively – but more likely positively – affected (from about -1.56% to about 5.49%, depending on the length of the event window). The $|CAAR|$ for UK firms (8.23%) was significantly larger than that for the non-UK firms (6.30%), revealing a stronger reaction by UK firms.

To answer the second question, regarding the persistence of abnormal returns, we rely on firms’ buy-and-hold abnormal returns (BHAR) after the Brexit announcement for a time period of 261 trading days (1 year after the Brexit announcement, which corresponds to 26 June 2017). Our results show a significant negative (positive) long-term abnormal return for UK (non-UK) securities 1 year after the Brexit announcement. Moreover, all firms with business activities with the BA, whether UK or non-UK, experienced a stronger negative impact than companies with fewer business activities with the BA. Precisely, UK and non-UK firms that conduct activities within the EA or with other “non-EU” international areas (IA hereafter) experienced a lesser decrease of their long-run financial performance after the Brexit announcement.

We address our third question by relying on the predictions of the political risk model proposed by Pastor and Veronesi (2012, 2013) and applied by Liu, Shu, and Wei (2017). According to this model, following a political uncertainty shock, the discount rate increases and asset prices become depressed. However, stock prices may also fall, because investors expect lower future cash flows (*cash flow hypothesis* hereafter). We test for these explanations by measuring changes in analysts' earnings forecasts (i.e., expectations of firms' cash flows) for the years 2015 (one year before the Brexit announcement) and 2016 (the year of the Brexit announcement). We find that changes in analysts' earnings forecasts are more negative for UK firms than for non-UK firms, specifically for UK firms with a high level of sales with the BA and EA, supporting the cash flow hypothesis. Secondly, we measure changes in realized cash flows based on operating profits divided by total assets (OPOA) and by sales divided by total assets (SOA). We find that, after the Brexit announcement, UK firms' operating performance (OPOA and SOA) declined, in line with the observations about analysts' earnings forecasts.

To answer the fourth question, we analyse the stock return volatility after the Brexit announcement. We observe a larger increase in volatility for UK firms with a high level of sales with the BA and EA. Our results regarding analysts' earnings forecasts and realized cash flows are consistent with the political risk model. The drop in UK stock prices following the increase in political uncertainty seems to have been driven by a fall in expected cash flows and an increase in the equity premium. This relation is stronger for UK firms with high levels of sales with the BA and EA.³

Our paper makes several contributions. First, we document that the increase in political uncertainty following the Brexit announcement caused a short- and a long-run drop in stock prices. Moreover, the long-run fall in prices was more pronounced for UK firms with a high level of sales with the BA and EA. Second, we provide empirical support for the causal relation between political uncertainty and stock prices. Brexit provides an accurate setting for testing causality, because, although the shock was anticipated, the outcome regarding political stability was unexpected. Third, we show that the political uncertainty generated by the Brexit announcement increased stock returns' volatility, reflecting a decrease in analysts' earnings forecasts and firms' realized cash flows.

³ Liu, Shu, and Wei (2017) find that the drop in stock prices was not purely driven by the changes in cash flow news resulting from expected decreases in a firm's cash flow but rather by the change in the discount rate following an increase in political uncertainty, especially for firms that were more sensitive to changes in the government policy.

The remainder of the paper is organized as follows. Section 2 provides a short overview of the literature about Brexit and the event study methodology. In section 3, we state our main hypotheses about the Brexit uncertainty shock. Section 4 describes the methodology and the sample. Section 5 analyses and characterizes the impact of the announcement of the Brexit referendum result. Section 6 concludes.

2. Literature review

In this paper, we rely on the event study methodology⁴ to analyse the consequences of the Brexit uncertainty shock. Event studies are applied to a variety of firm-specific and economy-wide events. Some examples include corporate events for which post-announcement long-term abnormal stock returns were observed, for example corporate mergers, proxy contests, spinoffs, initial public offerings (IPOs), seasoned equity offerings, new exchange listings, earnings, stock splits, share repurchases, and dividend initiations, omissions and reductions.

Further applications of the short-term event study methodology deal with macroeconomic events, such as trade deficits, central bank announcements and interventions (Frenkel (1981), Hardouvelis (1988), Kwok and Brooks (1990), Jones, Lamont, and Lumsdaine (1998), and Andersen et al. (2003)), money supply announcements (Cornell (1983)), political scandals (Liu, Shu, and Wei (2017), and US macroeconomic announcements (Kurov et al. (2016) and Kurov and Stan (2018))).

According to Wu, Wheatley, and Sornette (2017), the Brexit vote provides a natural experiment for testing the efficient market hypothesis. Based on a simple and natural one-factor linear model, they show that the Brexit results could have been predicted with high confidence after only 20 out of 382 local voting results had been revealed, hours before the market priced in the outcome.

Previous studies on the short-run effects of the Brexit announcement find a negative impact on stock prices (e.g., Schiereck, Kiesel, and Kolaric (2016), Tielmann and Schiereck (2016),

⁴ Dolley's study (1933) is the first published research on event studies. He examines the price effects of stock splits, investigating nominal price changes at the time of the split. See a review by MacKinlay (1997) and a recent review by Baruch, Panayides, and Venkataraman (2017).

Burdekin, Hughson, and Gu (2017), and Oehler, Horn, and Wendt (2017)). Schiereck, Kiesel, and Kolaric (2016) compare the negative impact of the Brexit announcement with the negative impact of the bankruptcy announcement of the US bank Lehman's Brothers. They find that the impact of the Brexit announcement was much stronger, especially for the EU banking sector. More precisely, they observe a drop in stock prices and an increase in CDS spreads (credit default swaps) for EU banks vs non-EU banks.

Tielmann and Schiereck (2016) observe a negative impact of the Brexit announcement on market values and a strong negative impact on the EU logistic sector, especially for British firms. Burdekin, Hughson, and Gu (2017) report that the Brexit announcement on average negatively affected the world stock market, more precisely the European indexes and EU countries, and especially the weakest members of the eurozone, which were facing debt issues and/or had a weak banking sector, collectively known as PIIGS (Portugal, Italy, Ireland, Greece, and Spain). Similarly, Oehler, Horn, and Wendt (2017) perform an intraday analysis and observe a negative abnormal return in the very short run of British listed companies that realized more transactions with the British zone and were characterized by a low level of internationalization.

Based on the previous findings, we conjecture that the Brexit announcement led to a significant increase in political uncertainty in Europe, specifically in the UK. In the next section, we will discuss how we could test the impact of political uncertainty after the Brexit announcement on asset prices.

3. Predictions

In this paper, we analyse the Brexit announcement as an uncertainty shock, in the spirit of Bloom (2009), that affects investors' beliefs and their expectations about the government policy. The key effect of the increased political uncertainty following such a shock is an increase in the equity premium (e.g., Pastor and Veronesi (2013)): investors claim higher expected returns for holding stocks, leading to a higher discount rate and a depressing effect on asset prices. As in the model of Pastor and Veronesi (2013), we consider that the main driver of political uncertainty is the political cost. In weak economic times, a government is more likely to change its policy, and therefore the political costs become more uncertain. Furthermore, when the economy is performing well, politicians do not perceive a need to

change their policy (“if it isn’t broken, don’t fix it”). Such a context of uncertain political costs was most likely to be the situation in the UK just after the Brexit announcement. In contrast to the EU countries that would remain in the European Union, the UK’s government future policy became much more unpredictable, as a complete set of new policy options suddenly became available.

Based on the framework of political uncertainty models, we predict that firms with greater exposure to political uncertainty are more severely affected by a political shock; hence, we expect a more pronounced negative effect on UK stock returns after the Brexit announcement than for non-UK firms due to a higher equity premium for UK stocks. Liu, Shu, and Wei (2017) point out that negative stock returns around a political event could also be due to a decrease in the future cash flow or bad cash flow news (*cash flow hypothesis*). Therefore, the drop in stock price returns⁵ in the presence of political uncertainty could arise either because the expected risk premium has increased or because the expected future cash flow has decreased. If we consider the latter case, we expect that analysts’ earnings forecasts as a measure of the expected cash flow will drop after the Brexit announcement.

Although we expect UK stocks to be more negatively affected by the Brexit announcement than other EU (non-UK) stocks, the impact also depends on the business activity sector of the company and the length of the event window. There is already ample evidence about the short-run negative effects of the Brexit announcement on EU stock markets.⁶ In this paper, we introduce two extensions. First, we consider a longer time horizon to identify the long-run impact of Brexit. Second, we take into account the heterogeneity of UK and non-UK companies with respect to the “degree of internationalization” of their business activity. We expect that UK firms with a low degree of internationalization, that is, with a high percentage of sales with the BA and EA, are more strongly exposed to political uncertainty. These companies are therefore more likely to experience increased volatility in their stock prices after the Brexit announcement than firms with a high degree of internationalization.

⁵ If we consider a simple discounted cash flow model of stock price.

⁶ For example: until 10 days after the Brexit announcement (Tielman and Schiereck (2016) and Ramiah et al. (2017)) until 19 days after the Brexit announcement (Davies and Studnicka (2017)) and until 30 days after the announcement (Cannon and Bacon (2018)).

We summarize the above discussion in the two following conjectures: conjecture 1 summarizes the predictions of the political uncertainty theory and conjecture 2 the prediction of the cash flow hypothesis.

Conjecture 1 (political uncertainty theory)

The uncertainty shock was stronger for UK firms than for non-UK firms, leading to a more pronounced drop in UK stock returns, both in the short run and in the long run. The stock returns of UK firms with a lower level of internationalization were more severely affected.

Conjecture 2 (cash flow hypothesis)

The realized and expected cash flows dropped on average for UK firms after the Brexit announcement, especially for those with a low level of internationalization (i.e., with a high level of business activity with the BA and EA).

In addition to the decrease in future cash flows when political uncertainty increases, the stock prices for firms with high exposure to political uncertainty could be exposed to increased stock return volatility. A positive correlation between political uncertainty and stock return volatility is observed in several studies, for example Chan and Wei (1996), Bernhard and Leblang (2006), Bialkowski, Gottschalk, and Wisniewski (2008), Boutchkova et al. (2012), Pastor and Veronisi (2013), Brogaard and Detzel (2015), Fernandez-Villaverde et al. (2015), Jurado, Ludvigson, and Ng (2015), Baker, Bloom, and Davis's (2016), and Liu, Shu, and Wei (2017). Therefore, if the negative returns observed during the Brexit announcement period were caused by increased political uncertainty, we would expect the stock return volatility to have increased over the same period, especially for UK firms that conduct most of their business activity with the BA and EA.

We summarize the above discussion about volatility and sales growth effects in conjecture 3.

Conjecture 3 (volatility)

The stock return volatility increased after the Brexit announcement, especially for UK firms with a low level of internationalization.

4. Material and methods

In this section, we describe our sample and introduce various indicators for capturing the effects of the Brexit announcement in the short run and in the long run.

4.1. Sample construction

We rely on Factset data to identify our sample of European listed companies and Datastream (Thomson Reuters) for the information on the geographic segment sales, financial and accounting ratios, and closing prices. For the short-run analysis, we focus on the days before and after the Brexit announcement. To avoid the exchange risk issue, we take the prices of UK firms in pounds sterling (£/GBP) and the prices of non-UK firms in euros (€). Normative returns are obtained from the FTSE 350 index for UK firms and from the Totmkeu index (Thomson Reuter Index Europe) for non-UK firms. We set the event date as *Friday, 24 June 2016*, when the referendum result was publicly announced, that is, the day following the referendum. Since we focus on the stock price reactions of British (UK) and European (non-British) (non-UK) listed firms, our final sample contains 3,015 observations: 805 for UK firms and 2,210 for non-UK firms (see Appendix A). Note that we consider only European companies. We first collect all the exchange-listed stocks in the European Union. Second, we collect the *sales by geographic area*⁷ of all the firms. We distinguish the following three geographic areas: the British area (BA), the EU (non-UK) area (EA), and the international area (IA), which corresponds to the non-EU area (international area). Panel A and Panel B of Appendix A summarize our sample by country and by standard industry classification (SIC code), respectively.

INSERT TABLE 1

4.2. Short-horizon event study

4.2.1 Event study

We adopt the event study methodology to examine investors’ reaction to the expected news of “the EU referendum result in the UK”. The methodology is based on the assumption that capital markets are sufficiently efficient to evaluate the impact of new information (an event) on the expected future profits of firms.

⁷ The name of the variable in Datastream is “sales by geographic zone”.

To assess empirically the Brexit announcement effects in the short run, we measure the presence of abnormal returns. The abnormal return AR_{it} of firm i on date t is computed as follows: $AR_{it} = R_{i,t} - E(R_{i,t})$, where $R_{i,t}$ is the daily return and $E(R_{i,t})$ is the normal (or expected) return as predicted by the CAPM.⁸ We refer to the event date, that is, the announcement of the referendum outcome (24 June 2016), as date t_0 . We estimate the betas over a period ranging from $t_0 - 305$ to $t_0 - 35$ relative to the event date (see Figure 1). We then compute the cumulative abnormal return (CAR) of each firm i over the event window $[a, b]$ using the following formula: $CAR_{i,[a,b]} = \sum_{t=a}^b AR_{it}$. The cumulative average abnormal return (CAAR) is then given by: $CAAR_{[a,b]} = \frac{1}{N} \sum_{i=1}^N CAR_{i,[a,b]}$, where N is the number of firms in our sample.

INSERT FIGURE 1

4.2.2 Cumulative average abnormal returns ($CAAR_{[-1,+1]}$)

We estimate abnormal returns based on the CAPM.⁹ After estimating the model over the pre-event period $[t_0 - 305$ to $t_0 - 35]$, we cumulate the abnormal returns for the 3-day window $[t_0 - 1, t_0 + 1]$. This relatively short event window ensures that we capture the impact of the Brexit referendum announcement day. Conventional event studies average the computed CAARs across the sample, thereby neglecting the distinction between positive and negative information effects. We address this conceptual shortcoming of the standard event study methodology by analysing the absolute value of the CAAR ($|CAAR|$), which should allow us better to capture disparate, significant changes in share prices (see Flannery, Hirtle, and Kovner (2017)).

4.2.3 Absolute cumulative average abnormal returns ($|CAAR|$)

The standard event study methodology assumes that all firms react in the same direction, which leads to the conclusion that a zero-mean AR reflects the absence of an effect of the event on firms. However, the mean AR could be close to zero either because the ARs are negligible for all firms or because the positive ARs of some firms offset the negative ARs of other firms.

⁸ See Appendix B for more details about the capital asset pricing model (CAPM).

⁹ We use four additional models to estimate abnormal returns, as robustness checks: Fama and French's (1993) three-factor model, Carhart's (1997) four-factor model, Fama and French's (2014) five-factor model, and the CAPM (with double estimation windows $[-305, -35]$ and $[+35, +270]$). The results for these models are available in the supplementary tables.

The standard event study methodology also assumes that the events are unanticipated, which implies zero market expectations (Flannery, Hirtle, and Kovner (2017)). This means that the ARs at $t < 0$ have to be equal to zero when the event is unanticipated. By contrast, when an event's timing is known in advance by investors (anticipated), such as in the case of the announcement of the UK referendum result, the market is particularly prone to disparate revaluations, and the information content in the announcement requires evaluation by taking into account the market's prior beliefs about the referendum result (Brexit or Bremain).¹⁰ This mean that the ARs at $t < 0$ are likely to be different from zero, which means that the CAAR is not sufficient to report the real reaction of the market. We therefore rely on its absolute value, $|CAAR|$, which is more suitable for capturing the market reaction. The $|CAAR|$ should be large if investors react strongly to the announcement, regardless of the distribution of positive and negative effects.¹¹

Let $|CAAR| = \frac{\sum_{i=1}^N |CAAR_i|}{N}$. We assess the significance of the $|CAAR|$ during the event window by comparing its value with its average value in the pre-event period (estimation window $[t_0 - 305, t_0 - 35]$). We compute the statistical significance of the $|CAAR|$ by comparing the difference in means between the event period and the pre-event period (Wilcoxon rank sum test).¹²

4.3 Long-horizon event study

4.3.1 Buy-and-hold abnormal return (BHAR)

Ritter (1991) and Barber and Lyon (1997) suggest relying on the buy-and-hold abnormal return (BHAR) to measure long-run abnormal returns.¹³ The BHAR for stock i during the event window $[\tau_1, \tau_2]$ is calculated as follows: $BHAR_{i,[\tau_1, \tau_2]} = \prod_{t=\tau_1}^{\tau_2} [1 + R_{i,t}] - \prod_{t=\tau_1}^{\tau_2} [1 + R_{M,t}]$, where $R_{i,t}$ is the realized return of company i on day t and $R_{M,t}$ is the return of the benchmark index of company i on day t .

¹⁰ The Brexit outcome was not anticipated by the stock market. Even on the day of the referendum, bookmakers' odds showed a 90% chance of the Bremain "Brexit remain" outcome (Bloomberg (2016a) and Schiereck, Kiesel, and Kolaric (2016)).

¹¹ In addition to the $|CAAR|$, Flannery, Hirtle, and Kovner (2017) use three measures of new market information, a measure of abnormal trading volume, "CAV", a measure of absolute change in credit defaults, "swap CDS spreads", and a measure of changes in option volatility across disclosure dates, "volat".

¹² This non-parametric test, unlike the t-test, does not require the underlying populations to be normally distributed.

¹³ The following authors use the BHAR to measure the long-run abnormal return: Barber and Lyon (1997), Kothari and Warner (2004), and Tielmann and Schiereck (2016).

4.3.2 Buy-and-hold abnormal performance method (BHMAR)

The abnormal return (AR) is defined as $AR_{i,t} = R_{i,t} - R_{M,t}$, where $R_{i,t}$ is the daily return for security i on day t and $R_{M,t}$ is the daily return of index M on day t . The buy-and-hold abnormal performance (BHMAR)¹⁴ for security i is calculated by capitalizing the abnormal daily returns from day τ to day T : $BHMAR_{\tau,T}^i = [\prod_{t=\tau}^T (1 + AR_{i,t})] - 1$. The BHMAR for all securities in the sample, from day τ to day T , is equal to the average of the abnormal returns of all securities over the same period, $BHMAR_{\tau,T} = \frac{1}{N} \sum_{i=1}^N BHMAR_{\tau,T}^i$, where N is the number of securities in the sample. The null hypothesis states that the BHMAR for all securities in the sample, from day τ to day T , is equal to zero, that is, $H_0 : BHMAR_{\tau,T} = 0$.

4.3.3 The one-year cumulative abnormal returns (CAR_[one year])

The one-year cumulative abnormal returns (CAR_[one year]) are the difference between the cumulated sum of the daily returns¹⁵ of the European firms and the cumulated sum of the daily returns of the *Totmkeu index* (Thomson Reuter Index Europe). Let $CAR_{[one\ year]} = \frac{1}{N} (\sum_{t=0}^T R_{i,t} - \sum_{t=0}^T R_{M,t})$, where $R_{i,t}$, $R_{M,t}$ are the expected return on the capital asset and the return of a market index, respectively, and T is the number of working days after the Brexit announcement (261 trading days after the Brexit announcement, which corresponds to 26 June 2017).

5. Results

The results section is organized as follows: in subsection 1 we provide evidence suggesting that the Brexit announcement increased uncertainty, and in subsections 2 and 3 we show that the Brexit announcement had a negative impact on UK firms in the short run and the long run, respectively. In subsection 4 we analyse the three conjectures stated in section III based on regressions.

5.1. Political uncertainty

¹⁴ The BHMAR method of calculating the long-run abnormal performance is used by Kothari and Warner (1997), Lyon, Barber, and Tsai (1999), and Oehler, Horn, and Wendt (2017).

¹⁵ Liu, Szewczyk, and Zantout (2008) use monthly returns in their study.

The average three-day cumulative raw return (CRR) is strongly negative, with a cross-sectional mean of -9.624% (-5.541%), of which 87.45% (85.29%) of the observations are negative, suggesting that the Brexit announcement caused great political uncertainty in the UK (non-UK).¹⁶ (See Table 1.)

INSERT TABLE 1 & FIGURE 2

Figure 2 represents the economic policy uncertainty index in the UK and the EU from 1997 to 2018. According to Figure 2 and Baker, Bloom, and Davis's (2016)¹⁷ analysis, policy uncertainty jumped dramatically after the Brexit announcement, particularly in the UK.

5.2 Short-term market reaction: abnormal returns (AR)

Table 2 shows that UK and non-UK firms reported negative ARs of about -0.88% and -0.97% one day before the Brexit announcement ($t = -1$), respectively. This can be explained by the fact that the market expectations were in favour of the British exit outcome one day before the announcement.¹⁸ Non-UK (UK) firms reported positive (negative) and significant ARs on the date of the Brexit announcement ($t_0 = 0$) of about 4.66% (-2.88%).¹⁹ These results suggest that the Brexit announcement negatively (positively) affected the returns of UK (non-UK) firms.

INSERT TABLE 2

Panel A of Table 3 reports the cumulative average abnormal returns (CAARs) and the absolute cumulative average abnormal returns ($|CAARs|$) based on the CAPM model over different event windows. According to the CAAR, the market reaction to the Brexit announcement is negative and significant for UK firms in all the event windows. Conversely, for non-UK firms, the market reaction is more contrasted: it is positive and significant for event windows $[-1, 0]$,

¹⁶ Liu, Shu, and Wei (2017) use the CRR measure of political uncertainty and find that the CRR is equal to -5.027% and that 86.95% of the observations are negative.

¹⁷ Baker, Bloom, and Davis's (2016), Policy uncertainty: Trying to estimate the uncertainty impact of Brexit, *Presentation*, 2 September (à rajouter à la biblio).

¹⁸ Wu, Wheatley, and Sornette (2017) review what happened on the day before the event.

¹⁹ This result (the negative AR of UK firms) is very close to those reported by previous studies about the effects of the Brexit announcement (e.g., Ramiah, Pham, and Moosa (2017)).

[-1, 1], and [-2, 2], significant and negative for event windows [-5, 5], [-15, 15], and [-30, 30], and close to zero for event windows [-10, 10] and [-20, 20]. For example, the CAARs of UK firms amount to -7.94% over the eleven days surrounding the event date ($t=0$), and the null hypothesis is rejected at the 1% significance level. For longer event windows, the CAAR is lower: for example, -1.86% over the period [-30, +30]. However, regardless of the event window, all the CAARs are negative and highly significant for UK firms. In contrast, for non-UK firms, the CAARs are positive and significant (1%), equal to +5.49% (+3.90%) over the three (five) days surrounding the event date ($t = 0$). When considering longer event windows, the CAARs for non-UK firms are also lower than for UK firms, for example -0.45% (-1.56%) over the period [-15, +15] ([-30, + 30]). These results highlight the difference in the market reaction to the Brexit announcement, measured by the CAAR, between UK and non-UK firms. The reaction is always significantly negative for UK firms²⁰ and positive (negative) for small (large) event windows for non-UK firms.

Panel B of Table 3 reports the $|CAAR|_{[-1,1]}$, which represents the cumulative absolute abnormal returns over the three-day window surrounding the event date [$t-1, t+1$]. The second row reports the $\overline{|CAAR|}_{Est. window}$, which represents the average three-day cumulative abnormal returns in the estimation window [$t-305, t-35$]. The third row represents the Wilcoxon rank sum test results. Across all the EU sample and the two UK and non-UK subsamples, the Brexit announcement has a significant $|CAAR|_{[-1,1]}$, ranging from 8.23% (for UK firms) to 6.30% (for non-UK firms). All the $|CAAR|_{[-1,1]}$ amounts are significantly larger than the pre-event window value ($\overline{|CAAR|}_{Est. window}$).

The difference in means between the $|CAAR|_{[-1,1]}$ for UK and non-UK firms is positive and significant at the 1% level ($diff = 1.93\%$); by contrast, the difference in means between the $\overline{|CAAR|}_{Est. window}$ for UK and non-UK firms is close to zero ($diff = 0.25\%$). These results show that the reaction of UK firms to the Brexit announcement (measured by the cumulative absolute abnormal returns) was significantly larger (on average) than that of non-UK firms.

 INSERT TABLE 3

²⁰ This result is robust when we use CAARs based on Fama and French's (1993) three-factor model, Carhart's (1997) four-factor model, Fama and French's (2014) five-factor model, and the CAPM (estimation windows [-305, -35] and [+35, +270]) (see the supplementary tables).

5.3 Long-run market reaction: BHAR

Panel C of Figure 3 displays the time series of the BHAR over one year after the Brexit announcement $[t_0, t_0+270]$. The figure clearly shows that the market performance measured by the BHAR deteriorated for UK firms over the long-term period following the Brexit announcement. In contrast, we observe the opposite pattern for non-UK firms. These observations suggest that the BHAR is negative (positive) for UK (non-UK) firms.²¹

Panels A and B of Figure 3 display the BHAR over one year before and after the announcement $[t_0 - 270, t_0 + 270]$ and over two years before and one year after the announcement $[t_0 - 539, t_0 + 270]$, respectively.

 INSERT FIGURE 3

To test for the significance of the visual effects displayed in Figure 3, we follow the methodology suggested by Liu, Shu, and Wei (2017). For each subsample (UK and non-UK), we group firms into terciles based on the percentage of sales with the BA and the EA ($Sales(BA+EA)$) and compare the two most extreme groups. Formally, we regress the BHARs (or any other relevant variable) on the indicator variable *DummyHL*, which identifies the highest and lowest groups (*DummyHL* is equal to one if the observation belongs to the highest group and zero if the observation belongs to the lowest group), that is, $BHAR_i = a + \beta_i DummyHL$. This method, which produces more conservative t-statistics (Liu, Shu, and Wei (2017)), is relevant to our event study. Table 4 reports the BHAR, BHMAR, and $CAR_{[one\ year]}$. Panels A and B correspond to UK and non-UK firms, respectively. We find that the BHAR, BHMAR, and $CAR_{[one\ year]}$ are all negative for the UK subsample (in the middle and highest groups) and all positive for the non-UK subsample. The differences in the BHAR, BHMAR, and $CAR_{[one\ year]}$ between the two extreme groups of sales with the BA and EA areas (variable $Sales(BA+EA)$) are all negative and significant for the UK subsample. They are also negative but not significant for the non-UK subsample (see the two last columns of Table 4: portfolio method (reg)).

²¹ Note that our data show that the BHAR of UK firms, independently of their business activity, is negatively affected in the long run. To save space, we do not report the results of the BHAR by business activity here.

INSERT TABLE 4

5.4 Cross-sectional effects

We now investigate in more detail the three conjectures stated in section 3 based on regression analysis. We control for within-industry and within-country correlations among firms, by two-way clustering (standard errors are clustered by industry and country separately), in all the regression analyses. Note that, without clustering, all our conclusions are unchanged.

Table 5 reports the pairwise correlations between the independent variables used in our study. The absolute value of the correlation coefficients between the variables used in the same specification does not exceed 0.60, suggesting that multicollinearity is not an issue. The highest variance inflation factor (VIF) is below 3.00, far below the threshold of concern of 10 suggested by Wallace et al. (1994). Hence, collinearity does not appear to be a serious issue in interpreting the regression results throughout the paper.

INSERT TABLE 5

5.4.1 Conjecture 1

The regressions reported in Table 6 clearly show that the UK dummy has a strong negative impact on the long-run performance of stocks. The dependent variable is the BHAR over 12 months after the announcement (which corresponds to the BHAR on 26 June 2017). We control for the firm size ($\ln SZ$), book-to-market ratio (B/M), leverage ($Leverage$), buy and hold (BHR), absolute value of BHR ($AbsBHR$), and idiosyncratic risk ($IVol$). As documented by several studies (e.g., Fama and French (1992), Daniel et al. (2001), and Liu, Shu, and Wei (2017)), cross-sectional stock returns depend on firm characteristics. Consistent with conjecture 1, the percentage of sales by area has a significant impact on the BHAR (with and without controls). More specifically, in the EU sample, the coefficients for Sales_BA, Sales_EA, Sales IA, and Sales(BA+EA) are -0.158, 0.025, 0.075, and -0.076, respectively. All the coefficients are highly significant at the 1% level, except for the coefficient for Sales EA, which is not significant. The results show that firms with high levels of sales with the BA and (BA and EA) suffered greater

wealth loss than firms with high levels of sales with the EA and IA, 12 months after the Brexit announcement.

The estimated slope coefficients of the control variables deserve discussion. We find that low-growth firms (lnSZ) and firms with high idiosyncratic risk (IVol) suffered greater wealth loss (i.e., earn lower returns) 12 months after the Brexit announcement than small firms and firms with low idiosyncratic risk. These results suggest that risky firms suffered greater wealth loss than safe firms in the long run, which is consistent with the risk-based explanation. We also find that large firms (B/M) and firms with higher past week returns (BHR) suffered less wealth loss (i.e., earn relatively higher returns) 12 months after the Brexit announcement. The leverage (Leverage) has no significant effect on the BHAR.

Table 6 also reports the regression results for the BHAR for the UK and non-UK subsamples. For the UK subsample, all the coefficients of the measures of sales are highly significant at the 1% level, except for the coefficient for Sales_EA. In contrast, for the non-UK subsample, the coefficient for Sales_BA is highly significant at the 1% level, while the coefficients for Sales_EA, Sales_IA, and Sales (BA+EA) are not significant.

These observations suggest that the results reported in Table 6 (Subsample A) are likely to be driven by UK firms: UK firms with high levels of sales with the BA and (BA and EA) suffered greater wealth loss than UK firms with high levels of sales with the EA and IA 12 months after the Brexit announcement. We conclude that UK firms were more sensitive to political (and economic) uncertainty in the long run following the Brexit announcement, while non-UK firms were less affected by it.

INSERT TABLE 6

5.4.2 Conjecture 2

The drop in AR of UK firms, which reflects the decline in their stock prices, could be due to either a decrease in the expected cash flows or an increase in the discount rate. While the latter reason is compatible with the political uncertainty theory, the former is in line with the cash

flow hypothesis. In this subsection, we try to disentangle these two potential reasons for the drop in stock prices. We rely on the changes in analysts' earnings forecasts, which we assume to reflect the investors' expectations. If the announcement return was driven by expected changes in cash flows, we should observe a significant drop in analysts' earnings forecasts, especially for UK firms. We measure the change in earnings forecasts as the difference in the median earnings forecast per share (EPS) between six months after and six months before the Brexit announcement, divided by the stock price two days prior to the announcement.

$$\Delta Forecast_{2016} = (median\ EPS_{+6m} - median\ EPS_{-6m}) / price_{t-2}$$

where $\Delta Forecast_{2016}$ represents the changes in analysts' earnings forecasts in 2016. $median\ EPS_{+6m}$ and $median\ EPS_{-6m}$ correspond to the median EPS forecast six months after the Brexit announcement and the median EPS forecast six months before the Brexit announcement, respectively. $Price_{t-2}$ is the stock price two days prior to the announcement. Note that prices are in pounds sterling (£/GBP) for UK firms and euros (€/euros) for non-UK firms. To ease the interpretation of the results, we convert the change into a percentage. (Details are provided in Appendix C.)

We start by providing univariate test results about the sign of the change in analysts' earnings forecasts ($\Delta Forecast\ EPS$). From the summary statistics reported in Table 1, we observe that analysts revised their earnings forecasts downwards substantially from before to after the Brexit announcement, as indicated by the negative cross-sectional means of $\Delta Forecast\ EPS_{2016}$ for UK firms (-0.978%) and for non-UK firms (-0.562%). By contrast, one year before the Brexit announcement, $\Delta Forecast\ EPS_{2015}$ was equal to 0.265% for UK firms and -0.082% for non-UK firms.²²

Panels A1–A2 of Table 7 report the univariate tests for each of the two subsamples (UK and non-UK firms) separately. The results show that the changes in analysts' earnings forecasts for the year 2016 are negative and significant at the 5% level in the UK group (-0.373%), suggesting that the Brexit announcement caused analysts to revise their earnings forecasts of UK firms downwards for the current year. Although these observations are consistent with the

²² The percentages of observations with negative (positive) values for $\Delta Forecast\ EPS_{2015}$ are 30.55% (69.45%) in the UK subsample and 31.17% (68.83%) in the non-UK subsample, and for $\Delta Forecast\ EPS_{2016}$ they are 70.29% (29.71%) in the UK subsample and 40.02% (59.98%) in the non-UK subsample.

cash flow hypothesis, they are also in line with former observations in the accounting literature that analysts tend to issue optimistic forecasts first and then walk down their forecasts (e.g., Richardson, Teoh and Wysocki (2004) and Liu, Shu, and Wei (2017)). More importantly, however, the last two columns of Table 7 indicate that the drop in analysts' earnings forecasts is negative and significant only for the UK subsample and for the year 2016. This observation is consistent with the cash flow hypothesis stated in conjecture 2, which predicts that the drop in analysts' earnings forecasts should be larger for UK firms.

INSERT TABLE 7

We check the robustness of the univariate analysis by including several control variables. Panels A and B of Table 8 report the results for the years 2016 and 2015, respectively. The dummy variable (DummyUK) is significant at the 1% level and negatively related to the change in earnings forecasts for the year 2016 (Panel A) and not significant when the dependent variable is the change in earnings forecasts for the year 2015 (one year before the Brexit announcement) (Panel B). These results suggest that the drop in analysts' earnings forecasts was larger for UK firms than for non-UK firms, especially for UK firms with a higher level of sales with the BA than the EA.

INSERT TABLE 8

To investigate the cash flow hypothesis further, we also analyse the realized cash flows, which we take as a proxy for investors' expectation. We rely on firms' operating performance, measured as the operating profits divided by the total assets (OPOA) and by the sales divided by the total assets (SOA). From the summary statistics reported in Table 1, it can be seen that the realized earnings are substantially reduced from 2015 to 2016, as evidenced by the negative means of $\Delta OPOA$ -0.521% (0.040%) and ΔSOA -5.124% (-1.885%) in the UK subsample (non-UK subsample), where $\Delta OPOA$ and ΔSOA are the changes in the OPOA and SOA from fiscal year 2015 to fiscal year 2016.²³

²³ The percentages of observations with negative (positive) values for $\Delta OPOA$ and ΔSOA are 56.69% (43.31%) and 64.97% (35.03%), respectively, in the UK subsample, and 31.54% (68.46%) and 49.27% (50.73%), respectively, in the non-UK subsample.

Panels B1–B2 of Table 7 report the univariate test results based on changes in these profitability measures. We can observe two main patterns. First, the changes in the OPOA and SOA are smaller in the group of firms with a low percentage of sales with the BA and EA than in the group of firms with a high percentage of sales with the BA and EA (for both subsamples: UK and non-UK). The difference is highly significant (at the 1% level) for changes in the OPOA (in the UK and non-UK subsamples, 3.034% and 0.844%) but only marginally significant (10%) for the changes in the SOA (in the non-UK subsample, 0.218%). This result suggests that the percentage of sales with the BA and EA does not affect negatively the changes in the OPOA and the SOA. Second, the changes in the OPOA and the SOA are negative and larger in the UK subsamples (regardless of the quantile of the percentage of sales with BA and EA) than in the non-UK subsamples. To check the robustness of the latter result, we regress ΔOPOA and ΔSOA , respectively, with respect to the UK dummy. Table 9 shows that the UK dummy variable (DummyUK) has a significantly negative impact, at the 1% level, on the two measures (ΔOPOA and ΔSOA). This result suggests that the decrease in the OPOA and SOA is larger for UK firms, in accordance with conjecture 2.

Again, this outcome is in line with the cash flow hypothesis, suggesting that, after the Brexit announcement, the operating performance of UK firms declined.

INSERT TABLE 9

The combination of the observations about the analysts' forecasts and the realized cash flows suggests that the cash flow hypothesis is supported by our findings. The drop in expected and realized cash flows is likely to be at the root of the more negative returns of UK firms compared with non-UK firms over the Brexit announcement period.

5.4.3 Conjecture 3

According to conjecture 3, the stock return volatility increased more sharply for UK firms after the Brexit announcement, especially for firms characterized by a low level of internationalization.

We measure the change in volatility, ΔVol , from before to after the Brexit announcement in percentage points, based on daily stock returns. We start from three trading days after the Brexit announcement (i.e., 29 June 2016) and use one month as the post-Brexit announcement period. Due to seasonality, the pre-Brexit announcement period is defined as the same calendar time window as in the previous two years (i.e., 29 June–29 July 2015 and 30 June–29 July 2014) to construct a more robust volatility benchmark.

From the summary statistics reported in Table 1, we observe that the cross-sectional mean of the daily stock return volatility increased substantially from before to after the Brexit announcement: ΔVol for UK and non-UK firms, equal to 0.796% and 0.064%, with 76.02% and 50.94% of the observations being positive, respectively.

Table 10 reports the univariate test results to assess the significance of the volatility increases for firms with a high versus a low percentage of sales with the BA and EA. The main finding is that ΔVol increased significantly (at the 5% level) for UK firms only (0.292), thereby confirming that the volatility shock was stronger for UK firms with a high percentage of sales with the BA and EA.

INSERT TABLE 10

Table 11 reports the estimates for the multivariate analysis of volatility changes. The results show that volatility increased significantly after the Brexit announcement, especially for UK firms (the coefficients of DummyUK are positive and significant at the 1% level) and for non-UK firms with a high percentage of sales with the BA (the coefficient of Sales_BA is 0.005, significant at the 5% level). By contrast, the volatility decreased significantly after the Brexit announcement for EU firms with a high percentage of sales with the IA (e.g., the coefficient of Sales_IA is -0.001%, significant at the 5% level). These findings support conjecture 3.

INSERT TABLE 11

5.5 Robustness check

In this section, we briefly report the results of several sensitivity tests to check the robustness of our findings. First, we test for the sensitivity of our results regarding the short-run market reaction (Panel A of Table 3) to the use of CAARs based on Fama and French's (1993) three-factor model, Carhart's (1997) four-factor model, Fama and French's (2014) five-factor model, and the CAPM (estimation windows $[-305, -35[$ and $] +35, +270]$). The results (Table 14, supplementary tables) show that the signs and the degree of significance of the CAARs remain qualitatively unchanged for all event windows for UK firms and for small event windows ($[-1, 0]$, $[-1, 1]$, $[-2, 2]$) for non-UK firms.

Second, we re-estimate the specifications of Table 6 using, as dependent variables, the buy-and-hold abnormal performance (BHMAR) 12 months after the Brexit announcement and the one-year cumulative abnormal returns ($CAR_{[one\ year]}$) when the normative returns are obtained from the Totmkeu index (Thomson Reuter Index Europe). The results reported in Tables 13 and 14 corroborate those in previous tables. The coefficients of DummyUK, Sales_BA, Sales_IA, and Sales (BA+EA) remain negative and statistically significant at conventional levels. The core evidence on the long-run effect of the Brexit announcement on UK firms and the impact of the percentage of sales with the BA and EA remain unchanged. We also confirm that lower-growth firms (lnSZ) and firms with high idiosyncratic risk (IVol) suffered greater wealth loss (i.e., earned lower return) 12 months after the Brexit announcement than small firms and firms with low idiosyncratic risk. Furthermore, we confirm that big firms (B/M) and firms with higher past week returns (BHR) suffered less wealth loss (i.e., earned relatively higher returns) 12 months after the Brexit announcement. All in all, the results remain qualitatively unchanged when we use the BHMAR and one-year cumulative abnormal returns to capture the effects of the Brexit announcement on the long-run market performance of UK and non-UK firms.

6. Conclusions

According to Pastor and Veronesi (2012), market reactions to political changes are weak if these changes are widely anticipated but can be strong if markets are caught by surprise. In this paper, we addressed this issue in the case of stock market reactions following the announcement of the UK referendum about Brexit. The particularity of this event is that the markets knew in

advance the two possible outcomes (Brexit or Bremain) and the exact date of the announcement. The referendum result was in favour of the least likely option, “Brexit”, evoking GB’s exit from the EU, which affected the UK–EU stock markets differently.

We analysed the short-run and long-run effects of the Brexit announcement on the market performance of UK and non-UK firms. Our findings about the negative short-run market reaction of UK firms confirm those of previous event studies; specifically, the Brexit announcement affected negatively (positively) the abnormal returns of UK (non-UK) firms.

More importantly, we showed that the decline in the UK stock prices extended into the long run, over one year after the Brexit announcement, in particular for the stock prices of UK firms engaging in business activities with British and European (non-British) areas. We also showed that analysts’ earnings forecasts and the realized accounting decreased in the long run, which is the main reason for the long-run decline in the stock prices. In addition, we documented an increase in the volatility of UK stocks after the Brexit announcement. We found that the volatility of UK stocks increased after the Brexit announcement more than those of non-UK firms.

How long the negative impact on UK firms of the Brexit announcement will last is an open question. The answer depends to a great extent on the length of the period of political uncertainty that the UK entered after the Brexit announcement. It would therefore be of interest to follow up this study in relation to the evolution of the political uncertainty.

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Figures and tables

I. Figures

Figure 1: Timeline for the event study.

Figure 1 shows the time line for the event study using an event window $[a; b]$ to compute the cumulative abnormal return (CARs). We use an estimation window $[t_0-305; t_0-35]$ days before the Brexit announcement. The event date (date 0) is the date of the Brexit announcement (June 24, 2016). T2 and T3 are equal to -30 and +30 respectively.

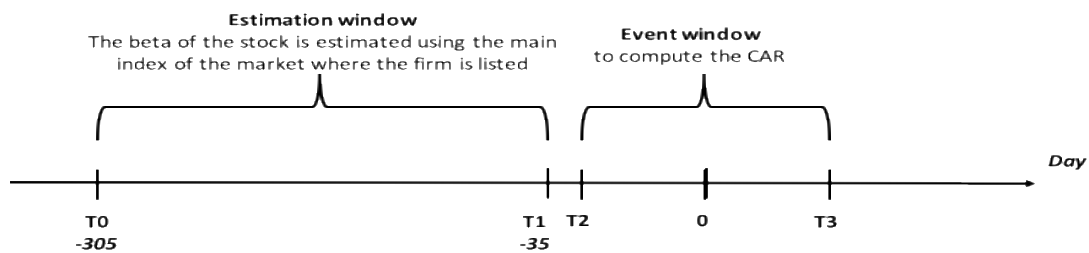


Figure 2: The index of economic policy uncertainty (EPU)

Figure 2 shows the index of economic policy uncertainty (EPU¹) of United Kingdom (red colour) and of EU (blue colour). Source “Measuring Economic Policy Uncertainty” by Baker, Bloom and Davis (2016), all data at www.PolicyUncertainty.com. Monthly data normalized to 100 prior to 2010. Data to April 2018.

¹ The EPU is based on newspapers articles regarding policy uncertainty. The EPU draws on two newspapers per country for the European indexes: Le Monde and Le Figaro for France, Handelsblatt and Frankfurter Allgemeine Zeitung for Germany, Corriere Della Sera and La Repubblica for Italy, El Mundo and El Pais for Spain, and The Times of London and Financial Times for the United Kingdom. The Index is computed first by counting the number of newspapers articles containing the terms uncertain or uncertainty, economic or economy, and one or more policy-relevant terms. The raw counts are then scaled by a measure of the number of articles in the same newspaper and month. It standardizes each newspaper-level monthly series to unit standard deviation prior to 2011 and average across newspapers by month to obtain country-level and European EPU indexes, which they normalize to a mean of 100 prior to 2011. The country-level indexes are based on the average of the two country's newspapers. For the European-wide EPU index, the equally weighted average is taken across all 10 European newspapers. (For more details, see www.PolicyUncertainty.com)

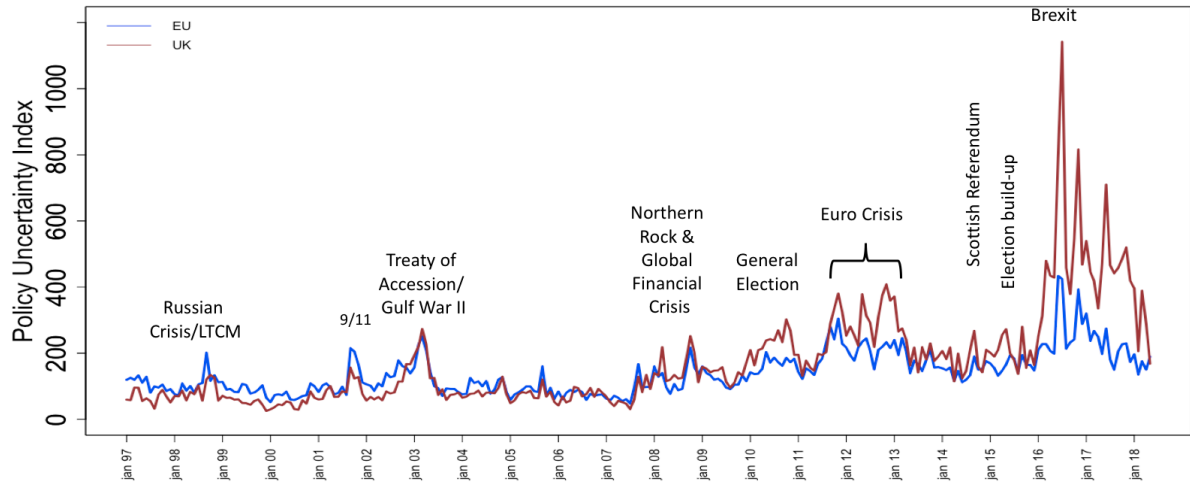
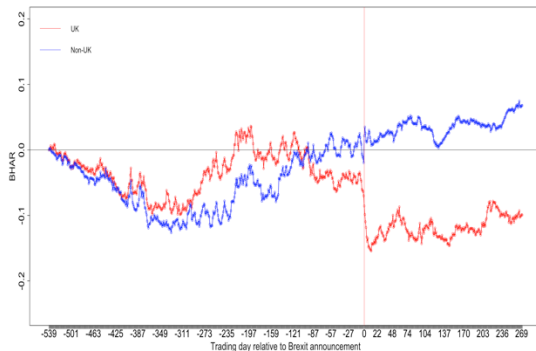


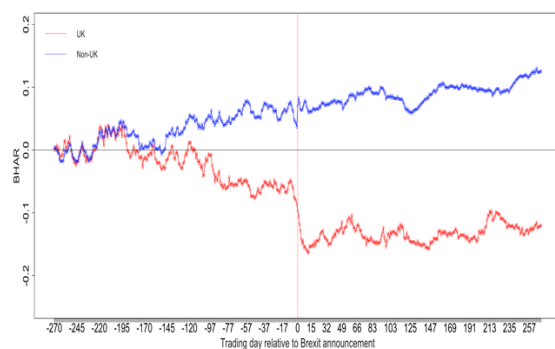
Figure 3: Long-run abnormal return by three different observation periods

Figure 3 reports the time-series of the buy-and-hold abnormal return (BHAR). $BHAR_{i,[\tau_1, \tau_2]} = \prod_{t=\tau_1}^{\tau_2} [1 + R_{i,t}] - \prod_{t=\tau_1}^{\tau_2} [1 + R_{M,t}]$, Barber & Lyon (1997). where $R_{i,t}$ is the realized return of company i on day t and $R_{M,t}$ the return of the benchmark index of company i on day t . Realized return and the return of the benchmark index are in pound sterling (£/GBP) for UK firms and are in (€/euros) for non-UK firms. Normative returns are obtained from FTSE 350 index for UK firms, and from Totmkeu index (Thomson Reuter Index Europe) for non-UK firms. BHAR of UK firms is represented in red colour and BHAR of non-UK firms is represented in blue colour. Panel A represents the time series of BHAR on the observation period of two years before and one year after the Brexit announcement, $[t_0 - 539; t_0 + 270]$. -539 represents the number of working days before the Brexit announcement (two-years). Panel B represents the time series of BHAR on the observation period of one year before and after the Brexit announcement, $[t_0 - 270; t_0 + 270]$. Panel C represents the time series of BHAR on the observation period of one year after the Brexit announcement, $[t_0; t_0 + 270]$. 270 represents the number of working days after the Brexit announcement (one-year).

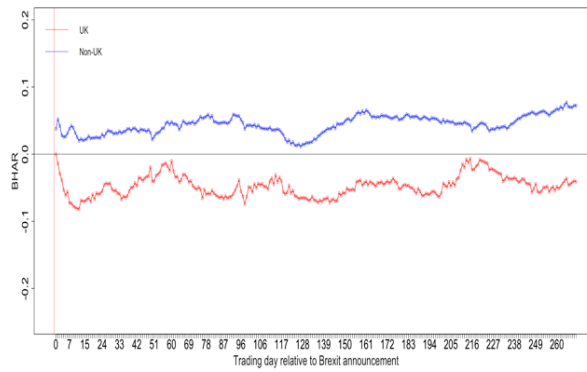
Panel A: periods $[t_0 - 539; t_0 + 270]$



Panel B: periods $[t_0 - 270; t_0 + 270]$



Panel C: periods $[t_0; t_0 + 270]$



II. Tables

Table 1: Descriptive statistics on financial and control data

Table 1 provides summary statistics for the firms' characteristics. Sales by geographic zone and financial information on listed firms were obtained from Datastream. The precise definition of each variable is provided in Appendix C. Panel A and B represent UK listed firms and non-UK listed firms, respectively.

Panel A: UK firms	Mean	S.D.	5th Percentile	p25	p50	p75	95th Percentile	Obs.
Sales_BA (%)	54.673	41.857	0.000	6.000	63.000	100.000	100.000	805
Sales_EA (%)	15.118	24.286	0.000	0.000	1.000	22.000	74.000	805
Sales_IA (%)	30.200	34.506	0.000	0.000	14.000	58.000	100.000	805
CRR (%)	-9.624	11.152	-31.604	-14.396	-7.958	-2.869	6.921	805
CAR1 (%)	-3.350	11.100	-24.704	-8.608	-1.837	3.450	11.799	800
CAR (%)	8.228	8.165	0.652	2.704	5.753	10.870	25.545	800
BHAR (%)	-4.809	56.216	-84.459	-30.662	-8.802	16.252	71.873	805
BHMAR (%)	-4.430	46.337	-70.397	-26.068	-7.059	12.857	59.621	805
CAR[one year] (%)	-2.662	44.091	-72.060	-19.357	-1.283	19.551	57.714	805
ΔVol (%)	0.796	2.884	-2.132	0.058	0.719	1.581	3.738	805
Δ Forecast EPS_2015 (%)	0.265	11.815	-8.462	-0.228	0.509	1.150	9.468	694
Δ Forecast EPS_2016 (%)	-0.978	8.614	-8.703	-1.446	-0.455	0.197	7.486	690
SD_EPS_2015	0.049	0.174	0.002	0.007	0.017	0.038	0.150	726
SD_EPS_2016	0.038	0.094	0.001	0.006	0.016	0.035	0.122	729
SOA (2015) (%)	90.217	83.216	3.685	33.161	67.795	121.589	263.073	804
SOA (2016) (%)	84.531	79.533	3.409	27.274	65.627	111.651	253.133	786
ΔSOA (%)	-5.124	30.753	-37.801	-10.677	-2.921	1.756	21.303	785
OPOA (2015) (%)	1.822	19.422	-38.319	0.737	5.895	11.054	22.107	804
OPOA (2016) (%)	1.219	19.745	-38.354	0.000	5.966	10.228	22.160	786
ΔOPOA (%)	-0.521	10.502	-14.684	-2.326	-0.409	1.385	11.622	785
LnSZ (ln(MV))	5.379	2.184	1.912	3.789	5.245	6.973	9.101	792
B/M	0.630	0.694	0.068	0.251	0.447	0.820	1.786	788
Leverage	20.630	27.065	0.000	0.000	10.560	33.690	73.020	805
BHR (%)	0.778	7.478	-10.312	-2.658	1.032	4.260	11.234	805
AbsBHR	4.961	5.647	0.323	1.657	3.649	5.298	14.307	805
Beta	0.998	0.009	0.985	0.994	0.997	1.001	1.012	805
IVol (%)	2.772	2.127	1.143	1.602	2.044	3.071	6.758	805

Panel B: Non-UK firms	Mean	S.D.	5th Percentile	p25	p50	p75	95th Percentile	Obs.
Sales_BA (%)	1.592	8.156	0.000	0.000	0.000	0.000	9.000	2,210
Sales_EA (%)	73.412	29.829	14.000	51.000	86.000	100.000	100.000	2,210
Sales_IA (%)	24.995	28.997	0.000	0.000	12.000	47.000	83.000	2,210
CRR (%)	-5.541	5.982	-15.149	-8.331	-4.735	-1.618	1.441	2,210
CAR1 (%)	4.651	6.029	-5.031	1.739	5.494	8.554	11.965	2,210
CAR (%)	6.301	4.274	0.671	3.067	5.949	8.953	12.808	2,210
BHAR (%)	6.581	42.556	-52.893	-14.619	2.855	23.661	73.735	2,210
BHMAR (%)	4.969	37.484	-47.311	-13.723	1.553	20.168	63.410	2,210
CAR[one year] (%)	4.495	44.274	-46.533	-11.014	5.788	23.335	58.286	2,210
ΔVol (%)	0.064	1.834	-1.772	-0.464	0.014	0.492	2.018	2,185
Δ Forecast EPS_2015 (%)	-0.082	8.679	-4.814	-0.206	0.275	0.881	4.001	1,620
Δ Forecast EPS_2016 (%)	-0.562	6.204	-5.654	-0.451	0.151	0.668	2.930	1,659
SD_EPS_2015	0.150	0.310	0.005	0.024	0.062	0.152	0.537	1,735
SD_EPS_2016	0.141	0.274	0.005	0.023	0.057	0.146	0.522	1,729
SOA (2015) (%)	61.383	65.790	1.000	10.000	41.000	95.000	176.000	2,210
SOA (2016) (%)	59.311	62.960	1.000	10.000	41.000	92.000	171.000	2,123
ΔSOA (%)	-1.885	16.509	-20.000	-4.000	0.000	1.000	13.000	2,123
OPOA (2015) (%)	2.120	10.833	-9.000	0.000	2.000	6.000	15.000	2,208
OPOA (2016) (%)	2.195	10.284	-10.000	0.000	2.000	6.000	14.000	2,122
ΔOPOA (%)	0.040	5.689	-5.000	-1.000	0.000	1.000	6.000	2,121
LnSZ (ln(MV))	5.841	2.086	2.557	4.404	5.634	7.333	9.512	2,185
B/M	0.794	0.828	0.101	0.322	0.599	1.020	2.128	2,154
Leverage	26.720	25.549	0.000	4.460	21.870	42.560	71.600	2,209
BHR (%)	0.950	6.143	-7.645	-1.947	1.252	4.233	8.392	2,210
AbsBHR	4.150	4.628	0.284	1.507	3.247	5.266	10.724	2,210
Beta	1.000	0.007	0.991	0.997	1.000	1.003	1.010	2,210
IVol (%)	2.378	1.396	1.199	1.638	2.016	2.673	4.573	2,210

Table 2: Daily average abnormal returns (AARs) for the 3,015 sample firms and over the event window [-5; 5]. Source: own calculations.

Table 2 shows the daily average abnormal return (AARs) over the period [-5; 5] relative to the event date (where t=0 is the date of the Brexit announcement, June 24, 2016). UK corresponds to British firms and non-UK corresponds to European (non-UK) firms. Column 1 lists a cut-out of the event window [-5; 5] relative to the event date (t=0). Columns 2 and 4 list the daily median abnormal return in percentage and columns 3 and 5 list the mean abnormal return in percentage, for each date. The ARs are based on the CAPM model. Realized return and the return of the benchmark index are in pound sterling (£/GBP) for UK firms and are in (€/euros) for non-UK firms. Normative returns are obtained from FTSE 350 index for UK firms, and from Totmkeu index (Thomson Reuter Index Europe) for non-UK firms. Significance of the median ARs is based on Wilcoxon rank sum tests (the null hypothesis is that the median is equal to zero). Significance of the mean ARs is based on standard t-tests (the null hypothesis is that the mean is equal to zero). *, **, and *** correspond to 10%, 5%, and 1% significance level, respectively.

Day	<u>UK</u>	Mean %	<u>Non-UK</u>	Mean %
	Median %		Median %	
-5	-0,73**	-0,09	-0,76***	-0,29***
-4	-1,63***	-1,40***	-1,92***	-1,76***
-3	-0,20**	-0,15*	-0,52***	-0,43***

-2	-0,19**	-0,18*	-0,30***	-0,33***
-1	-0,88***	-0,58***	-0,97***	-0,77***
0	-0,42***	-1,49***	4,66***	3,76***
1	-0,31***	-1,28***	2,18***	1,66***
2	-1,49***	-1,22***	-1,34***	-1,17***
3	-1,12***	-0,74***	-1,83***	-1,61***
4	-1,48***	-1,21***	-0,51***	-0,30***
5	-0,69***	-0,63***	-0,19	-0,01
N	805		2210	

Table 3: Cumulative average abnormal returns (CAARs) by event window and cumulative absolute abnormal returns |CAARs|. Source: Own calculations.

Table 3 displays the cumulative average abnormal returns (CAARs) in panel A and cumulative absolute abnormal returns |CAARs| in panel B for the 3,015 EU listed firms. UK corresponds to British firms and non-UK corresponds to European (non-UK) firms. Standard event study techniques are used to calculate unexpected changes in stock prices. The estimation window consists of 270 days' window preceding the event date by 35 days $[t_0 - 305; t_0 - 35]$. The CAARs are calculated over different event windows around the event date ($t_0 = \text{June 24, 2016}$). Abnormal returns are calculated using the CAPM as the normal performance return model for stock returns. Realized return and the return of the benchmark index are in pound sterling (£/GBP) for UK firms and are in (€/euros) for non-UK firms. Normative returns are obtained from FTSE 350 index for UK firms, and from Totmkeu index (Thomson Reuter Index Europe) for non-UK firms. In panel A, column 1 lists the different event windows, columns 2 and 4 list the median CAARs and columns 3 and 5 list the mean CAARs associated with the event windows. Significance of median CAARs is based on Wilcoxon rank sum tests (the null hypothesis is that the median is equal to zero). Significance of mean CAARs is based on standard t-tests (the null hypothesis is that the mean is equal to zero).

Panel B represents the results of |CAAR|. $|CAAR|_{[-1; 1]}$ represents the three day cumulative absolute abnormal returns (over the three days' window surrounding the event date $[t_0 - 1; t_0 + 1]$) and $\overline{|CAAR|}_{\text{Est. window}}$ represents the average three-day cumulative abnormal returns on the estimation window. Significance of the difference (Diff (A) – (B)) between $|CAAR|_{[-1; 1]}$ and $\overline{|CAAR|}_{\text{Est. window}}$ is based on Wilcoxon rank sum test (the null hypothesis is that the difference is null). Columns (6) and (7) display the difference between medians and means (UK – non-UK), i.e. the difference between column (2) and column (4) and the difference between column (3) and column (5).

In columns (2) and (4) significances are based on the Wilcoxon rank-sum test. In columns (3) and (5), significances are based on the paired Student's t-test. In column (6) and (7) significances are based on the Mann Whithney Rank-sum test and on the independent sample t.test, respectively. *, **, and *** correspond to 10%, 5%, and 1% significance level, respectively.

Panel A : CAARs based on CAPM				
	UK		Non-UK	
(1) Event window	(2) Median %	(3) Mean %	(4) Median %	(5) Mean %
[-1; 0]	-1,31***	-2,07***	3,69***	2,99***
[-1; 1]	-1,84***	-3,35***	5,49***	4,65***
[-2; 2]	-3,60***	-4,76***	3,90***	3,15***
[-5; 5]	-8,61***	-8,97***	-0,90***	-1,25***
[-10; 10]	-7,94***	-9,22***	0,47	-0,90**
[-15; 15]	-6,63***	-6,93***	-0,45***	-1,53***

[-20; 20]	-4,11***	-4,58***	0,91	-0,29
[-30; 30]	-1,86**	-2,52**	-1,56***	-3,06***

Panel B: |CAARs| based on CAPM

		<u>UK</u>		<u>Non-UK</u>		<u>(UK – non-UK)</u>	
		Median%	Mean %	Median%	Mean %	Median%	Mean%
(A)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	CAAR _[-1; 1]	5.75	8.23	5.95	6.30	-0,20*	1.93***
						(0.074) ⁱⁱⁱ	(0.000) ^{iv}
(B)	$\overline{ CAAR }$ _{Est. window}	2.45	3.00	2.44	2.75	0,01*	0.25***
						(0.093) ⁱⁱⁱ	(0.000) ^{iv}
	Diff (A) – (B)	3.30***	5.23***	3.51***	3.55***		
	(p-value)	(0,000) ⁱ	(0,000) ⁱⁱ	(0,000) ⁱ	(0,000) ⁱⁱ		
	<i>N</i>	805		2210			

Note: ⁱ Wilcoxon rank-sum test, ⁱⁱ Paired student's t-test, ⁱⁱⁱ Mann Whithney Rank-sum test, ^{iv} the independent sample t.test.

Table 4: Univariate test on market reaction

Table 4 presents the univariate tests on the market reaction to the Brexit announcement. BHAR, BHMAR and $CAR_{[one\ year]}$ represent the buy-and-hold abnormal return 12 months after the Brexit announcement, the buy-and-hold abnormal performance 12 months after the Brexit announcement and the one-year cumulative abnormal returns, respectively. We select the BHAR, BHMAR and $CAR_{[one\ year]}$ on the day ($t = t_0 + 261$), more precisely on the 26 June 2017 (which corresponds to 12 months after the Brexit announcement). For all the three measures, realized return and the return of the benchmark index are in pound sterling (£/GBP) for UK firms and are in (€/euros) for non-UK firms. Normative returns are obtained from FTSE 350 index for UK firms, and from Totmkeu index (Thomson Reuter Index Europe) for non-UK firms. In each panel, all firms in the sample are split into three groups **by the percentage of sales with BA and EA** (variable: sales(BA+EA)). Panel A and B represent UK firms and non-UK firms, respectively. In the last two columns, the t-statistics are calculated based on robust standard errors clustered by industry for UK firms and by industry and country for non-UK firms. *, **, and *** indicate that the event date values are significant at the 10%, 5%, and 1% level, respectively.

	<u>Quantile by Sales(BA+EA)</u>			<u>3 minus 1</u>		<u>portfolio method (reg)</u>	
	(1) (Lowest)	(2)	(3) (Highest)	Difference	t-stat	beta	t-stat
Panel A : UK firms							
<u>Long-run reaction</u>							
BHAR_12m	2,118	-6,979	-9,190	-11.308**	(-2.207)	-18.126***	(-4.695)
BHMAR_12m	1,395	-6,400	-7,994	-9.388**	(-2.224)	-14.829***	(-4.628)
$CAR_{[one\ year]}$	4,808	-2,527	-9,435	-14.244***	(-3.620)	-15.144***	(-4.797)

Panel B : non-UK firms							
<u>Long-run reaction</u>							
BHAR_12m	10,368	7,149	2,638	-7,729***	(-3.364)	-2.747	(-1.314)
BHMAR_12m	8,431	5,479	1,372	-7,060***	(-3.490)	-2.830	(-1.536)

CAR _[one year]	7,100	6,910	0,022	-7.077***	(-2.804)	-1.743	(-0.991)
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Table 5: Pairwise correlations between independent variables

Table 5 provides Pearson (below diagonal) and Spearman (above diagonal) correlations between the independent variables used in the regressions of tables 6, 8, 9, 11, 13 and 14. *, **, and *** indicate that the event date values are significant at the 10%, 5%, and 1% level, respectively. The detailed definition of these variables are provided in Appendix C.

	BHAR (%)	Delta_EP S_16	SD_EPS_ 16	Delta_EP S_15	SD_EPS_ 15	delta_OP OA	delta_SO A	delta_vol (%)	Dummy UK	Sales_BA (%)	Sales_EA (%)	Sales_IA (%)	sales_(B A+EA) (%)	lnSZ	B/M	Leverage	AbsBHR	BHR (%)	Beta	IVol_p
BHAR (%)	1.00	0.19***	0.08***	0.03	0.10***	-0.01	0.16***	-0.12***	-0.16***	-0.16***	0.12***	0.10***	-0.10***	-0.02	0.04**	-0.01	-0.06**	0.05**	0.06**	-0.07***
Delta_EPS_16	0.14***	1.00	0.10***	-0.06**	0.15***	0.09***	0.23***	-0.17***	-0.22***	-0.21***	0.13***	0.08***	-0.08***	-0.02	0.03	0.00	-0.07**	0.11***	0.24***	0.00
SD_EPS_16	0.00	-0.12***	1.00	-0.03	0.81***	0.01	0.01	-0.13***	-0.41***	-0.33***	0.19***	0.13***	-0.13***	0.24***	0.03	0.12***	-0.01	0.02	0.13***	-0.06**
Delta_EPS_15	0.09***	0.15***	-0.07**	1.00	0.02	0.00	0.01	0.02	0.07**	0.10***	-0.04**	-0.07**	0.07**	-0.06**	-0.06**	-0.03	-0.04*	-0.10***	-0.28***	-0.05**
SD_EPS_15	-0.01	-0.03	0.81***	-0.03	1.00	0.02	0.04**	-0.17***	-0.42***	-0.33***	0.17***	0.17***	-0.17***	0.25***	0.02	0.11***	-0.03	0.03	0.13***	-0.07***
ΔSOA	-0.07***	0.03	0.02	-0.04**	-0.03	1.00	0.33***	-0.05**	-0.16***	-0.08***	0.14***	-0.12***	0.12***	-0.07**	0.11***	0.04*	0.00	-0.04**	-0.01	0.05**
ΔOPOA	0.09***	0.00	-0.01	-0.05**	0.00	0.01	1.00	-0.03	-0.10***	-0.05**	0.05**	-0.03	0.03	-0.06**	0.07***	0.05**	0.02	0.03	0.05**	0.06**
Δvol (%)	-0.06***	-0.19***	0.05**	0.08***	0.01	0.01	0.01	1.00	0.33***	0.27***	-0.23***	-0.03	0.03	0.05**	-0.01	0.00	0.08***	-0.12***	-0.04*	0.06**
DummyUK	-0.11***	-0.03	-0.20***	0.02	-0.16***	-0.07***	-0.03*	0.15***	1.00	0.73***	-0.64***	0.01	-0.01	-0.13***	-0.12***	-0.17***	0.08***	-0.01	-0.23***	0.07**
Sales_BA (%)	-0.12***	-0.03	-0.16***	0.03	-0.14***	-0.05**	-0.03*	0.13***	0.72***	1.00	-0.65***	-0.16***	0.16***	-0.05**	-0.09***	-0.11***	0.04	-0.07***	-0.24***	-0.01
Sales_EA (%)	0.07***	0.02	0.09***	0.00	0.06**	0.05**	0.02	-0.11***	-0.67***	-0.64***	1.00	-0.51***	0.51***	-0.01	0.15***	0.12***	-0.01	0.01	0.11***	-0.05**
Sales_IA (%)	0.04**	0.01	0.06**	-0.04*	0.09***	-0.01	0.01	0.00	0.08***	-0.27***	-0.57***	1.00	-1.00***	0.12***	-0.13***	-0.03	-0.07***	0.08***	0.14***	0.04**
sales_(BA+EA) (%)	-0.04**	-0.01	-0.06**	0.04*	-0.09***	0.01	-0.01	0.00	-0.08***	0.27***	0.57***	-1.00	1.00	-0.12***	0.13***	0.03	0.07***	-0.08***	-0.14***	-0.04**
lnSZ	0.01	0.02	0.10***	0.00	0.10***	-0.03	-0.05**	0.04**	-0.10***	-0.07***	-0.05**	0.14***	-0.14***	1.00	-0.19***	0.30***	-0.21***	-0.18***	0.07***	-0.56***
B/M	0.00	-0.13***	0.06**	-0.14***	0.05**	-0.01	0.02	-0.01	-0.09***	-0.08***	0.13***	-0.08***	0.08***	-0.23***	1.00	0.09***	0.07***	0.10***	0.15***	0.07**
Leverage	-0.01	-0.04**	0.05**	-0.05**	0.05**	0.01	0.04**	0.00	-0.10***	-0.07***	0.08***	-0.02	0.02	0.23***	-0.01	1.00	-0.06**	-0.08***	0.11***	-0.19***
AbsBHR	-0.09***	-0.15***	0.07***	0.01	0.06**	-0.01	0.04**	0.15***	0.07***	0.03	-0.02	0.00	0.00	-0.21***	0.10***	0.02	1.00	0.10***	-0.01	0.27***
BHR (%)	0.09***	0.18***	-0.04*	0.02	-0.04*	-0.04**	0.06**	-0.09***	-0.01	-0.06**	0.01	0.05**	-0.05**	-0.16***	0.05**	-0.06**	0.03*	1.00	0.06**	0.01
Beta	0.04**	0.07***	0.07***	-0.16***	0.06**	0.00	0.02	-0.10***	-0.14***	-0.18***	0.09***	0.09***	-0.09***	0.02	0.18***	0.06**	0.06**	0.00	1.00	0.11***
IVol_p	-0.16***	-0.05**	0.04*	-0.14***	0.05**	0.02	0.08***	-0.07***	0.11***	0.00	-0.08***	0.10***	-0.10***	-0.45***	0.14***	-0.06**	0.29***	0.04**	0.12***	1.00

Table 6: The regression results of the long-run market performance over a 12 months's

This table reports the effect of Brexit announcement on the long-run market performance (over a 12 months's horizon). The dependent variable is the buy-and-hold abnormal return (BHAR) 12 months after the Brexit announcement. Normative returns are obtained from Totmkeu index (Thomson Reuter Index Europe). $BHAR_{i,[\tau_1, \tau_2]} = \prod_{t=\tau_1}^{\tau_2} [1 + R_{i,t}] - \prod_{t=\tau_1}^{\tau_2} [1 + R_{M,t}]$, Barber & Lyon (1997). Where $R_{i,t}$ is the realized return of company i on day t and $R_{M,t}$ is the return of the benchmark index of company i on day t . Realized return and the return of the benchmark index are in pound sterling (£/GBP) for UK firms and are in (€/euros) for non-UK firms. Normative returns are obtained from FTSE 350 index for UK firms, and from Totmkeu index (Thomson Reuter Index Europe) for non-UK firms. We select the BHMAR on the day $(t + 261)$, which corresponds to the 26 June 2017 (12 months after the Brexit announcement). DummyUK equals to one for British firms. Sales_BA, sales_EA, sales_IA, and sales(BA+EA) are the percentage of sales with BA, the percentage of sales with EA, the percentage of sales with IA and the sum of percentage of sales with BA and EA in December 2015, respectively. LnSZ and B/M are the logarithm of a firm's market value and book-to-market ratio six months before the Brexit announcement (as of the end of 2015). Leverage is the ratio of total liabilities to total assets. BHR is the buy-and-hold stock return from two weeks to one week before the Brexit announcement. IVol refers to idiosyncratic risk obtained from the CAPM used to estimate cumulative abnormal returns. The detailed definitions of these variables are provided in Appendix C. The t-statistics calculated based on robust standard errors clustered by industry and country separately are reported in parentheses. Sample A, subsample B and subsample C represent all listed EU firms, UK listed firms, EU non-UK listed firms, as of the end of 2015, respectively. *, **, and *** indicate that the event date values are significant at the 10%, 5%, and 1% level, respectively.

Dependent variable = BHAR_totmkeu_12m (%)

	Sample A: All EU firms				Subsample B: UK firms				Subsample C: Non-UK firms			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DummyUK	-2.233 (-1.012)	-9.580*** (-4.536)	-11.205*** (-6.773)	-11.206*** (-6.774)								
Sales_BA (%)	-0.158*** (-5.721)				-0.179*** (-4.887)				-0.232** (-2.559)			
Sales_EA (%)		0.025 (1.080)				0.082 (1.435)				0.011 (0.425)		
Sales_IA (%)			0.075*** (3.351)				0.222*** (4.975)				0.009 (0.338)	
Sales(BA + EA) (%)				-0.076*** (-3.358)				-0.222*** (-4.982)				-0.009 (-0.343)
LnSZ	-0.808** (-2.292)	-0.527 (-1.468)	-0.894** (-2.470)	-0.894** (-2.471)	-0.817 (-1.056)	-0.108 (-0.139)	-0.954 (-1.231)	-0.954 (-1.230)	-0.838** (-2.108)	-0.797* (-1.945)	-0.873** (-2.132)	-0.874** (-2.134)
B/M	3.004***	3.091***	3.075***	3.074***	6.079***	6.252***	5.594***	5.592***	2.491***	2.468***	2.471***	2.472***

	(3.564)	(3.639)	(3.632)	(3.632)	(2.817)	(2.831)	(2.598)	(2.597)	(2.770)	(2.742)	(2.746)	(2.746)
Leverage	-0.007	-0.005	-0.003	-0.003	0.011	0.008	0.011	0.011	0.000	-0.002	-0.002	-0.002
	(-0.291)	(-0.186)	(-0.116)	(-0.115)	(0.210)	(0.156)	(0.209)	(0.211)	(0.002)	(-0.074)	(-0.075)	(-0.075)
BHR (%)	0.203**	0.288***	0.255***	0.255***	0.009	0.119	-0.014	-0.014	0.255**	0.296***	0.290***	0.290***
	(2.158)	(3.043)	(2.697)	(2.697)	(0.047)	(0.636)	(-0.075)	(-0.076)	(2.285)	(2.652)	(2.594)	(2.592)
IVol (%)	-9.013***	-8.578***	-8.879***	-8.880***	-8.535***	-7.922***	-8.770***	-8.770***	-9.587***	-9.437***	-9.498***	-9.500***
	(-20.767)	(-19.638)	(-20.310)	(-20.311)	(-11.441)	(-10.418)	(-11.740)	(-11.741)	(-17.100)	(-16.773)	(-16.879)	(-16.881)
_cons	32.277***	27.467***	30.013***	37.576***	25.475***	8.875	10.454*	32.631***	34.861***	33.065***	34.157***	35.067***
	(10.493)	(7.452)	(9.755)	(9.920)	(4.063)	(1.520)	(1.853)	(4.711)	(9.855)	(7.605)	(9.654)	(7.975)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes
N	2941	2941	2941	2941	788	788	788	788	2153	2153	2153	2153
adj. R-sq	0.20	0.19	0.20	0.20	0.20	0.17	0.21	0.21	0.17	0.17	0.17	0.17
Mean (max) VIF	1.32 (2.69)	1.31 (2.43)	1.25 (1.92)	1.25 (1.92)	1.35 (1.65)	1.30 (1.60)	1.35 (1.68)	1.35 (1.68)	1.24 (2.03)	1.25 (2.08)	1.25 (2.08)	1.25 (2.08)

Table 7: Univariate test on the changes in expected and realized cash flow around the Brexit announcement.

Table 7 presents the univariate tests on the changes in expected and realized cash flow in Panels A1-A2 and B1-B2, respectively. Expected cash flow is measured by analysts' consensus EPS forecasts. Δ Forecast EPS_2015 (2016) is changes in EPS forecasts in 2015 (2016) divided by the stock price two days prior to the Brexit announcement (prices are in pound sterling (£/GBP) for UK firms and are in (€/euros) for non-UK firms) in percentage. Realized cash flow is measured by realized Operating profit/Total assets (OPOA) or Sales/Total assets (SOA). Δ Operating profit/Total assets or Δ Sales/Total assets is the difference in realized OPOA or SOA between 2016 and 2015. In each panel, all firms in the sample are split into three groups *by the percentage of sales with BA and EA* (variable: sales(BA+EA)). In Panels A1-B1, the sorting variable is UK firms. In panel A2-B2 the sorting variable is non-UK firms. The detailed definitions of these variables are provided in Appendix C. In the last two columns, the t-statistics are calculated based on robust standard errors clustered by industry for UK firms and by industry and country for non-UK firms. *, **, and *** indicate that the event date values are significant at the 10%, 5%, and 1% level, respectively.

	Quantile by Sales(BA+EA)			3 minus 1		portfolio method (reg)	
	(1)	(2)	(3)	Difference	t-stat	beta	t-stat
	(Lowest)		(Highest)				
Panel A1: UK firms							
Δ Forecast EPS_2015	-0.116	0.371	0.548	0.665	(0.568)	0.180	(1.407)
Δ Forecast EPS_2016	-0.520	-1.508	-0.933	-0.413	(-0.497)	-0.373**	(-2.534)
Panel A2: Non-UK firms							
Δ Forecast EPS_2015	-0.327	-0.202	0.342	0.669	(1.224)	0.065	(0.874)
Δ Forecast EPS_2016	-0.503	-0.371	-0.821	-0.319	(-0.839)	0.091	(1.282)

	Quantile by Sales(BA+EA)			3 minus 1		portfolio method (reg)	
	(1)	(2)	(3)	Difference	t-stat	beta	t-stat
	(Lowest)		(Highest)				
Panel B1: UK firms							
Δ SOA	-4,339	-6,551	-4,675	-0.336	(-0.115)	3.034***	(3.030)
Δ OPOA	0,163	-1,128	-0,637	-0.799	(-0.834)	0.336	(0.980)
Panel B2: Non-UK firms							
Δ SOA	-2.368	-2.347	-1.036	1.332	(1.605)	0.844***	(2.982)
Δ OPOA	-0.095	0.154	0.062	0.157	(0.470)	0.218*	(1.957)

Table 8: Expected cash flow regression analyses.

Table 8 reports the effect of Brexit announcement on the change in analysts' earnings per share (EPS) forecasts. In panels A and B, the dependent variable is Δ *Forecast EPS*, which corresponds to the change in forecasted EPS divided by the stock price two days prior the Brexit announcement in percentage for years 2015 and 2016, respectively. The price two days prior the Brexit announcement is in pound sterling (£/GBP) for UK firms and are in (€/euros) for non-UK firms. Δ *Forecast EPS* is defined as the difference between the median EPS forecast in the six months after the Brexit announcement and the median EPS forecast in the six months before the Brexit announcement. DummyUK is equal to one for British firms. Sales_BA, sales_EA, sales_IA, and sales(BA+EA) are the percentage of sales with BA, the percentage of sales with EA, the percentage of sales with IA and the sum of percentage of sales with BA and EA in December 2015, respectively. *SD_EPS_2015* (*2016*) is the standard deviation of analysts' EPS forecasts for year 2015 (2016) in the (-6m, +6m) window around the Brexit announcement. LnSZ and B/M are the logarithm of a firm's market value and book-to-market ratio six months before the Brexit announcement (as of the end of 2015). Leverage is the ratio of total liabilities to total assets (as of the end of 2015). AbsBHR is the absolute value of the buy-and-hold stock return from two weeks to one week before the Brexit announcement.

IVol refers to idiosyncratic risk obtained from the CAPM used to estimate cumulative abnormal returns. OPOA equals to the operating income divided by total assets as of the end of 2015. The detailed definitions of these variables are provided in Appendix C. The t-statistics calculated based on robust standard errors clustered by industry and country separately are reported in parentheses. Sample A, subsample B and subsample C include all listed EU firms, UK firms, European non-UK firms, as of the end of 2015, respectively. *, **, and *** indicate that the event date values are significant at the 10%, 5%, and 1% level, respectively.

Dependent variable = Δ Forecast EPS_2016

	Sample A: All EU firms				Subsample B: UK firms				Subsample C: Non-UK firms			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DummyUK	-0.356*** (-4.530)	-0.482*** (-6.422)	-0.590*** (-9.576)	-0.590*** (-9.575)								
Sales_BA (%)	-0.005*** (-4.834)				-0.006*** (-3.829)				-0.002 (-0.489)			
Sales_EA (%)		0.002** (2.250)				0.003 (1.318)				0.002** (1.966)		
Sales_IA (%)			0.001 (1.621)				0.008*** (4.237)				-0.002* (-1.782)	
Sales(BA+EA) (%)				-0.001 (-1.612)				-0.008*** (-4.224)				0.002* (1.786)
SD_EPS_2016	0.196** (2.061)	0.200** (2.091)	0.177* (1.840)	0.177* (1.841)	-1.707** (-2.004)	-1.667* (-1.909)	-1.920** (-2.247)	-1.916** (-2.239)	0.262*** (3.018)	0.276*** (3.191)	0.275*** (3.173)	0.275*** (3.173)
LnSZ	-0.032** (-2.425)	-0.022 (-1.592)	-0.033** (-2.433)	-0.033** (-2.431)	-0.026 (-0.767)	-0.005 (-0.158)	-0.031 (-0.914)	-0.031 (-0.906)	-0.030** (-2.066)	-0.022 (-1.464)	-0.022 (-1.520)	-0.022 (-1.518)

B/M	0.178*** (4.641)	0.179*** (4.625)	0.181*** (4.655)	0.181*** (4.655)	0.072 (0.766)	0.074 (0.769)	0.039 (0.412)	0.041 (0.433)	0.170*** (4.128)	0.172*** (4.200)	0.173*** (4.202)	0.173*** (4.202)
Leverage	0.000 (0.368)	0.000 (0.379)	0.001 (0.598)	0.001 (0.599)	-0.002 (-0.966)	-0.002 (-0.998)	-0.002 (-0.916)	-0.002 (-0.909)	0.001 (1.377)	0.001 (1.248)	0.001 (1.250)	0.001 (1.249)
AbsBHR	-1.844*** (-3.785)	-2.061*** (-4.213)	-1.995*** (-4.055)	-1.995*** (-4.055)	0.541 (0.523)	0.155 (0.147)	0.543 (0.523)	0.548 (0.527)	-3.149*** (-5.588)	-3.297*** (-5.872)	-3.305*** (-5.880)	-3.305*** (-5.881)
IVol (%)	0.038* (1.822)	0.051** (2.430)	0.039* (1.848)	0.039* (1.849)	-0.050 (-1.289)	-0.028 (-0.706)	-0.071* (-1.815)	-0.070* (-1.799)	0.073*** (2.725)	0.080*** (2.966)	0.080*** (2.963)	0.080*** (2.965)
OPOA (%)	-0.005*** (-2.939)	-0.007*** (-4.072)	-0.007*** (-3.788)	-0.007*** (-3.791)	-0.021*** (-5.720)	-0.021*** (-5.660)	-0.021*** (-5.725)	-0.021*** (-5.709)	0.001 (0.383)	0.001 (0.304)	0.001 (0.292)	0.001 (0.292)
_cons	0.327*** (2.709)	0.121 (0.855)	0.296** (2.435)	0.426*** (2.935)	0.305 (1.104)	-0.190 (-0.721)	-0.158 (-0.618)	0.607** (1.991)	0.223* (1.650)	0.043 (0.267)	0.215 (1.599)	0.055 (0.338)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes
N	2288	2288	2288	2288	673	673	673	673	1615	1615	1615	1615
adj. R-sq	0.12	0.12	0.11	0.11	0.13	0.12	0.13	0.13	0.05	0.06	0.06	0.06
Mean (max) VIF	1.32 (2.76)	1.31 (2.50)	1.26 (1.90)	1.26 (1.90)	1.35 (1.72)	1.31 (1.69)	1.35 (1.74)	1.35 (1.74)	1.26 (2.00)	1.27 (2.05)	1.27 (2.06)	1.27 (2.06)

Panel B : Dependent variable = Δ Forecast EPS_2015

	Sample A: All EU firms				Subsample B: UK firms				Subsample C: Non-UK firms			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DummyUK	0.032 (0.435)	0.218*** (3.052)	0.242*** (4.169)	0.242*** (4.167)								
Sales_BA (%)	0.004*** (4.329)				0.003*** (2.858)				0.008** (2.496)			
Sales_EA (%)		-0.000 (-0.521)				-0.003** (-1.987)				0.001 (0.903)		
Sales_IA (%)			-0.003*** (-3.454)				-0.003** (-2.575)				-0.002* (-1.706)	
Sales(BA+EA) (%)				0.003*** (3.447)				0.003** (2.554)				0.002* (1.714)
SD_EPS_2015	0.337*** (4.441)	0.347*** (4.523)	0.353*** (4.599)	0.353*** (4.596)	2.670*** (8.404)	2.697*** (8.119)	2.651*** (8.408)	2.652*** (8.412)	0.292*** (3.709)	0.293*** (3.721)	0.293*** (3.716)	0.293*** (3.714)
LnSZ	-0.044*** (-3.470)	-0.049*** (-3.811)	-0.039*** (-2.984)	-0.039*** (-2.988)	-0.096*** (-3.920)	-0.110*** (-4.316)	-0.095*** (-3.885)	-0.095*** (-3.890)	-0.031** (-2.135)	-0.027* (-1.799)	-0.025 (-1.635)	-0.025 (-1.636)
B/M	0.003 (0.090)	-0.004 (-0.110)	-0.007 (-0.190)	-0.007 (-0.194)	0.111* (1.696)	0.116* (1.688)	0.113* (1.738)	0.113* (1.744)	-0.014 (-0.326)	-0.015 (-0.345)	-0.018 (-0.418)	-0.018 (-0.423)
Leverage	0.001 (1.437)	0.001 (1.433)	0.001 (1.150)	0.001 (1.149)	-0.002 (-1.059)	-0.002 (-1.227)	-0.001 (-0.887)	-0.001 (-0.889)	0.003** (2.552)	0.003** (2.464)	0.002** (2.371)	0.002** (2.369)
AbsBHR	0.066	0.021	-0.044	-0.045	-0.631	-0.816	-0.680	-0.677	0.255	0.243	0.195	0.193

	(0.152)	(0.048)	(-0.101)	(-0.103)	(-0.850)	(-1.050)	(-0.922)	(-0.918)	(0.480)	(0.456)	(0.364)	(0.362)
IVol (%)	0.013	0.011	0.013	0.013	-0.095***	-0.121***	-0.087***	-0.087***	0.045**	0.041*	0.043*	0.043*
	(0.763)	(0.602)	(0.723)	(0.723)	(-3.382)	(-4.105)	(-3.098)	(-3.111)	(2.008)	(1.800)	(1.883)	(1.886)
OPOA (%)	0.006***	0.006***	0.006***	0.006***	0.007***	0.008***	0.008***	0.008***	0.007***	0.007***	0.007***	0.007***
	(3.581)	(3.604)	(3.638)	(3.637)	(2.927)	(2.835)	(3.149)	(3.146)	(2.853)	(2.806)	(2.768)	(2.766)
_cons	0.471***	0.540***	0.528***	0.264**	1.120***	1.476***	1.352***	1.014***	0.264**	0.204	0.293**	0.133
	(4.260)	(4.131)	(4.732)	(1.987)	(5.554)	(7.474)	(7.284)	(4.611)	(2.042)	(1.301)	(2.255)	(0.842)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes
N	2289	2289	2289	2289	689	689	689	689	1599	1599	1599	1599
adj. R-sq	0.09	0.08	0.08	0.08	0.21	0.22	0.20	0.20	0.08	0.08	0.08	0.08
Mean (max) VIF	1.32 (2.70)	1.31 (2.51)	1.27 (1.88)	1.27 (1.88)	1.37 (1.76)	1.33 (1.74)	1.37 (1.79)	1.37 (1.79)	1.25 (1.97)	1.26 (2.02)	1.26 (2.03)	1.26 (2.03)

Table 9: Realized cash flow regression analyses

Table 9 reports the effect of Brexit announcement on the future accounting performance of firms. In Panels A and B the dependent variables are the operating profits divided by total assets (Δ OPOA) and sales divided by total assets (Δ SOA) from fiscal 2015 to fiscal 2016, respectively. DummyUK is equal to one for British firms. Sales_BA, sales_EA, sales_IA, and sales(BA+EA) are the percentage of sales with BA, the percentage of sales with EA, the percentage of sales with IA and the sum of percentage of sales with BA and EA as of the end of 2015, respectively. LnSZ and B/M are the logarithm of a firm's market value and book-to-market ratio six months before the Brexit announcement (as of the end of 2015). Leverage is the ratio of total liabilities to total assets (as of the end of 2015). The detailed definitions of these variables are provided in Appendix C. The t-statistics calculated based on robust standard errors clustered by industry and country separately are reported in parentheses. Sample A, subsample B and subsample C include all listed EU firms, UK firms, European non-UK firms, as of the end of 2015, respectively. *, **, and *** indicate that the event date values are significant at the 10%, 5%, and 1% level, respectively.

Panel A: Dependent variable = Δ OPOA (%)

	<i>Sample A: All EU firms</i>				<i>Subsample B: UK firms</i>				<i>Subsample C: Non-UK firms</i>			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DummyUK	-0.983***	-0.622***	-0.479***	-0.479***								
	(-7.426)	(-4.910)	(-4.801)	(-4.801)								
Sales_BA (%)	0.009***				0.006*				0.002			
	(5.196)				(1.740)				(0.316)			
Sales_EA (%)		-0.003*				-0.007				0.001		
		(-1.838)				(-1.408)				(0.560)		
Sales_IA (%)			-0.002*				-0.005				-0.001	

			(-1.815)				(-1.364)				(-0.677)	
Sales(BA+EA) (%)				0.002*				0.005				0.001
				(1.819)				(1.356)				(0.687)
LnSZ	-0.068***	-0.081***	-0.064***	-0.064***	-0.047	-0.062	-0.052	-0.052	-0.053***	-0.049**	-0.049**	-0.049**
	(-3.566)	(-4.181)	(-3.263)	(-3.262)	(-0.758)	(-1.002)	(-0.828)	(-0.830)	(-2.811)	(-2.544)	(-2.520)	(-2.517)
B/M	-0.002	0.005	0.001	0.001	1.005***	1.021***	1.003***	1.004***	-0.001	-0.000	-0.000	-0.000
	(-0.033)	(0.100)	(0.023)	(0.024)	(5.146)	(5.188)	(5.118)	(5.118)	(-0.019)	(-0.006)	(-0.008)	(-0.008)
Leverage	0.004***	0.004**	0.004**	0.004**	0.011**	0.011**	0.011**	0.011**	0.004***	0.004***	0.004***	0.004***
	(2.669)	(2.507)	(2.402)	(2.402)	(2.260)	(2.242)	(2.293)	(2.292)	(2.918)	(2.905)	(2.894)	(2.894)
_cons	0.499***	0.773***	0.557***	0.311	-1.207***	-0.699*	-0.698*	-1.237**	0.410***	0.333*	0.410***	0.314*
	(3.390)	(4.139)	(3.750)	(1.634)	(-2.699)	(-1.744)	(-1.740)	(-2.440)	(2.913)	(1.773)	(2.901)	(1.658)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes
N	2840	2840	2840	2840	769	769	769	769	2071	2071	2071	2071
adj. R-sq	0.03	0.02	0.02	0.02	0.09	0.09	0.09	0.09	0.03	0.03	0.03	0.03
Mean (max) VIF	1.31 (2.68)	1.30 (2.46)	1.23 (1.92)	1.23 (1.92)	1.32 (1.60)	1.27 (1.54)	1.32 (1.59)	1.32 (1.59)	1.23 (2.02)	1.24 (2.07)	1.23 (2.08)	1.23 (2.08)

Panel B: Dependent variable = Δ SOA (%)

	<i>Sample A: All EU firms</i>				<i>Subsample B: UK firms</i>				<i>Subsample C: Non-UK firms</i>			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DummyUK	-0.983***	-0.622***	-0.479***	-0.479***								
	(-7.426)	(-4.910)	(-4.801)	(-4.801)								
Sales_BA (%)	0.009***				0.006*				0.002			
	(5.196)				(1.740)				(0.316)			
Sales_EA (%)		-0.003*				-0.018				0.006		
		(-1.838)				(-1.086)				(1.354)		
Sales_IA (%)			-0.002*				-0.021				-0.006	
			(-1.815)				(-1.634)				(-1.516)	
Sales(BA+EA) (%)				0.002*				0.021				0.006
				(1.819)				(1.630)				(1.511)
LnSZ	-0.068***	-0.081***	-0.064***	-0.064***	-0.047	-0.406**	-0.357*	-0.358*	-0.053***	-0.239***	-0.237***	-0.237***
	(-3.566)	(-4.181)	(-3.263)	(-3.262)	(-0.758)	(-1.980)	(-1.735)	(-1.737)	(-2.811)	(-4.149)	(-4.128)	(-4.129)
B/M	-0.002	0.005	0.001	0.001	1.005***	-0.091	-0.013	-0.013	-0.001	0.001	0.001	0.001
	(-0.033)	(0.100)	(0.023)	(0.024)	(5.146)	(-0.139)	(-0.020)	(-0.020)	(-0.019)	(0.004)	(0.009)	(0.009)
Leverage	0.004***	0.004**	0.004**	0.004**	0.011**	0.002	0.004	0.004	0.004***	0.011**	0.011**	0.011**
	(2.669)	(2.507)	(2.402)	(2.402)	(2.260)	(0.137)	(0.231)	(0.230)	(2.918)	(2.419)	(2.393)	(2.393)
_cons	0.499***	0.773***	0.557***	0.311	-1.207***	-0.217	-0.145	-2.286	0.410***	0.420	0.982**	0.354
	(3.390)	(4.139)	(3.750)	(1.634)	(-2.699)	(-0.164)	(-0.110)	(-1.366)	(2.913)	(0.749)	(2.332)	(0.627)

Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes
N	2840	2840	2840	2840	769	769	769	769	2071	2073	2073	2073
adj. R-sq	0.03	0.02	0.02	0.02	0.09	0.04	0.04	0.04	0.03	0.03	0.03	0.03
Mean (max) VIF	1.31 (2.68)	1.30 (2.46)	1.23 (1.92)	1.23 (1.92)	1.32 (1.60)	1.27 (1.54)	1.32 (1.59)	1.32 (1.59)	1.23 (2.02)	1.24 (2.07)	1.23 (2.08)	1.23 (2.08)

Table 10: Univariate test on the changes in volatility around the Brexit announcement

Table 10 presents the univariate tests on the changes in daily stock return volatility (ΔVol) from before to after the Brexit announcement in percentage. The post-event period is defined as June 29 – 29 July, 2016 and the pre-event period is defined as June 29 – 29 July, 2015 and June 30 – 29 July, 2014.

In each panel, all firms in the sample are split into three groups *by the percentage of sales with BA and EA* (variable: sales(BA+EA)). In Panel A, the sorting variable is UK firms. In Panel B the sorting variable is non-UK firms. The detailed definitions of these variables are provided in Appendix C. In the last two columns, the t-statistics are calculated based on robust standard errors clustered by industry for UK firms and by industry and country for non-UK firms. *, **, and *** indicate that the event date values are significant at the 10%, 5%, and 1% level, respectively.

	<i>Quantile by Sales(BA+EA)</i>			<i>3 minus 1</i>		<i>Portfolio method (reg)</i>	
	(1) (Lowest)	(2)	(3) (Highest)	Difference	t-stat	beta	t-stat
Panel A: UK firms							
ΔVol	0,568	0,963	0,861	0.293	(1.128)	0.292**	(2.290)
Panel B: non-UK firms							
ΔVol	0.067	-0.022	0.138	0.072	(0.763)	-0.051	(-0.937)

Table 11: Regression results of volatility changes on the Brexit announcement

Table 11 reports the effect of Brexit announcement on the change in daily stock return volatility from before to after the Brexit announcement in percentage (Δ Vol). The post event period is defined as June 29 – 29 July, 2016 and the pre-event period is defined as June 29 – 29 July, 2015 and June 30 – 29 July, 2014. DummyUK is equal to one for British firms. Sales_BA, sales_EA, sales_IA, and sales(BA+EA) are the percentage of sales with BA, the percentage of sales with EA, the percentage of sales with IA and the sum of percentage of sales with BA and EA as of the end of 2015, respectively. LnSZ and B/M are the logarithm of a firm's market value and book-to-market ratio six months before the Brexit announcement (as of the end of 2015). Leverage is the ratio of total liabilities to total assets (as of the end of 2015). AbsBHR is the absolute value of the buy-and-hold stock return from two weeks to one week before the Brexit announcement. IVol refers to idiosyncratic risk obtained from the CAPM used to estimate cumulative abnormal returns. The detailed definitions of these variables are provided in Appendix C. The t-statistics calculated based on robust standard errors clustered by industry and country separately are reported in parentheses. Sample A, subsample B and subsample C include all listed EU firms, UK firms, European non-UK firms, as of the end of 2015, respectively. *, **, and *** indicate that the event date values are significant at the 10%, 5%, and 1% level, respectively.

Dependent variable = Δ Vol (%)

	Sample A: All EU firms				Subsample B: UK firms				Subsample C: Non-UK firms			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DummyUK	0.676*** (11.189)	0.799*** (13.896)	0.829*** (18.395)	0.829*** (18.395)								
Sales_BA (%)	0.003*** (3.738)				0.002 (1.580)				0.005** (2.129)			
Sales_EA (%)		-0.000 (-0.730)				-0.001 (-0.419)				-0.000 (-0.043)		
Sales_IA (%)			-0.001** (-2.207)				-0.002* (-1.701)				-0.001 (-0.735)	
Sales(BA+EA) (%)				0.001** (2.212)				0.002* (1.699)				0.001 (0.744)
LnSZ	0.066*** (6.886)	0.062*** (6.392)	0.069*** (7.078)	0.069*** (7.079)	0.095*** (3.997)	0.090*** (3.823)	0.096*** (4.036)	0.096*** (4.035)	0.044*** (4.308)	0.043*** (4.134)	0.046*** (4.374)	0.046*** (4.377)
B/M	0.026 (1.130)	0.026 (1.105)	0.027 (1.150)	0.027 (1.150)	-0.069 (-1.047)	-0.061 (-0.920)	-0.062 (-0.935)	-0.062 (-0.934)	0.034 (1.478)	0.032 (1.387)	0.033 (1.415)	0.033 (1.415)
Leverage	-0.000 (-0.380)	-0.000 (-0.345)	-0.000 (-0.472)	-0.000 (-0.472)	0.001 (0.774)	0.001 (0.811)	0.001 (0.852)	0.001 (0.851)	-0.000 (-0.130)	-0.000 (-0.098)	-0.000 (-0.142)	-0.000 (-0.143)
AbsBHR	1.555*** (4.466)	1.589*** (4.552)	1.575*** (4.521)	1.575*** (4.520)	1.820** (2.412)	1.871** (2.472)	1.781** (2.365)	1.780** (2.364)	1.619*** (4.175)	1.625*** (4.181)	1.624*** (4.183)	1.624*** (4.184)
IVol (%)	0.103***	0.095***	0.108***	0.108***	0.236***	0.231***	0.239***	0.239***	-0.020	-0.022	-0.019	-0.019

	(8.525)	(7.860)	(8.921)	(8.923)	(10.154)	(9.947)	(10.256)	(10.256)	(-1.342)	(-1.482)	(-1.269)	(-1.268)
_cons	-0.779***	-0.701***	-0.766***	-0.902***	-0.641***	-0.502***	-0.495***	-0.726***	-0.367***	-0.346***	-0.356***	-0.407***
	(-9.218)	(-6.978)	(-9.089)	(-8.760)	(-3.243)	(-2.775)	(-2.766)	(-3.353)	(-4.070)	(-3.123)	(-3.943)	(-3.631)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes
N	2941	2941	2941	2941	788	788	788	788	2153	2153	2153	2153
adj. R-sq	0.18	0.17	0.18	0.18	0.16	0.16	0.17	0.17	0.04	0.04	0.04	0.04
Mean (max) VIF	1.32 (2.69)	1.31 (2.42)	1.25 (1.92)	1.25 (1.92)	1.35 (1.63)	1.31 (1.59)	1.35 (1.66)	1.35 (1.67)	1.24 (2.03)	1.26 (2.07)	1.25 (2.08)	1.25 (2.08)

Table 12: The regression results of the BHMAR

Table 12 reports the effect of Brexit announcement on the long-run market performance (over a 12 months's horizon). The dependent variable is the buy-and-hold abnormal performance (BHMAR) 12 months after the Brexit announcement. $BHMAR_{i,T}^i = \left[\prod_{t=\tau}^T (1 + (R_{i,t} - R_{M,t})) \right] - 1$. Where $R_{i,t}$ is the realized return of company i on day t and $R_{M,t}$ is the return of the benchmark index of company i on day t . Realized return and the return of the benchmark index are in pound sterling (£/GBP) for UK firms and are in (€/euros) for non-UK firms. Normative returns are obtained from FTSE 350 index for UK firms, and from Totmkeu index (Thomson Reuter Index Europe) for non-UK firms. We select the BHMAR on the day $(t + 261)$, which corresponds to the 26 June 2017 (12 months after the Brexit announcement). DummyUK equals to one for British firms. Sales_BA, sales_EA, sales_IA, and sales(BA+EA) are the percentage of sales with BA, the percentage of sales with EA, the percentage of sales with IA and the sum of percentage of sales with BA and EA in December 2015, respectively. LnSZ and B/M are the logarithm of a firm's market value and book-to-market ratio six months before the Brexit announcement (as of the end of 2015). Leverage is the ratio of total liabilities to total assets. BHR is the buy-and-hold stock return from two weeks to one week before the Brexit announcement. IVol refers to idiosyncratic risk obtained from the CAPM used to estimate cumulative abnormal returns. The detailed definitions of these variables are provided in Appendix C. The t-statistics calculated based on robust standard errors clustered by industry and country separately are reported in parentheses. Sample A, subsample B and subsample C represent all listed EU firms, UK listed firms, EU non-UK listed firms, as of the end of 2015, respectively. *, **, and *** indicate that the event date values are significant at the 10%, 5%, and 1% level, respectively.

Dependent variable = BHMAR_totmkeu_12m (%)

	Sample A: All EU firms				Subsample B: UK firms				Subsample C: Non-UK firms			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DummyUK	-1.337	-7.310***	-8.660***	-8.661***								
	(-0.699)	(-3.996)	(-6.045)	(-6.046)								
Sales_BA (%)	-0.130***				-0.147***				-0.198**			
	(-5.401)				(-4.868)				(-2.468)			
Sales_EA (%)		0.021				0.069				0.009		

			(1.035)			(1.470)			(0.405)			
Sales_IA (%)			0.064*** (3.268)				0.181*** (4.923)				0.008 (0.334)	
Sales(BA+EA) (%)				-0.064*** (-3.275)				-0.181*** (-4.932)				-0.008 (-0.339)
LnSZ	-0.497 (-1.626)	-0.267 (-0.860)	-0.573* (-1.826)	-0.573* (-1.828)	-0.658 (-1.031)	-0.081 (-0.126)	-0.770 (-1.204)	-0.769 (-1.204)	-0.496 (-1.411)	-0.462 (-1.276)	-0.527 (-1.457)	-0.527 (-1.458)
B/M	2.622*** (3.587)	2.688*** (3.653)	2.681*** (3.656)	2.681*** (3.656)	4.636*** (2.606)	4.807*** (2.640)	4.238** (2.387)	4.235** (2.386)	2.282*** (2.875)	2.267*** (2.854)	2.270*** (2.858)	2.270*** (2.858)
Leverage	-0.004 (-0.210)	-0.002 (-0.114)	-0.001 (-0.046)	-0.001 (-0.045)	0.010 (0.236)	0.008 (0.181)	0.010 (0.240)	0.010 (0.242)	0.003 (0.110)	0.001 (0.036)	0.001 (0.036)	0.001 (0.036)
BHR (%)	0.163** (2.003)	0.230*** (2.807)	0.200** (2.450)	0.200** (2.449)	0.000 (0.003)	0.094 (0.614)	-0.014 (-0.094)	-0.015 (-0.096)	0.197** (1.998)	0.227** (2.302)	0.222** (2.251)	0.222** (2.252)
IVol (%)	-7.610*** (-20.227)	-7.257*** (-19.182)	-7.515*** (-19.849)	-7.516*** (-19.851)	-7.154*** (-11.635)	-6.646*** (-10.599)	-7.355*** (-11.940)	-7.355*** (-11.941)	-8.224*** (-16.613)	-8.122*** (-16.360)	-8.169*** (-16.450)	-8.169*** (-16.450)
_cons	25.265*** (9.474)	21.324*** (6.679)	23.403*** (8.784)	29.792*** (9.082)	20.774*** (4.020)	7.178 (1.491)	8.499* (1.827)	26.597*** (4.657)	27.766*** (8.890)	26.265*** (6.846)	27.179*** (8.705)	27.974*** (7.209)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes
N	2941	2941	2941	2941	788	788	788	788	2153	2153	2153	2153
adj. R-sq	0.19	0.18	0.19	0.19	0.20	0.17	0.21	0.21	0.17	0.17	0.17	0.17
Mean (max) VIF	1.32 (2.69)	1.31 (2.43)	1.25 (1.92)	1.25 (1.92)	1.35 (1.65)	1.30 (1.60)	1.35 (1.68)	1.35 (1.68)	1.24 (2.03)	1.25 (2.08)	1.25 (2.08)	1.25 (2.08)

Table 13: The regression results of the one-year cumulative abnormal returns

Table 13 reports the effect of Brexit announcement on the long-run market performance (over a 12 months's horizon). The dependent variable is the one-year cumulative abnormal returns ($CAR_{[0; 270]}$). $CAR_{[one\ year]} = \frac{1}{N} (\sum_{t=0}^T R_{i,t} - \sum_{t=0}^T R_{M,t})$. Where $R_{i,t}$ is the realized return of company i on day t and $R_{M,t}$ is the return of the benchmark index of company i on day t . Realized return and the return of the benchmark index are in pound sterling (£/GBP) for UK firms and are in (€/euros) for non-UK firms. Normative returns are obtained from FTSE 350 index for UK firms, and from Totmkeu index (Thomson Reuter Index Europe) for non-UK firms. **We select the $CAR_{[one\ year]}$ on the day $(t + 261)$, which corresponds to the 26 June 2017 (12 months after the Brexit announcement).** DummyUK equals to one for British firms. Sales_BA, sales_EA, sales_IA, and sales(BA+EA) are the percentage of sales with BA, the percentage of sales with EA, the percentage of sales with IA and the sum of percentage of sales with BA and EA in December 2015, respectively. LnSZ and B/M are the logarithm of a firm's market value and book-to-market ratio six months before the Brexit announcement (as of the end of 2015). Leverage is the ratio of total liabilities to total assets. BHR is the buy-and-hold stock return from two weeks to one week before the Brexit announcement. IVol refers to idiosyncratic risk obtained from the CAPM

used to estimate cumulative abnormal returns. The detailed definitions of these variables are provided in Appendix C. The t-statistics calculated based on robust standard errors clustered by industry and country separately are reported in parentheses. Sample A, subsample B and subsample C represent all listed EU firms, UK listed firms, EU non-UK listed firms, as of the end of 2015, respectively. *, **, and *** indicate that the event date values are significant at the 10%, 5%, and 1% level, respectively.

Dependent variable = $CAR_{[one\ year]}$ (%)

	<i>Sample A: All EU firms</i>				<i>Subsample B: UK firms</i>				<i>Subsample C: Non-UK firms</i>			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
DummyUK	0.613 (0.321)	-6.203*** (-3.388)	-7.452*** (-5.211)	-7.453*** (-5.212)								
Sales_BA (%)	-0.143*** (-5.960)				-0.167*** (-5.304)				-0.193** (-2.438)			
Sales_EA (%)		0.018 (0.884)				0.101** (2.064)				-0.001 (-0.048)		
Sales_IA (%)			0.077*** (3.932)				0.194*** (5.090)				0.020 (0.854)	
Sales(BA+EA) (%)				-0.077*** (-3.937)				-0.194*** (-5.094)				-0.020 (-0.858)
LnSZ	-1.078*** (-3.530)	-0.842*** (-2.708)	-1.189*** (-3.799)	-1.189*** (-3.800)	-1.258* (-1.897)	-0.533 (-0.792)	-1.333** (-2.008)	-1.332** (-2.006)	-1.052*** (-3.038)	-1.066*** (-2.987)	-1.133*** (-3.178)	-1.133*** (-3.179)
B/M	2.560*** (3.506)	2.669*** (3.625)	2.583*** (3.529)	2.583*** (3.529)	6.399*** (3.461)	6.863*** (3.608)	5.634*** (3.055)	5.633*** (3.054)	1.915** (2.448)	1.923** (2.453)	1.924** (2.456)	1.924** (2.456)
Leverage	-0.004 (-0.177)	-0.000 (-0.019)	0.002 (0.097)	0.002 (0.098)	-0.022 (-0.498)	-0.021 (-0.467)	-0.025 (-0.556)	-0.025 (-0.553)	0.020 (0.825)	0.019 (0.790)	0.020 (0.808)	0.020 (0.808)
BHR (%)	-0.062 (-0.759)	0.001 (0.012)	-0.031 (-0.383)	-0.031 (-0.384)	-0.094 (-0.600)	0.031 (0.193)	-0.093 (-0.593)	-0.093 (-0.592)	-0.080 (-0.819)	-0.062 (-0.641)	-0.066 (-0.675)	-0.066 (-0.675)
IVol (%)	-3.150*** (-8.379)	-2.814*** (-7.431)	-2.997*** (-7.930)	-2.997*** (-7.931)	-2.371*** (-3.710)	-1.849*** (-2.823)	-2.453*** (-3.833)	-2.453*** (-3.833)	-4.159*** (-8.523)	-4.117*** (-8.406)	-4.116*** (-8.403)	-4.116*** (-8.403)
_cons	23.663*** (8.880)	19.952*** (6.245)	21.618*** (8.128)	29.283*** (8.943)	21.160*** (3.939)	5.062 (1.007)	7.410 (1.534)	26.827*** (4.522)	26.530*** (8.617)	26.204*** (6.924)	25.998*** (8.443)	27.978*** (7.311)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes
N	2941	2941	2941	2941	788	788	788	788	2153	2153	2153	2153
adj. R-sq	0.08	0.06	0.07	0.07	0.08	0.05	0.08	0.08	0.07	0.06	0.06	0.06
Mean (max) VIF	1.32 (2.69)	1.31 (2.43)	1.25 (1.92)	1.25 (1.92)	1.35 (1.65)	1.30 (1.60)	1.35 (1.68)	1.35 (1.68)	1.24 (2.03)	1.25 (2.08)	1.25 (2.08)	1.25 (2.08)

Supplementary tables

Table 14: Cumulative average abnormal returns (CAARs) by event window. Source: Own calculations. (robustness tests)

Table 14 displays the cumulative average abnormal returns (CAARs) in panel A for the 3,015 EU firms. UK corresponds to British firms and non-UK corresponds to European (non-UK) firms. Standard event study techniques are used to calculate unexpected changes in stock prices. The estimation window consists of 270 days' window preceding the event date by 35 days [t-305; t-35]. The CAARs are calculated over different event windows around the event date (t=0). Abnormal returns are calculated using the the [Fama & French's \(1993\)](#) three-factor model (panel A), the [Carhart's \(1997\)](#) four-factor model (panel B), the [Fama & French \(2014\)](#) five-factor model (panel C) and the CAPM model (with double estimation windows [-350; -35[&]+35; +270]) (panel D). Realized return and the return of the benchmark index are in pound sterling (£/GBP) for UK firms and are in (€/euros) for non-UK firms. Normative returns are obtained from FTSE 350 index for UK firms, and from Totmkeu index (Thomson Reuter Index Europe) for non-UK firms. In panel A, column 1 lists the different event windows, columns 2 and 4 list the median CAARs and columns 3 and 5 list the mean CAARs associated with the event windows. Significance of median CAARs is based on Wilcoxon rank sum tests (the null hypothesis is that the median is equal to zero). Significance of mean CAARs is based on standard t-tests (the null hypothesis is that the mean is equal to zero). *, **, and *** correspond to 10%, 5%, and 1% significance level, respectively.

<i>Panel A : CAARs based on Fama & French (1993) three-factor model</i>				
Event window	UK		Non-UK	
	(1) Median %	(2) Mean %	(1) Median %	(2) Mean %
[-1; 0]	-2,73***	-3,33***	2,45***	1,92***
[-2; 2]	-3,00***	-4,36***	5,02***	4,46***
[-5; 5]	-6,10***	-6,29***	4,41***	3,79***
[-10; 10]	-3,98***	-5,44***	2,09***	1,71***
[-15; 15]	-3,61***	-3,87***	4,46***	3,31***
[-20; 20]	-2,07***	-2,93**	2,66***	1,56***
[-30; 30]	-1,13	-0,92	2,33***	1,46***
[-1; 1]	-2,24***	-3,76***	-0,3	-1,30**
N	805		2210	

<i>Panel B : CAARs based on Carhart (1997) four-factor model</i>				
Event window	UK		Non-UK	
	(1) Median %	(2) Mean %	(1) Median %	(2) Mean %
[-1; 0]	-2,88***	-3,44***	2,18***	1,79***
[-2; 2]	-3,57***	-4,61***	4,68***	4,15***
[-5; 5]	-6,39***	-6,48***	4,10***	3,48***
[-10; 10]	-4,89***	-5,86***	1,82***	1,47***
[-15; 15]	-5,00***	-4,40***	3,48***	2,78***
[-20; 20]	-4,40***	-3,54***	1,57***	0,89**
[-30; 30]	-2,47**	-1,44	1,13**	0,69
[-1; 1]	-2,72***	-4,01***	-1,45***	-1,96***
N	805		2210	

<i>Panel C : CAARs based on Fama & French (2014) five-factor model</i>				
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Event window	<u>UK</u>		<u>Non-UK</u>	
	(1) Median %	(2) Mean %	(1) Median %	(2) Mean %
[-1; 0]	-2,41***	-2,99***	2,33***	1,89***
[-2; 2]	-2,43***	-3,69***	4,88***	4,36***
[-5; 5]	-5,53***	-5,69***	4,27***	3,71***
[-10; 10]	-2,90***	-4,46***	1,98***	1,62***
[-15; 15]	-1,81***	-2,74***	3,86***	3,03***
[-20; 20]	-1,36**	-2,18**	1,97***	1,26***
[-30; 30]	-1,57	-1,03	1,93***	1,22**
[-1; 1]	-1,52***	-3,00***	-0,44*	-1,50**
N	805		2210	

Panel D : CAARs based on CAPM (double estimation windows [-350 ; -35[&]+35 ; +270])

Event window	<u>UK</u>		<u>Non-UK</u>	
	(1) Median %	(2) Mean %	(1) Median %	(2) Mean %
[-1; 0]	-1,44***	-2,24***	3,74***	3,02***
[-2; 2]	-3,76***	-5,23***	5,53***	4,71***
[-5; 5]	-9,80***	-10,06***	4,04***	3,25***
[-10; 10]	-10,14***	-11,40***	-0,84***	-1,03***
[-15; 15]	-9,71***	-10,12***	0,79	-0,47*
[-20; 20]	-7,27***	-8,61***	-0,17*	-0,91**
[-30; 30]	-7,37***	-8,37***	1,48***	0,51
[-1; 1]	-1,88***	-3,62***	-0,87***	-1,90***
N	805		2210	

Appendix

Appendix A: Descriptive statistics.

Panel A: Description by country

Country	Isin code	Number of companies	Weight (%)	Market value 2015 (billion €)	Weight	Market value 2016 (billion €)	Weight (%)	
UNITED KINGDOM	GB	805	26.7	2812.739	29.1	2392.866	28	The 28 EU member states
GERMANY	DE	391	13.1	1528.811	15.8	1366.861	16	
FRANCE	FR	388	12.8	1817.895	18.8	1641.385	19.2	
POLAND	PL	246	8.1	144.015	1.5	104.864	1.2	
SWEDEN	SE	235	7.8	528.987	5.5	483.028	5.6	
ITALY	IT	161	5.2	450.054	4.7	390.293	4.6	
SPAIN	ES	103	3.5	665.018	6.9	557.339	6.5	
FINLAND	FI	93	3.1	171.476	1.8	174.181	2	
BELGIUM	BE	82	2.8	153.955	1.6	154.378	1.8	
DENMARK	DK	69	2.3	291.629	3	297.59	3.5	
NETHERLANDS	NL	69	2.2	456.128	4.7	418.977	4.9	
AUSTRIA	AT	51	1.8	85.223	0.9	75.515	0.9	
GREECE	GR	48	1.7	34.022	0.4	31.488	0.4	
IRELAND	IE	39	1.2	165.644	1.7	147.723	1.7	
PORTUGAL	PT	27	1	51.198	0.5	45.857	0.5	
LUXEMBOURG	LU	24	0.8	80.665	0.8	71.998	0.8	
CROATIA	HR	11	0.4	10.467	0.1	9.825	0.1	
LITHUANIA	LT	13	0.4	2.202	0	2.118	0	
ESTONIA	EE	7	0.3	1.423	0	1.635	0	
HUNGARY	HU	8	0.3	9.71	0.1	10.844	0.1	
ROMANIA	RO	11	0.3	14.491	0.2	10.975	0.1	
CYPRUS	CY	6	0.2	1.168	0	0.229	0	
CZECH REPUBLIC	CZ	5	0.2	21.768	0.2	19.493	0.2	
SLOVENIA	SI	7	0.2	4.623	0	4.049	0	
MALTA	MT	3	0.1	0.895	0	1.015	0	
BULGARIA	BG	1	0	0.214	0	0.182	0	
LATVIA	LV	0	0	0	0	0	0	
SLOVAKIA	SK	2	0	0.086	0	0.095	0	
NORWAY	NO	106	3.5	146.724	1.5	129.394	1.5	The three EEA EFTA States
ICELAND	IS	4	0.1	3.159	0	3.659	0	
LIECHTENSTEIN	LI	1	0.1	1.524	0	1.621	0	
Total		3015		9655,91		8549,477		

Panel B: Description of SIC code

SIC CODE	Description of SIC code	SIC_n	Number of observation (EU sample)	Weight
.01-09	Agriculture, Forestry, Fishing	SIC_1	0	0%
.10-14	Mining	SIC_2	136	5%
15-17	Construction	SIC_3	119	4%
20-39	Manufacturing	SIC_4	1122	37%
40-49	Transportation & Public Utilities	SIC_5	271	9%
50-51	Wholesale Trade	SIC_6	91	3%
52-59	Retail Trade	SIC_7	151	5%
60-67	Finance, Insurance, Real Estate	SIC_8	512	17%
70-89	Services	SIC_9	610	20%
91-99	Public Administration	SIC_10	2	0%
NA	NA	SIC_11	1	0%
		Total	3015	

Note: A company may have up to eight SIC codes assigned to it or as little as one depending on the number of business segments that make up the company's revenue. We choose in our analysis the SIC Code 1 (in datastream SIC Code list) that would represent the business segment which provided the most revenue.¹

Note: Industrial Classification Manual compiled by the Executive Office of the President of the United States, Office of Management and Budget. These SIC codes are assigned to both U.S. and non-U.S. companies according to the type of business in which they are engaged. A company may have up to eight SIC codes assigned to it or as little as one depending on the number of business segments that make up the company's revenue. If a sales breakdown for segments is available SIC Code 1 would represent the business segment which provided the most revenue. SIC Code 8 would represent the segment that provided the least revenue. If a sales breakdown is not available, the SIC Code is assigned according to the best judgment of World scope.

Appendix B

i. *Market model:*

The market model is based on the assumption of a constant and linear relation between individual asset returns and the return of a market index: $E(R_{i,t}) = \hat{\alpha}_i + \hat{\beta}_i E(R_{m,t})$, where: $E(R_{i,t})$: is the expected return on the capital asset and $R_{m,t}$ is the return of a market index.

i. *CAPM : Capital asset pricing model*

The CAPM model assumes the following linear relationship: $E(R_{i,t}) = R_{f,t} + \beta_i (E(R_{m,t}) - R_{f,t})$, where: $R_{f,t}$ is the risk-free rate of interest such as interest arising from government bonds (German 10-year bund in our case), β_i : (the beta) is the sensitivity of the expected excess asset returns to the expected excess market returns. $\beta_i = \text{cov}(R_m, R_i) / \text{VAR}(R_m)$.

We estimate the model parameters of the capital asset pricing model by a time-series regression based on realized returns: $E(R_{i,t}) - R_{f,t} = \alpha_i + \beta_i (E(R_{m,t}) - R_{f,t}) + \epsilon_{i,t}$, with $E(\epsilon_{i,t}) = 0$ and $\text{VAR}(\epsilon_{i,t}) = \sigma_{\epsilon_i}^2$.

ii. *Fama–French (1993) three-factor model*²

The Fama-French three-factor model assumes the following relationship:

$$E(R_{i,t}) = R_{f,t} + \beta_i (E(R_{m,t}) - R_{f,t}) + b_{i,s} \text{SMB} + b_{i,v} \text{HML} + \alpha$$

The three factors are (i) company size, (ii) company price-to-book ratio, and (iii) market risk. The "three factor" β_i is analogous to the classical β_i but not equal to it, since there are now two additional factors to do some of the work. SMB stands for "Small [market capitalization] Minus Big" and HML for "High [book-to-market ratio] Minus Low".

Fama and French measure the historic excess returns of small caps over big caps and of value stocks over growth stocks. These factors are calculated with combinations of portfolios composed by ranked stocks (BtM ranking, Cap ranking) and available historical market data.

We estimate the model parameters of the three-factor model by a time-series regression based on realized returns:

$$E(R_{i,t}) - R_{f,t} = \alpha_i + \beta_{i,m} (E(R_{m,t}) - R_{f,t}) + b_{i,s} \text{SMB} + b_{i,v} \text{HML} + \epsilon_{i,t}$$

¹ Datastream SIC Codes description: SIC CODES were developed by the U.S. government to provide a standard industry classification that covers all the economic activities of the United States. They are derived from the 1987 edition of the Standard

² SMB, HML, UMD, RMW and CMA are collected from : <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html>

The Fama/French factors are constructed using the 6 value-weight portfolios formed on size and book-to-market.

*SMB (Small Minus Big) is the average return on the three small portfolios minus the average return on the three big portfolios, $SMB = 1/3 (Small\ Value + Small\ Neutral + Small\ Growth) - 1/3 (Big\ Value + Big\ Neutral + Big\ Growth)$.

*HML (High Minus Low) is the average return on the two value portfolios minus the average return on the two growth portfolios, $HML = 1/2 (Small\ Value + Big\ Value) - 1/2 (Small\ Growth + Big\ Growth)$.

Detail for 6 Portfolios Formed on Size and Book-to-Market

The portfolios, which are constructed at the end of each June, are the intersections of 2 portfolios formed on size (market equity, ME) and 3 portfolios formed on the ratio of book equity to market equity (BE/ME). The size breakpoint for year t is the median of our sample listed companies at the end of **June** of year t. BE/ME for **June** of year t is **the book equity for the last fiscal year** end in t-1 divided by ME for December of t-1. The BE/ME breakpoints are the 30th and 70th (our listed companies: UK and European companies) percentiles.

	Median ME	
70th BE/ME percentile	Small Value	Big Value
	Small Neutral	Big Neutral
30th BE/ME percentile	Small Growth	Big Growth

iii. The Carhart (1997): four-factor model:

$$E(R_{i,t}) - R_{f,t} = \alpha_i + \beta_i (E(R_{m,t}) - R_{f,t}) + b_{i,s} SMB + b_{i,v} HML + b_{i,u} UMD + \epsilon_{i,t}$$

UMD represents the momentum.

iv. Fama-French (2014): five-factor model

$$E(R_{i,t}) - R_{f,t} = \alpha_i + \beta_i (E(R_{m,t}) - R_{f,t}) + b_{i,s} SMB + b_{i,v} HML + b_{i,r} RMW_t + b_{i,c} CMA_t + \epsilon_{i,t}$$

In this equation RMW_t is the difference between the returns on diversified portfolios of stocks with robust and weak profitability, and CMA_t is the difference between the returns on diversified portfolios of low and high investment stocks, which [Fama & French \(2014\)](#) call conservative and aggressive.

If the sensitivities to the five factors, β_i , $b_{i,s}$, $b_{i,v}$, $b_{i,r}$ and $b_{i,c}$ capture all variation in expected returns, the intercept α_i is zero for all securities and portfolios i. ³

³Fama and French (2014), five-factor model.

<https://www8.gsb.columbia.edu/programs/sites/programs/files/finance/Finance%20Seminar/spring%202014/ken%20french.pdf>

Appendix C: Variable definitions

<i>Variable</i>	<i>Definition and data source</i>
DummyUK	Dummy variable equals to 1 for UK firms and to 0 for non-UK firms.
Sales_BA	Percentage of sales with British area “UK” as of the end of the 2015.
Sales_EA	Percentage of sales with euro (non-UK) area “EA” as of the end of the 2015.
Sales_IA	Percentage of sales with non-euro area “IA” as of the end of the 2015.
Sales_BA_EA	Percentage of sales with British area “UK” and euro (non-UK) area “EA” as of the end of the 2015. (Sum of Sales_BA and Sales_EA).
BHAR_12m	The buy-and-hold abnormal return 12 months after the Brexit announcement, when the normative returns are obtained from Totmkeu index (Thomson Reuter Index Europe). $BHAR_{i,[\tau_1,\tau_2]} = \prod_{t=\tau_1}^{\tau_2} [1 + R_{i,t}] - \prod_{t=\tau_1}^{\tau_2} [1 + R_{M,t}]$. We select the BHAR on the day (t + 261), which corresponds to the 26 June 2017 (12 months after the Brexit announcement).
BHMAR_12m	The buy-and-hold abnormal performance 12 months after the Brexit announcement, when the normative returns are obtained from Totmkeu index (Thomson Reuter Index Europe). $BHMAR_{i,T} = \left[\prod_{t=\tau}^T (1 + (R_{i,t} - R_{j,t})) \right] - 1$. We select the BHMAR on the day (t + 261), which corresponds to the 26 June 2017 (12 months after the Brexit announcement).
CAR _[one year]	The one-year cumulative abnormal returns (CAR _[0; 270]) when the normative returns are obtained from Totmkeu index. We select the CAR _[one year] on the day (t + 261), which corresponds to the 26 June 2017 (12 months after the Brexit announcement).
CAAR	The cumulative abnormal return over the three-day window (i.e., June 23, 24 and 27, 2016) centered on the Brexit announcement (June 24, 2016) in percentage based on CAPM. Source: Datastream.
CAAR	The absolute cumulative abnormal return over the three-day window (i.e., June 23, 24 and 27, 2016) centered on the Brexit announcement (June 24, 2016) in percentage based on CAPM. Source: Datastream.
CRR	The cumulative raw return over the three-day window (i.e., June 23, 24 and 27, 2016) centered on the Brexit announcement (June 24, 2016) in percentage. Source: Datastream.
ΔVol	The difference in volatility of daily stock returns in percentage over a one-month window following the Brexit announcement (June 29 – 29 July, 2016) and during the same calendar time window in the previous two years (i.e., (June 29 – 29 July, 2015 and June 30 – 29 July, 2014). Winsorized at the 0.5% and 99.5% levels. Source: Datastream.
ΔForecast EPS_2016	The change in analysts’ earnings forecasts per share (EPS) divided by the stock price two days prior to the Brexit announcement (which corresponds to the June 22, 2016 and prices are in pound sterling (£/GBP) for UK firms and are in (€/euros) for non-UK firms) in percentage for year 2016. The change in analysts’ EPS forecasts is defined as the difference between the median EPS forecast six months after the Brexit announcement and the median EPS forecast six months before the Brexit announcement. Winsorized at the 0.5% and 99.5% levels. Source: Datastream.
ΔForecast EPS_2015	The change in analysts’ EPS forecasts divided by the stock price two days prior to the Brexit announcement (which corresponds to the June 22, 2016) for year 2015. ΔForecast EPS_2015 is defined similarly to ΔForecast EPS_2016. Source: Datastream.
SD_EPS_2016	Standard deviation of analysts’ EPS forecasts for year 2016 in the (-6m, +6m) window around the Brexit announcement. Winsorized at the 0.5% and 99.5% levels. Source: Datastream.
SD-EPS_2015	Standard deviation of analysts’ EPS forecasts for year 2015 in the (-6m, +6m) window around the Brexit announcement. Winsorized at the 0.5% and 99.5% levels. Source: Datastream.
OPOA (2015) (Oinc./TA)	Operating income divided by total assets as of the end of 2015 in percentage. Winsorized at the 0.5% and 99.5% levels. Source: Datastream.
OPOA (2016) (Oinc./TA)	Operating income divided by total assets as of the end of 2016 in percentage. Winsorized at the 0.5% and 99.5% levels. Source: Datastream.
ΔOPOA	The change in OPOA from fiscal 2015 to fiscal 2016 = OPOA(2016) – OPOA(2015).
SOA (2015) (Netsales/TA)	The rotation of invested capital equals to revenues (net sales) divided by the total assets as of the end of the 2015 in percentage. Winsorized at the 0.5% and 99.5% levels. Source: Datastream.

SOA (2016) (Netsales/TA)	The rotation of invested capital equals to revenues (net sales) divided by the total assets as of the end of the 2016 in percentage. Winsorized at the 0.5% and 99.5% levels. Source: Datastream.
Δ SOA	The change in SOA from fiscal 2015 to fiscal 2016 = SOA(2016) – SOA(2015).
Δ MarketShares	Growth in net sales computed as $\text{Net sales}_{\text{Dec.2016}} - \text{Net sales}_{\text{Dec.2015}}$ divided by $\text{Net sales}_{\text{Dec.2015}}$.
LnSZ	The natural logarithm of the firm market value as of the end of the 2015. Winsorized at the 0.5% and 99.5% levels. Source: Datastream.
B/M	Book-to market ratio, constructed as the book value of equity as of the end of 2015 divided by the market value of equity as of the end of 2015. Winsorized at the 0.5% and 99.5% levels. Source: Datastream.
Leverage	Total liabilities (debts) divided by total assets as of the end of 2015. Winsorized at the 0.5% and 99.5% levels. Source: Datastream.
BHR	Buy-and-hold stock return from two weeks to one week before the Brexit announcement in percentage. Source: Datastream.
AbsBHR	Absolute value of the buy-and-hold stock return from two weeks to one week before the Brexit announcement. Source: Datastream.
Beta	Beta obtained from the market model in estimating the cumulative abnormal return. Source: Datastream.
IVol	Idiosyncratic volatility, which is defined as the standard deviation of the daily return residuals from the CAPM used to estimate the cumulative abnormal return, multiplied by 100. Source: Datastream.

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