Mergers and Acquisitions and Brexit: A Natural Experiment

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Abstract

We study the impact of Brexit uncertainty on one of the most important forms of corporate investment: mergers and acquisitions (M&As). Brexit provides us with an ideal natural experiment to explore the real effects of economic uncertainty and understand the underlying transmission mechanism. We document a significant decline in the number of M&A deals for UK firms after Brexit compared to EU firms. This inhibiting effect is amplified by the channels of real options, foreign trade, and financial constraints. Overall, our results provide for deeper understanding of this unprecedented uncertainty in Brexit policy on local M&A activity. Policy makers are urged to respond.

JEL classification: G30; G38

Keywords: Brexit; Uncertainty; Mergers and acquisitions; Real options

1. Introduction

The British voted to leave the European Union (EU) in the referendum of 23 June 2016. The unexpected Brexit event triggered a surge in uncertainty for UK businesses, evidenced by numerous news articles (Koch et al., 2024). Historical events, including the 1973 oil crisis, Gulf Wars, and the 2007 financial crisis, caused instant but temporary spikes in uncertainty. However, Brexit is unprecedented as it creates long-lasting uncertainty (Bloom et al., 2019; Kellard et al., 2021) and financial contagion (Escribano and Íñiguez, 2021), imposes new environment how UK firms operate (Hill et al., 2019), and reduces firms' hiring and investment (Hassan et al., 2024). It was not until the December 2019 election when the British parliament ratified the withdrawal agreement with the EU and the UK departed on 31 January 2020.

Prior studies (Harford, 2005; Cao et al., 2019; Koirala et al., 2022) show that economic, regulatory, and policy uncertainty play an important role in firms' mergers and acquisitions (M&As). Following these leads, we examine the impact of Brexit on M&As. While uncertainty proxies can be endogenous to the decision-making of M&A activities (Rodrik, 1991; Cao et al., 2019), we use a novel quasi-experimental research design to circumvent endogeneity issues. Using a sample from the STOXX Europe 600 Index, comprising 600 firms across 17 European countries, we designate UK firms as the treated group and EU firms as the control group. Through a difference-in-difference (DID) research design, we show that the number of UK firm M&A deals is reduced compared to that of non-UK firms in the STOXX Europe 600 Index post-Brexit.

We then investigate the economic mechanisms behind this reduction. Real options theory (Dixit and Pindyck, 1994) shows that a firm's expansion becomes more cautious under conditions of uncertainty and waiting can be beneficial during such periods (McGrath, 1997). The value of

real options to delay investment during uncertainty is higher for firms with higher irreversibility (Bernanke, 1983; Quigg, 1993; Bloom, 2009; Gulen and Ion, 2016).

Following these studies, we conduct cross-sectional tests to examine the real options channel. First, we examine the DID effect across firms with low and high investment irreversibility. Using five measures of investment irreversibility, we find that the reduction in UK companies' M&As after Brexit is significant for high investment irreversibility firms but not for low investment irreversibility firms, consistent with real options theory.

Second, we examine the DID effect across firms with low and high industry competition. UK firms tended to delay M&A deals due to Brexit uncertainty under the framework of real options theory. However, delays can incur high costs, especially for firms in competitive industries since competitors may benefit from the delay decisions (Grenadier, 2002). This, in turn, lowers the value associated with real options. Therefore, we conjecture that the inhibiting or negative effect of Brexit uncertainty on M&A deals is more pronounced for firms with low industry competition since bids from competitors would be less likely. Our results are consistent with expectation.

Further, we investigate the effect of Brexit on M&A deals through the foreign trade channel. Trade reforms can be accompanied by positive impacts on investment and employment due to the reduction of uncertainty, such as in making temporary agreements permanent.[1] The withdrawal of the UK from the EU single market and customs union can be considered a "reversal in" trade reform, affecting free trade adversely and inducing uncertainty. We posit that the negative effect of Brexit on UK firms' M&A activity is more pronounced for firms with high foreign sales. Our findings are consistent with this.

[1]See Harrison (1994), Melitz (2003), Bloom et al. (2016), and Crowley et al. (2018).

Finally, we investigate the effect of Brexit on M&A deals through the financial constraints channel. Financially constrained firms tend to have limited access to M&A deals (Francis et al., 2008; Masulis and Simsir, 2018) so are more likely to save cash by dampening expansion during periods of uncertainty Erel et al. (2015) due to the considerable resource requirements of M&As. We expect and subsequently show the negative effect of Brexit on UK companies' M&As to be more pronounced for constrained firms.

Our research makes several significant contributions to the literature. First, we add to the growing body of work examining the implications of Brexit-related uncertainty. Brexit represents a distinctive form of uncertainty, characterized by its prolonged duration, substantial economic and political significance, and complex geopolitical dynamics (Bloom et al., 2018). Its ongoing and multifaceted consequences remain a topic of debate and scrutiny in both academic and policy discussions. While previous studies have explored Brexit's effects on various economic domains, including financial markets (Davies and Studnicka, 2018; Schiereck et al., 2016; Hudson et al., 2020; Koch et al., 2024), loan markets (Berg et al., 2021), private equity (Wright et al., 2016; Kellard et al., 2021), and trade (Van Reenen, 2016; Bloom et al., 2019; Born et al., 2019; Hill et al., 2019; Steinberg, 2019; McGrattan and Waddle, 2020; Hassan et al., 2024), our study addresses a notable gap by investigating its impact on M&As. M&As represent a critical dimension of corporate investment, yet its response to Brexit-related uncertainty has received limited attention.

Second, we contribute methodologically by employing an innovative research design to examine the effects of uncertainty. Prior studies often rely on broad economic indices as proxies for uncertainty to analyze its impact on corporate decision-making (Nguyen and Phan, 2017;

Bonaime et al., 2018). However, these indices may overlook the unique features of events such as Brexit. Our approach leverages Brexit as an exogenous shock, an event with profound political, social, and economic ramifications, to implement a quasi-natural experimental design. This method allows us to isolate and systematically evaluate the specific influence of Brexit-induced uncertainty on firms' M&A activities. By focusing on this novel design, we provide a more detailed understanding of how unprecedented geopolitical events shape corporate strategies. Furthermore, our methodology aligns with recent advancements in empirical research emphasizing the importance of addressing endogeneity concerns. Roberts and Whited (2013) underscore the value of natural experiments in establishing causal relationships, which is a key focus of our study.

Finally, we contribute to the literature by examining the heterogeneity in the Brexit-induced effects on M&A activity through the lens of firms' foreign sales. We provide novel evidence that firms with higher foreign sales are disproportionately affected by Brexit, highlighting the importance of trade dependencies in strategic investment decisions under uncertainty. While prior studies examine the impact of policy uncertainty on M&As through the real options channel (Nguyen and Phan, 2017; Bonaime et al., 2018), our findings extend this work by highlighting the distinct effects of Brexit's "reverse trade reform" on M&A activities. This perspective not only enhances our understanding of how policy shocks reshape investment landscapes for globally engaged firms but also underscores the importance of policy clarity in mitigating disruptions to corporate expansion strategies.

The decline in M&A deals among UK firms carries significant policy implications. UK policymakers might consider introducing incentives or regulatory adjustments to stimulate M&A

activities, particularly in sectors heavily impacted by Brexit. Our findings indicate that firms with high investment irreversibility are more adversely affected by Brexit due to the value of delaying investments during uncertain times. Policies that reduce uncertainty, such as clear guidelines on trade, labor, and financial regulations, could encourage firms to proceed with strategic investments rather than postponing them.

Additionally, firms with significant foreign sales are more likely to be negatively impacted by Brexit due to increased uncertainty in international trade. To support these firms, policymakers could negotiate trade agreements that reduce trade barriers and provide greater certainty in foreign markets.

Further, financially constrained firms are shown to be more adversely affected by Brexit in the context of M&As. Financial institutions and policymakers could collaborate to improve access to capital for these firms, particularly during periods of economic uncertainty. Policies such as easing credit conditions, offering low-interest loans, or establishing special funds for M&A activities could help mitigate these constraints.

Senior management teams in UK firms should also consider these findings when planning M&A strategies. The heightened uncertainty following Brexit necessitates more cautious approaches, potentially focusing on smaller and less risky acquisitions. Furthermore, management should closely monitor industry competition and financial constraints, adjusting their strategies accordingly to optimize M&A decisions.

The remainder of the paper proceeds as follows. In Section 2, we review the literature and develop our hypotheses. In Section 3, we describe the data, while in Section 4, we conduct empirical analyses. Finally, Section 5 concludes the paper.

2. Literature and Hypotheses Development

Uncertainty refers to the unpredictability of future events or outcomes due to incomplete or unclear information. It affects decision-making by firms, households, and governments. Galbraith (1977) emphasizes its significance in economic and financial contexts, noting its wide-ranging impact. Abel (1983) describes uncertainty in economic systems as unexpected changes that influence fiscal, regulatory, or monetary policies, often resulting in delays in investment, spending, and other economic actions.

Uncertainty can arise from various sources, including geopolitical events, industry-specific shocks, or firm-level disruptions. Examples include political uncertainty during election years (Julio and Yook, 2012) and ambiguity in trade policies (Baker et al., 2016). These types of uncertainty affect the economic environment in distinct ways, requiring targeted approaches for analysis.

Brexit uncertainty specifically relates to the ambiguity surrounding the economic, regulatory, and trade-related consequences of the UK's departure from the European Union. Unlike Brexit as an event, Brexit uncertainty focuses on the unpredictability introduced into economic decision-making. Key areas of concern include future trade agreements, market access, and regulatory alignment. Brexit has caused a substantial and persistent rise in uncertainty (Bloom et al., 2019), stemming from economic and policy ambiguities regarding trade policies, regulations, and overall economic conditions (Graziano et al., 2021; Hassan et al., 2024). The unpredictable trade policy environment, particularly concerning tariffs, regulations, and market access, has posed significant challenges for businesses and governments.

Firms face increased risks when making long-term investment and employment decisions due to this uncertainty. Graziano et al. (2021) estimate that Brexit-related uncertainty reduces trade values by 11-20%, particularly in industries exposed to higher potential tariffs. Sectors requiring large upfront investments have been especially affected, consistent with the theory of investment under uncertainty, which argues that higher uncertainty increases the option value of waiting, leading firms to delay irreversible investments (Dixit and Pindyck, 1994). This uncertainty has also negatively affected investment, employment, and productivity in the UK, with broader implications for global trade and investment (Bloom et al., 2019; Hassan et al., 2024).

Measuring uncertainty has been a persistent challenge in economic research. Early methods relied on financial market indicators, such as the Chicago Board Options Exchange Volatility Index (VIX). While widely used, VIX captures market volatility rather than broader policy-related uncertainty and is less applicable in contexts with less developed financial systems or illiquid markets.

To address these limitations, Baker et al. (2016) develop the Economic Policy Uncertainty (EPU) index. This index combines newspaper coverage, tax code expirations, and forecaster disagreements to quantify policy-related uncertainty. It tracks spikes in uncertainty during significant events, such as elections and financial crises. For Brexit, the EPU index captures changes in economic and regulatory ambiguity over time.

Other measures include sentiment-based indices, such as the FEARS index Da et al. (2015) and the firm-level political risk index Hassan et al. (2019), which use textual analysis to assess investor sentiment and political risks. While these measures add detail, they face challenges such as limited data availability and applicability across contexts.

2.1. Impact of Breixt on M&A activities

The relationship between uncertainty and corporate investment is not straightforward. Theoretical perspectives offer divergent views depending on the assumptions about market structure, risk preferences, and investment characteristics. Prior studies, such as Hartman (1972), Abel (1983), and Caballero (1991), suggest that uncertainty may stimulate investment under specific conditions. Specifically, in markets with perfect competition, risk-neutral agents, and constant returns-to-scale production, uncertainty increases the expected marginal returns to investment, encouraging firms to invest.

However, these results are highly context-dependent. For many investments that are irreversible, firms face greater risks under uncertainty. The real options framework, developed by Bernanke (1983), McDonald and Siegel (1986), and Dixit and Pindyck (1994), provides a contrasting view. It posits that uncertainty increases the value of delaying investment until better information becomes available. Abel and Eberly (1994) extend this idea, showing that firms are likely to postpone projects when they have flexibility. Consistent with this framework, Gulen and Ion (2016) find that policy uncertainty reduces corporate investment in the United States.

Uncertainty also impacts firms indirectly, primarily by increasing financial constraints and influencing managerial behavior. Greenwald and Stiglitz (1990) and Pástor and Veronesi (2013) argue that policy uncertainty raises the cost of external financing, disproportionately affecting firms that rely heavily on external capital. Similarly, Gilchrist et al. (2014) show that higher uncertainty leads to increased credit spreads, further discouraging investment. On the managerial side, Panousi and Papanikolaou (2012) find that uncertainty amplifies managerial risk aversion, reducing executives' willingness to approve projects with uncertain outcomes.

Empirical studies supports these theoretical insights. For example, using U.S. election years as a proxy for political uncertainty, Julio and Yook (2012) show that firms reduce investment by nearly 5% during election periods. Similarly, Jens (2017) observes a decline in the months preceding elections, while An et al. (2016) document comparable effects in the Chinese market. Kang et al. (2014) and Gulen and Ion (2016) use policy uncertainty indices to show a robust negative relationship between uncertainty and investment across various industries.

M&As, as substantial and often irreversible investments, are particularly sensitive to uncertainty. Bonaime et al. (2018) find that policy uncertainty decreases M&A activity, largely through the real options mechanism, as firms delay decisions to mitigate potential losses. Nguyen and Phan (2017) provide further evidence, showing that policy uncertainty reduces the likelihood of acquisitions and prolongs deal completion times. During these periods, acquirers often prefer stock-based payments to preserve liquidity, and their cautious approach results in higher abnormal returns around deal announcements.

However, not all evidence points in the same direction. Garfinkel and Hankins (2011) suggest that some firms use M&A activity as a strategic tool to manage risk, particularly through vertical acquisitions that stabilize supply chains. Similarly, Duchin and Schmidt (2013) argue that uncertainty can facilitate managerial empire-building, as reduced investor oversight during turbulent periods allows managers to pursue acquisitions with fewer immediate consequences.

Brexit exemplifies the complex effects of uncertainty on M&A activity. On the one hand, the referendum and subsequent negotiations created significant uncertainty around trade agreements, regulatory frameworks, and economic stability, discouraging many firms from engaging in M&As. For instance, Kellard et al. (2021) show that heightened uncertainty, especially measures closely

aligned with Brexit, has significantly reduced private equity activity in the UK. On the other hand, certain firms have found opportunities amid this uncertainty. Breinlich et al. (2020) find a significant increase in outward investment activity by UK firms following the Brexit vote. Dhingra et al. (2017) highlight that the depreciation of the British pound made UK assets more attractive to foreign buyers, potentially increasing inbound M&A activity. Davies and Studnicka (2018) further demonstrate that some industries may benefit from regulatory divergence, spurring firms to acquire competitors or consolidate market positions domestically.

Despite these sectoral differences, the overall effect of Brexit is expected to be negative for M&A activity. The uncertainty it created is likely to outweigh the opportunities it presented, leading most firms to adopt a cautious approach. Based on these considerations, we propose the following hypothesis:

Hypothesis 1 *Brexit reduces firms' M&A activities.*

2.2. The real options transmission channel

Corporate real options offer firms the flexibility to delay or adjust investment decisions as conditions evolve, akin to financial options (Trigeorgis, 1996). This perspective is particularly valuable under uncertainty, as firms weigh the benefits of immediate investment against the option to wait for better information (Dixit and Pindyck, 1994). Investments that are difficult or costly to reverse, such as M&As, tend to enhance the value of waiting. Bernanke (1983) and Quigg (1993) provide theoretical and empirical evidence that firms are more likely to defer irreversible investments during uncertain times, as delaying can mitigate the risks associated with long-term commitments.

In the context of M&As, investment irreversibility is especially relevant. Quigg (1993) demonstrates that market prices often reflect a premium for the flexibility to delay investments, particularly when the costs of reversing such decisions are high. Gulen and Ion (2016) extend this view by showing that firms facing greater investment irreversibility are more likely to delay investments during periods of heightened policy uncertainty. M&A transactions, which involve significant financial and operational commitments, exemplify these dynamics, as firms often hesitate to proceed under unclear regulatory or economic conditions.

However, the benefits of waiting are not universal. Industry competition can significantly influence the strategic value of delay. Grenadier (2002) argues that in highly competitive markets, the opportunity costs of waiting can outweigh the advantages. Competitors may seize market opportunities, eroding potential gains for firms that delay their investments. Conversely, in less competitive industries, firms face lower risks of losing strategic opportunities, making the option to wait more attractive. This distinction underscores the importance of competition in shaping firms' responses to uncertainty in the M&A context.

Another critical factor is the extent to which firms or their target industries are exposed to policy uncertainty. Bonaime et al. (2018) highlight that heightened uncertainty about regulatory changes and economic policies creates additional risks for firms engaged in M&A activity. These risks are particularly pronounced in sectors heavily affected by Brexit, such as those reliant on external trade or facing significant regulatory shifts. Bloom et al. (2019) emphasize that Brexit's unexpected nature amplifies its impact on firms, with pre-referendum exposure to European markets playing a key role in determining the extent of uncertainty faced by different industries. Based on the preceding discussion, we formulate the following hypothesis:

Hypothesis 2 *Brexit increases firms' value from real options to delay M&As. Firms' M&A deals are more negatively affected when they have higher irreversibility, lower industry competition, and greater exposure to policy uncertainty.*

2.3. Heterogeneous Effects

Prior research shows that free trade enhances economic performance through a range of mechanisms, including improved productivity, efficient resource allocation, access to superior inputs, and increased innovation. Harrison (1994) and Pavcnik (2002) find that trade liberalization drives productivity growth by intensifying competition and reallocating resources from less efficient to more productive firms. Melitz (2003) builds on this by showing that trade enables only the most productive firms to engage in export markets, which raises overall industry productivity through resource reallocation.

Trade also strengthens firm performance by improving access to higher-quality and more diverse inputs. Amiti and Konings (2007) find that reductions in input tariffs lead to significant productivity gains, while Topalova and Khandelwal (2011) demonstrate similar effects in India's trade reforms. Further, Limão and Maggi (2015) highlight that reducing trade policy uncertainty helps create stable conditions that encourage investment and innovation, further amplifying the benefits of liberalization.

The competitive pressures induced by trade openness also play a key role in fostering innovation. Bloom et al. (2016) show that exposure to competition from Chinese imports spurs European firms to innovate and adopt advanced technologies, significantly boosting productivity. De Loecker et al. (2016) observe that trade liberalization reduces prices and marginal costs, re-

flecting enhanced production efficiency. These studies collectively highlight the broad economic benefits of free trade.

However, Brexit represents a stark departure from this trend. By increasing uncertainty around trade agreements, market access, and regulatory alignment, Brexit has introduced significant challenges to firms with cross-border operations. Goldberg and Pavcnik (2016) discuss how trade restrictions can reduce productivity and disrupt resource reallocation, while Crowley et al. (2018) show that policy uncertainty discourages firms from entering foreign markets, making them less likely to pursue growth through strategic investments such as M&As.

For firms with significant foreign sales, these challenges are particularly acute. Such firms depend on stable access to international markets, which is now threatened by the uncertainty surrounding Brexit. Disruptions to trade relationships and potential regulatory misalignment increase the risks associated with M&As, making firms more hesitant to commit to these long-term investments. This reluctance is especially pronounced for firms operating in sectors heavily dependent on cross-border trade, as Brexit creates significant uncertainty about future market conditions.

Hypothesis 3 *H3: Firms' M&A deals are more negatively affected by Brexit when they have higher foreign sales.*

Acquirers require substantial resources to execute M&As, making financial constraints a critical factor in determining firms' ability to pursue such deals. Prior research highlights the central role of access to capital in facilitating M&A activity. Francis et al. (2008) find that U.S. acquirers benefit significantly from cross-border M&As, particularly when targeting firms in countries with less integrated financial markets. These gains are linked to the internal capital markets

of diversified firms, which help overcome financial constraints and enhance the value of global diversification. Similarly, Maksimovic and Phillips (2008) demonstrate that diversified firms are better positioned to undertake acquisitions, especially during periods of industry distress, due to their ability to leverage internal resources.

In contrast, firms facing financial constraints are less likely to engage in M&A activity, particularly during periods of heightened uncertainty. Erel et al. (2015) provide evidence that financially strong acquirers relieve the financial constraints of target firms, allowing them to increase investment and reduce reliance on internal cash flows post-acquisition. This underscores the importance of financial health in enabling firms to act as acquirers, particularly in uncertain environments.

Policy uncertainty further exacerbates these dynamics by increasing the cost of raising capital. Greenwald and Stiglitz (1990) highlight how credit rationing and equity market imperfections constrain firms' ability to finance investments during uncertain periods. Pástor and Veronesi (2013) demonstrate that political uncertainty increases risk premiums, making external financing more expensive. Similarly, Gilchrist et al. (2014) and Brogaard and Detzel (2015) find that heightened uncertainty amplifies financial frictions, discouraging investment activity. Nguyen and Phan (2017) show that policy uncertainty reduces the likelihood of M&A activity, extends deal completion times, and influences payment structures, with constrained firms being particularly vulnerable.

Brexit represents a significant policy shock, introducing unprecedented uncertainty in trade, regulation, and economic stability. Firms that are financially constrained are likely to face even greater challenges in pursuing M&A deals under such conditions. These firms are more exposed

to higher capital costs and restricted financing options, which can deter strategic investments such as M&As. Consequently, financially constrained firms are expected to reduce M&A activity more sharply in response to Brexit-induced uncertainty compared to their less constrained counterparts.

Hypothesis 4 *Firms' M&A deals are more negatively affected by Brexit when they are more financially constrained.*

3. Data and descriptive statistics

Our sample consists of all publicly listed firms from the STOXX 600 Index, which is widely used for benchmarking in the finance industry and academic research, and has the advantage of covering a fixed number of 600 stocks across seventeen European countries, with small, medium, and large market capitalization, constituting 95% of the European stock market capitalization (STOXX, 2018). We exclude investment trusts and firms outside the UK and EU from our sample. Following previous studies (von Eije and Wiegerinck, 2010; Craninckx and Huyghebaert, 2011; De Beule and Duanmu, 2012), we collect M&A information from Zephyr via Bureau Van Dijk (BvD), which provides a good coverage of European transactions (Huyghebaert and Luypaert, 2010). Following Alperovych et al. (2021), we include the M&A deals classified as "Acquisition," "Merger," "Institutional buy-out," "Management buy-out," or "Management buy-in.", and with a minimum 50% stake acquired.

We further obtain a host of data at both the firm level and macroeconomic level to construct our control variables. Firms' financial and accounting data are from Datastream. In line with prior studies (Ferrell et al., 2016), we obtain firm-level governance scores from Thomson Reuters,

namely for three distinct pillars: management, shareholders, and corporate social responsibility (CSR) strategy. We obtain country-level GDP per capita from the World Bank, and country-level exchange rate from the Organisation for Economic Co-operation and Development (OECD).

Following Nguyen and Phan (2017), Bonaime et al. (2018), and Berg et al. (2021), we employ several firm-level control variables including firm size (Size), market to book ratio (MB), capital expenditure (Capx), cash holding (Cash), free cash flow (Cashflow), net working capital (NetWC), leverage (Lev), the Herfindahl-Hirschman Index (HHI), sales growth (SaleGrowth), and return on assets (ROA) to take into account the firm-level heterogeneity in our tests. The continuous variables are winsorized at the top and bottom 1% of the distribution to mitigate the impact of outliers. Online Appendix B provides a detailed description of all variables used in this study. Online Appendix Table A.1 reports the average number of firms across countries.

Table 1 provides descriptive statistics and correlations for the main variables used. Between 2012 and 2020 (Panel A Table 1), the average of number of M&A deals made by STOXX 600 firms was 0.43. Before Brexit, between 2012 and 2015 (Panel B Table 1), the average number of deals was 0.48. After Brexit, between 2017 and 2020 (Panel C Table 1), the average number of deals is 0.39. Overall, the average number of deals dropped notably after Brexit. We also find that despite the average firm size, cash holding, leverage, and sales growth increasing after Brexit, the average net working capital, HHI, and ROA in firms decrease after Brexit. Panel D shows that firm size, market-to-book ratio, and sales growth are positively correlated with the number of M&A deals. This suggests that larger firms, those with greater growth opportunities, and those experiencing higher sales growth are more likely to engage in M&As, consistent with Nguyen and Phan (2017) and Bonaime et al. (2018).

4. Empirical results

4.1. Baseline results

Following the study by Berg et al. (2021), we conduct the following DID regression to examine the effect of Brexit on M&As deals, as

$$DEALS_{i,t} = \alpha + \beta_0 DID_{i,t} + \beta_1 X_{i,t} + \varepsilon_{i,t} + \lambda_j + u_t, \tag{1}$$

where i indexes firm, and t indexes year. $DEALS_{i,t}$ represents the natural logarithm of one plus number of M&A deals conducted by firm i in year t. The main explanatory variable is the difference-in-differences (DID) interaction term, defined as DID=UK $\times$ PostBrexit. Specifically, the dummy variable UK equals one if the deal was initiated by UK-based firms, and zero otherwise. The dummy variable PostBrexit is equal to one for years between 2017 and 2020, and zero for years between 2012 and 2015. Observations from 2016 are excluded to ensure cleaner firm identification. A firm is identified as a UK firm if it is included in the FTSE All Share Index, which accounts for approximately 27.52% of our sample. The variable X represents a set of control variables. Additionally, λ_j and u_t represent country and year fixed effects, respectively.

We use the ordinary least squares (OLS) regression model to estimate Eq. (1). Table 2 reports the regression results examining the effect of Brexit on firms' M&A activities. The DID coefficient is significantly negative, suggesting that UK firms made fewer M&A deals than EU firms after Brexit. Negative DID coefficient would imply that Brexit depresses the external expansion of firms through M&As. The DID coefficient is significantly negative (-0.195) at the 5% level, suggesting that UK firms' engagement in M&A investment decreased following the Brexit

announcement. As shown in Table 2, the acquisition activities dropped by 4.6% ($\exp(-0.047)-1$) following this notice.

The finding is consistent with prior studies (Nguyen and Phan, 2017; Bonaime et al., 2018) highlighting the strong sensitivity of M&A activity to policy uncertainty, which reduces M&A activity as firms delay strategic decisions to minimize potential losses. The uncertainty surrounding events such as Brexit amplifies these challenges by increasing regulatory and economic unpredictability, complicating the financing of substantial investments, and reducing executives' readiness to authorize projects with unpredictable results (Greenwald and Stiglitz, 1990; Pástor and Veronesi, 2013; Panousi and Papanikolaou, 2012). By deferring investments, firms seek to preserve flexibility and avoid the risks associated with committing resources in an unstable environment. This cautious approach reflects broader concerns about navigating volatile market conditions, highlighting the importance of regulatory clarity in encouraging corporate investment and strategic growth.

For control variables, we find that firms' M&A activities are positively related to firm size, leverage, sales growth, and return on assets, are negatively related to market-to-book ratio, capital expenditure, cash holding, free cash flow, net working capital and the Herfindahl-Hirschman Index. These results are generally in accordance with Nguyen and Phan (2017) and Bonaime et al. (2018), among others.

Taken together, our results suggest that UK firm management teams became more conservative and risk averse on expansion activities through M&As, which is also consistent with our conjecture that increased policy uncertainty following the announcement of Brexit would suppress M&A activity for UK firms.

Figure 1 plots the distributional properties of the residuals. Panel A depicts the histograms of residuals from the main regression, while Panel B presents a quantile-quantile plot comparing the quantiles of the residuals to those of a normal distribution. These plots indicate that the distribution of the residuals differs from that of a normal distribution.[2]

4.2. The real options channel

In this subsection, we investigate the real options channel with regard to the impact of Brexit on M&As. The real options theory (Dixit and Pindyck, 1994) suggests that uncertainty can discourage a firm's irreversible investment, therein incentivizing the postponement of an acquisition investment given the increased value of the option to delay (Bernanke, 1983; Bloom, 2009). Specifically, the association between Brexit uncertainty and acquisition depends on investment irreversibility, the cost of postponing the acquisition, and the exposure to uncertainty.

Investment irreversibility

Following Bonaime et al. (2018) and Kellard et al. (2021), our first measure of investment irreversibility is the capital intensity ratio calculated as the ratio of net property, plant and equipment (PPE) to total assets. Firms with high PPE have greater difficulty in reversing their investment, compared to firms with low PPE.

Our next set measure of investment irreversibility is investment sunk costs. Following Bonaime et al. (2018), and Kellard et al. (2021) we use three sunk costs measures and calucate them as the ratio of depreciation expense and PPE sales of to PPE. Firms with faster depreciation and

[2]In untabulated results, we conduct the Portmanteau test for serial correlation in panel data, following Inoue and Solon (2006), and the modified Wald test for groupwise heteroskedasticity in the residuals of a fixed-effects regression model, following Greene (2000, p. 598). The findings indicate the presence of both heteroskedasticity and serial correlation. Thus, we use the cluster-robust standard errors to account for these issues.

higher secondary market sales of fixed assets have lower sunk costs, which helps to reduce the value of the real options to delay investment.

Our final measure of investment irreversibility is industry cyclicality. Shleifer and Vishny (1992) and Almeida and Campello (2007) suggest that the cyclicality of firms' sales is related to the values of asset liquidation. Highly cyclical industries have difficulties in liquidating assets during economic downturns since other firms experience the same negative shocks. Thus, highly cyclical industries are riskier during periods of uncertainty. To measure industry cyclicality, we regress firms' sales growth on the logarithm of GDP per capita in the two-digit industry. Firms with higher sensitivity to GDP are identified as durables while firms with lower sensitivity to GDP are identified as nondurables following Sharpe (1994). Durable industries are cyclical industries.

Table 3 reports the results of OLS regressions examining the effect of Brexit on firms' M&A activities across low and high investment irreversibility groups. The DID coefficient is significantly negative for high investment irreversibility groups. The negative coefficient for DID under investment irreversibility groups suggests that Brexit reduces firms' M&As through the real options channel (Bernanke, 1983; Quigg, 1993; Dixit and Pindyck, 1994). This finding indicates that firms with higher investment irreversibility are more inclined to postpone M&A activities, as significant financial and operational stakes drive hesitation under uncertain regulatory or economic conditions, consistent with Gulen and Ion (2016) and Bonaime et al. (2018).

The option to delay and industry competition

Real options theory implies that Brexit uncertainty induces UK firms to delay M&A deals. However, the value of delay is lessened when delay incurs high costs. Grenadier (2002) shows

that delay costs are high for firms in competitive industries since rivals can take advantage of the delay decisions. Thus, industry competition reduces the value of real options. Following this work, we conjecture that the negative effect of Brexit uncertainty on M&A deals is more pronounced for firms with low industry competition due to the lower probability of bids from rivals.

Table 4 reports the results of OLS regressions examining the effect of Brexit on firms' M&A activities across low and high industry concentration groups. The DID coefficient is significantly negative for high industry concentration groups, implying that Brexit dampens M&A activity through the real options channel (Bernanke, 1983; Quigg, 1993; Dixit and Pindyck, 1994). This result suggests that firms with higher industry concentration are more inclined to postpone M&A decisions, as lower competition makes delays less costly, consistent with Grenadier (2002) and Bonaime et al. (2018).

4.3. The foreign trade channel

Prior studies (Amiti and Konings, 2007; Topalova and Khandelwal, 2011; Bloom et al., 2016) show the positive growth impacts from free trade through a combination of higher productivity, improved reallocation, higher quality inputs, and higher levels of innovation. When trade reforms reduce uncertainty, for instance by making temporary agreements permanent, additional positive investment and employment impacts are usually observed. Within the scope of this literature, the withdrawal of the UK from the EU single market and customs union can be coined as a "reverse" trade reform, namely reducing free trade and increasing uncertainty. We conjecture that the negative effect of Brexit on UK companies' M&As are more pronounced for those with high foreign sales.

Table 5 reports the results of OLS regressions examining the effect of Brexit on firms' M&A activities across low and high foreign sales groups. The coefficient of DID is significantly negative for firms with high foreign sales, consistent with our expectation. This suggests that Brexit uncertainty disproportionately affects firms with substantial foreign sales. These firms rely on stable access to international markets, which is compromised by the Brexit uncertainty (Goldberg and Pavcnik, 2016; Crowley et al., 2018). Disruptions to trade relationships and potential regulatory misalignments heighten the risks associated with M&As, leading firms to be more cautious about making long-term investment commitments. This hesitation is particularly strong for firms in sectors heavily reliant on cross-border trade, as Brexit introduces considerable uncertainty about future market conditions.

4.4. The financial constraints channel

Financial constraints affect firms' M&A decisions (Maksimovic and Phillips, 2008) as financially constrained firms are more likely to save cash and reduce expansion during periods of uncertainty (Erel et al., 2015) since significant financial resources are involved in such deals. We predict that the negative effect of Brexit on UK firms' M&As are more pronounced for financially constrained firms. We use the firm's total asset (Almeida et al., 2004) and the Whited and Wu (2006) Index (WW index) to measure financial constraints.

Table 6 reports the results of OLS regressions examining the effect of Brexit on firms' M&A activities across less and more financially constrained groups. The DID coefficient is significantly negative for more financially constrained groups, consistent with our expectation. This finding is consistent with previous research showing that policy uncertainty increases the cost of raising capital. For instance, credit rationing and equity market imperfections restrict firms' investment

capacity during uncertain periods (Greenwald and Stiglitz, 1990), while higher risk premiums make external financing more costly (Pástor and Veronesi, 2013). Heightened uncertainty also intensifies financial frictions, deterring investment (Gilchrist et al., 2014; Brogaard and Detzel, 2015), especially for financially constrained firms (Nguyen and Phan, 2017).

We perform additional tests to assess the robustness of our results. The findings are discussed and presented in the Online Appendix Table A.2, A.3, A.4, A.5, A.6, A.7, A.8, A.9, A.10, and A.11 to preserve space.

5. Conclusion

We use the Brexit referendum as an exogenous shock to examine UK companies' M&*A*s against EU companies' M&*A*s. We show that UK firms reduced the number of M&*A* deals more than non-UK firms in the STOXX Europe 600 Index did, in the aftermath of Brexit. Further, this negative effect is significant for firms with high investment irreversibility and low industry competition, but not for firms with low investment irreversibility and high industry competition, consistent with real options theory. Further, the effect is significant for high foreign sales and financially constrained firms, but not for low foreign sales or financially unconstrained firms, which is consistent with the foreign trade and financial constraints channels.

Our study has practical implications for policy makers, regulators, and firm managers. UK policy makers and regulators could choose to make more informed decisions on imposed conditions for M&*A*s after a shock as great as Brexit, given the demonstrated reduction of UK M&*A*s after Brexit compared to in the EU. Our efforts may also prove useful for corporate senior management teams facing M&*A* decision-making during periods of extreme uncertainty akin to Brexit.

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Table 1

Descriptive statistics

This table reports descriptive statistics and correlations for the main variables. Size is the natural logarithm of total assets. MB is market-to-book ratio. Capx is the ratio of capital expenditure to total assets. Cashholding is the ratio of cash holding to total assets. Cashflow is the ratio of cash flow to total assets. NetWC is the ratio of net working capital to total assets. Leverage is the leverage ratio. HHI is the Herfindahl-Hirschman Index. SaleGrowth is the ratio of sales growth. ROA is return-on-assets. The sample includes the UK and EU firms in the STOXX 600 Index. Online Appendix Table B provides the detailed variable definitions.

	Mean	Stdev	P25	Median	P75
Panel A: Full Sample					
Number of deals	0.43	0.98	0.00	0.00	1.00
Size	16.13	1.64	15.00	16.14	17.35
MB	0.59	0.18	0.48	0.59	0.72
Capx	0.04	0.03	0.02	0.03	0.05
Cash	0.12	0.11	0.05	0.09	0.15
Cashflow	0.08	0.05	0.05	0.08	0.10
NetWC	-0.02	0.14	-0.10	-0.02	0.06
Leverage	0.25	0.16	0.14	0.25	0.35
HHI	0.45	0.30	0.19	0.34	0.65
SaleGrowth	1.06	0.19	0.99	1.05	1.12
ROA	7.42	7.69	3.61	6.13	10.03
Panel B: Before Brexit (2012-2015)					
Number of deals	0.48	1.08	0.00	0.00	1.00
Size	15.96	1.73	14.74	16.00	17.22
MB	0.59	0.18	0.47	0.60	0.72
Capx	0.04	0.03	0.02	0.03	0.06
Cash	0.12	0.11	0.05	0.09	0.14
Cashflow	0.08	0.05	0.05	0.08	0.10
NetWC	-0.01	0.14	-0.10	-0.02	0.07
Leverage	0.24	0.15	0.13	0.24	0.34
HHI	0.46	0.30	0.20	0.37	0.66
SaleGrowth	1.05	0.17	0.99	1.04	1.11
ROA	7.49	7.58	3.69	6.20	9.93
Panel C: After Brexit (2017-2020)					
Number of deals	0.39	0.88	0.00	0.00	0.00
Size	16.29	1.55	15.21	16.27	17.43
MB	0.59	0.18	0.48	0.59	0.72
Capx	0.04	0.03	0.02	0.03	0.05
Cash	0.13	0.12	0.05	0.09	0.15
Cashflow	0.08	0.05	0.05	0.08	0.10
NetWC	-0.02	0.14	-0.10	-0.03	0.05
Leverage	0.27	0.16	0.16	0.26	0.36
HHI	0.43	0.30	0.19	0.33	0.57
SaleGrowth	1.07	0.21	0.99	1.05	1.12
ROA	7.36	7.78	3.54	6.06	10.08

Panel D: Correlation

	Number of deals	Size	MB	Capx	Cash	Cashflow	NetWC	Leverage	HHI	SaleGrowth	ROA
Size	0.03	1.00									
MB	0.05	0.34	1.00								
Capx	-0.08	0.10	0.04	1.00							
Cash	-0.05	-0.26	-0.18	-0.08	1.00						
Cashflow	-0.04	-0.18	-0.09	0.25	0.02	1.00					
NetWC	-0.01	-0.20	-0.48	-0.12	-0.16	0.05	1.00				
Leverage	0.01	0.27	0.67	0.08	-0.29	-0.01	-0.28	1.00			
HHI	0.09	-0.02	-0.02	0.03	-0.03	0.05	0.04	0.00	1.00		
SaleGrowth	0.03	-0.17	-0.15	-0.07	0.12	0.15	0.00	-0.14	-0.04	1.00	
ROA	-0.04	-0.30	-0.30	0.04	0.19	0.54	0.20	-0.26	0.00	0.17	1.00

Table 2

The Brexit effect on M&A deals

This table reports the difference-in-difference (DID) results from the OLS regressions. The dependent variable is the natural logarithm of one plus number of M&A deals conducted by firm i in year t. DID is the product of Treat and Time. Treat is a dummy variable which is equal to one if a firm is a UK firm in the STOXX 600 and zero otherwise. Time is a dummy variable which is equal to one if the year is between 2017 and 2020 and zero if the year is between 2012 and 2015. Size is the natural logarithm of total assets. MB is market-to-book ratio. Capx is the ratio of capital expenditure to total assets. Cash is the ratio of cash holding to total assets. Cashflow is the ratio of cash flow to total assets. NetWC is the ratio of net working capital to total assets. Leverage is the leverage ratio. HHI is the Herfindahl-Hirschman Index. SaleGrowth is the ratio of sales growth. ROA is return-on-assets. The sample includes the UK and EU firms in the STOXX 600 Index. t-statistics in parentheses are based on cluster-robust standard errors at the country level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Online Appendix Table B provides the detailed variable definitions.

DID	-0.047**
	(-2.93)
Size	0.039
	(1.19)
MB	0.041
	(0.45)
Capx	-0.492
	(-1.77)
Cash	-0.142
	(-1.26)
Cashflow	-0.403
	(-1.22)
NetWC	0.183*
	(1.83)
Leverage	-0.131
	(-1.01)
HHI	-0.288
	(-0.90)
SaleGrowth	0.076
	(1.75)
ROA	0.004*
	(2.00)
Constant	-0.282
	(-0.49)
Observations	2994
Adjusted R^2	0.36
Firm FE	YES
Year FE	YES

Table 3

The Brexit effect on M&A deals across investment irreversibility

This table reports the difference-in-difference (DID) results from the OLS regression. The dependent variable is the natural logarithm of one plus number of M&A deals conducted by firm i in year t. DID is the product of Treat and Time. Treat is a dummy variable which is equal to one if a firm is a UK firm in the STOXX 600 and zero otherwise. Time is a dummy variable which is equal to one if the year is between 2017 and 2020 and zero if the year is between 2012 and 2015. Size is the natural logarithm of total assets. MB is market-to-book ratio. Capx is the ratio of capital expenditure to total assets. Cash is the ratio of cash holding to total assets. Cashflow is the ratio of cash flow to total assets. NetWC is the ratio of net working capital to total assets. Leverage is the leverage ratio. HHI is the Herfindahl-Hirschman Index. SaleGrowth is the ratio of sales growth. ROA is return-on-assets. We measure the target two-digit SIC industry investment irreversibility using the ratio of property, plant, and equipment to total assets (PPE), the ratio of depreciation to property, plant, and equipment (DP), the ratio of sales to property, plant, and equipment (Sale), and the beta from regressing sales growth on the logarithm of GDP per capita in the Fama-French five industries (Beta). We classify sample firms into two groups based on PPE, RL, DP, Sale, or Beta. High Beta groups are defined as durables and low Beta groups are defined as nondurables. The sample includes the UK and EU firms in the STOXX 600 Index. t-statistics in parentheses are based on cluster-robust standard errors at the country level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Online Appendix Table B provides the detailed variable definitions.

	High-PPE	Low-PPE	Low-DP	High-DP	Low-Sale	High-Sale	Durables	Nondurables
DID	-0.045**	-0.030	-0.038*	-0.046	-0.038***	-0.029	-0.047**	-0.034
	(-2.56)	(-0.78)	(-1.85)	(-1.32)	(-3.31)	(-0.75)	(-3.02)	(-1.29)
Size	-0.010	0.088	0.084**	0.059	-0.017	0.115**	0.014	0.078**
	(-0.37)	(1.67)	(2.58)	(1.04)	(-0.29)	(2.60)	(0.37)	(2.22)
MB	0.125	-0.031	-0.022	0.161	0.108	-0.117	-0.092	0.279
	(0.59)	(-0.10)	(-0.10)	(0.74)	(0.49)	(-0.53)	(-0.59)	(0.72)
Capx	-0.009	1.432	-0.394	0.144	0.121	-0.028	-0.778	-0.211
	(-0.02)	(0.74)	(-0.77)	(0.25)	(0.41)	(-0.03)	(-1.61)	(-0.40)
Cash	0.140	-0.208	-0.076	-0.148	0.289	-0.419**	-0.115	-0.175*
	(0.65)	(-1.75)	(-0.33)	(-0.84)	(1.65)	(-2.84)	(-0.70)	(-2.15)
Cashflow	-0.617**	-0.189	-1.038**	0.048	-0.908**	0.068	-0.367	-0.371
	(-2.60)	(-0.50)	(-2.46)	(0.15)	(-2.20)	(0.21)	(-0.65)	(-1.41)
NetWC	0.556*	-0.090	-0.110	0.308*	0.706***	-0.102	0.024	0.357
	(2.16)	(-0.42)	(-0.31)	(2.13)	(4.27)	(-0.53)	(0.10)	(1.77)
Leverage	-0.048	-0.149	-0.105	-0.171	-0.202*	0.047	0.108	-0.495
	(-0.46)	(-0.36)	(-0.74)	(-0.44)	(-2.07)	(0.12)	(0.80)	(-1.24)
HHI	-0.259	-0.384	-0.435	-0.038	-0.472	-0.043	-0.291	-0.255
	(-1.07)	(-0.83)	(-1.54)	(-0.08)	(-1.42)	(-0.10)	(-0.85)	(-0.40)
SaleGrowth	0.178**	0.009	0.194**	0.016	0.203**	-0.037	0.047	0.116**
	(2.53)	(0.23)	(2.24)	(0.50)	(2.95)	(-1.16)	(0.66)	(2.58)
ROA	-0.000	0.008***	0.004	0.003	0.001	0.006***	0.004	0.004*
	(-0.02)	(3.95)	(1.44)	(1.40)	(0.23)	(4.15)	(1.74)	(2.01)
Constant	0.293	-0.927	-1.056*	-0.716	0.531	-1.375*	0.183	-1.069
	(0.80)	(-1.08)	(-2.10)	(-0.71)	(0.55)	(-1.84)	(0.27)	(-1.52)
Observations	1699	1277	1492	1464	1573	1387	1523	1471
Adjusted R^2	0.31	0.40	0.31	0.40	0.30	0.41	0.37	0.35
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Table 4

The Brexit effect on M&A deals across firms with different industry concentrations

This table reports the difference-in-difference (DID) results from the OLS regression. The dependent variable is the natural logarithm of one plus number of M&A deals conducted by firm i in year t. DID is the product of Treat and Time. Treat is a dummy variable which is equal to one if a firm is a UK firm in the STOXX 600 and zero otherwise. Time is a dummy variable which is equal to one if the year is between 2017 and 2020 and zero if the year is between 2012 and 2015. Size is the natural logarithm of total assets. MB is market-to-book ratio. Capx is the ratio of capital expenditure to total assets. Cash is the ratio of cash holding to total assets. Cashflow is the ratio of cash flow to total assets. NetWC is the ratio of net working capital to total assets. Leverage is the leverage ratio. HHI is the Herfindahl-Hirschman Index. SaleGrowth is the ratio of sales growth. ROA is return-on-assets. Low (or high) industry concentration groups include firms below (or above) the median two-digit SIC sales in a given year. The sample includes the UK and EU firms in the STOXX 600 Index. t-statistics in parentheses are based on cluster-robust standard errors at the country level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Online Appendix Table B provides the detailed variable definitions.

	Low industry concentration of targets	High industry concentration of targets	Low industry concentration of acquirers	High industry concentration of acquirers
DID	-0.007	-0.080***	-0.042	-0.033
	(-0.17)	(-4.26)	(-0.89)	(-1.75)
Size	0.035	0.081*	0.101	0.065
	(0.52)	(1.84)	(1.77)	(1.48)
MB	0.043	-0.057	-0.057	-0.023
	(0.32)	(-0.34)	(-0.54)	(-0.10)
Capx	-0.135	-0.330	0.238	-0.668*
	(-0.22)	(-1.06)	(0.33)	(-2.06)
Cash	-0.231	-0.086	-0.004	-0.323
	(-1.07)	(-0.45)	(-0.02)	(-1.62)
Cashflow	-0.075	-0.726**	-0.028	-0.631
	(-0.15)	(-2.40)	(-0.05)	(-1.70)
NetWC	0.024	0.495**	0.107	0.108
	(0.10)	(2.99)	(0.56)	(0.66)
Leverage	-0.243	-0.000	-0.076	-0.079
	(-0.88)	(-0.00)	(-0.46)	(-0.40)
HHI	-0.623	0.088	-0.488	-0.016
	(-1.48)	(0.16)	(-1.32)	(-0.02)
SaleGrowth	0.039	0.128*	0.053	0.053
	(0.46)	(2.10)	(0.63)	(0.99)
ROA	0.005	0.002	0.001	0.005**
	(1.76)	(1.02)	(0.52)	(2.30)
Constant	0.008	-1.183	-1.055	-0.796
	(0.01)	(-1.55)	(-1.05)	(-1.04)
Observations	1205	1698	998	1983
Adjusted R^2	0.41	0.30	0.46	0.31
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Table 5

The Brexit effect on M&A deals across firms with different foreign sales

This table reports the difference-in-difference (DID) results from the OLS regression. The dependent variable is the natural logarithm of one plus number of M&A deals conducted by firm i in year t. DID is the product of Treat and Time. Treat is a dummy variable which is equal to one if a firm is a UK firm in the STOXX 600 and zero otherwise. Time is a dummy variable which is equal to one if the year is between 2017 and 2020 and zero if the year is between 2012 and 2015. Size is the natural logarithm of total assets. MB is market-to-book ratio. Capx is the ratio of capital expenditure to total assets. Cash is the ratio of cash holding to total assets. Cashflow is the ratio of cash flow to total assets. NetWC is the ratio of net working capital to total assets. Leverage is the leverage ratio. HHI is the Herfindahl-Hirschman Index. SaleGrowth is the ratio of sales growth. ROA is return-on-assets. We measure foreign sales as the ratio of foreign sales to sales. The sample includes the UK and EU firms in the STOXX 600 Index. t-statistics in parentheses are based on cluster-robust standard errors at the country level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Online Appendix Table B provides the detailed variable definitions.

	Low foreign sales	High foreign sales
DID	0.015	-0.062**
	(0.58)	(-2.38)
Size	0.074*	0.059
	(1.82)	(1.32)
MB	0.117	-0.181
	(1.49)	(-0.87)
Capx	0.535	-0.928*
	(0.65)	(-1.89)
Cash	-0.216	-0.229
	(-0.72)	(-1.49)
Cashflow	-0.335	-0.162
	(-1.23)	(-0.51)
NetWC	0.159	0.095
	(1.14)	(0.46)
Leverage	-0.319*	0.042
	(-2.11)	(0.25)
HHI	-0.415**	-0.160
	(-2.76)	(-0.28)
SaleGrowth	0.183***	-0.001
	(4.26)	(-0.02)
ROA	0.001	0.005*
	(0.43)	(2.00)
Constant	-0.977	-0.474
	(-1.54)	(-0.55)
Observations	1139	1738
Adjusted R^2	0.34	0.38
Firm FE	YES	YES
Year FE	YES	YES

Table 6

The Brexit effect on M&A deals across financial constraints firms

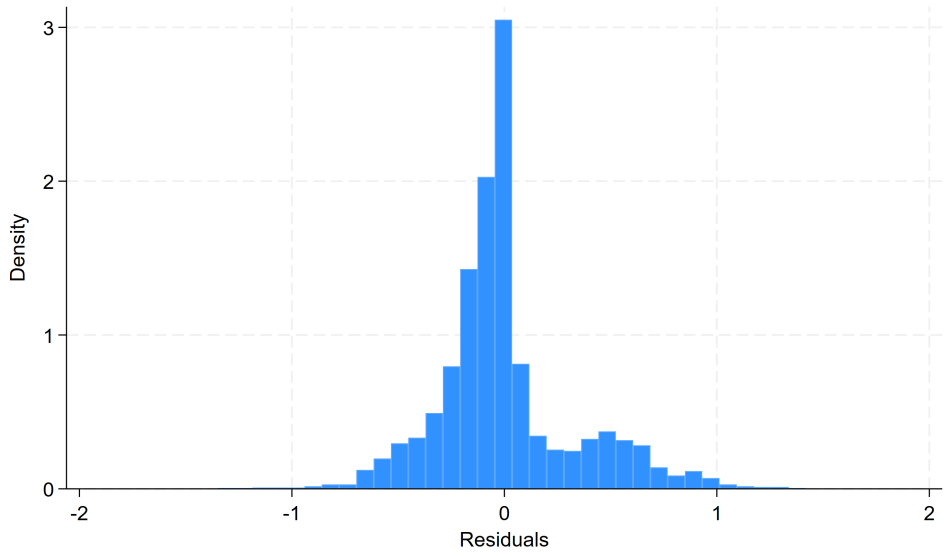
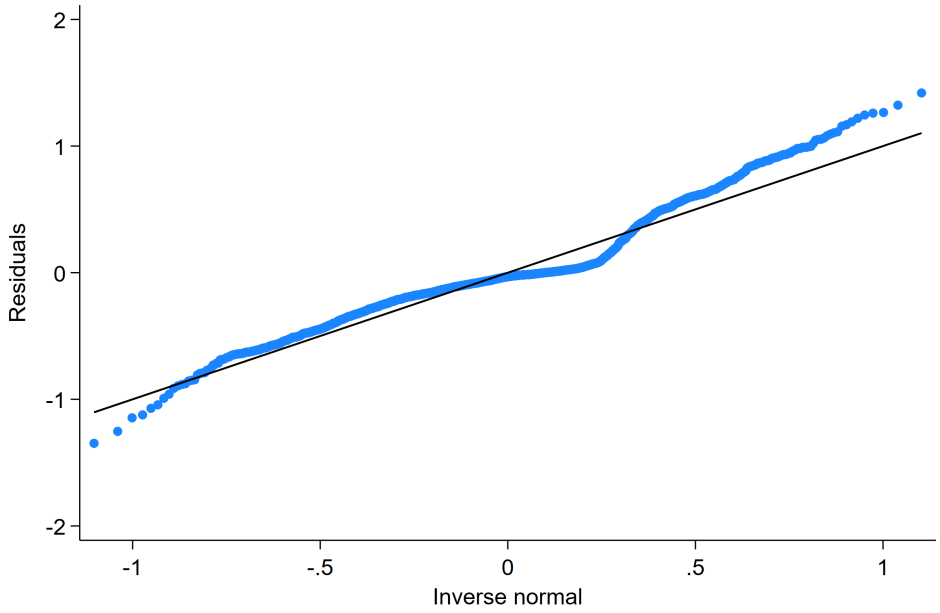
This table reports the difference-in-difference (DID) results from the OLS regression. The dependent variable is the natural logarithm of one plus number of M&A deals conducted by firm i in year t. DID is the product of Treat and Time. Treat is a dummy variable which is equal to one if a firm is a UK firm in the STOXX 600 and zero otherwise. Time is a dummy variable which is equal to one if the year is between 2017 and 2020 and zero if the year is between 2012 and 2015. Size is the natural logarithm of total assets. MB is market-to-book ratio. Capx is the ratio of capital expenditure to total assets. Cashholding is the ratio of cash holding to total assets. Cashflow is the ratio of cash flow to total assets. NetWC is the ratio of net working capital to total assets. Leverage is the leverage ratio. HHI is the Herfindahl-Hirschman Index. SaleGrowth is the ratio of sales growth. ROA is return-on-assets. We measure financial constraints according to the total asset (TA) and WW (Whited-Wu) Index. WW index (WW) is calculated as $WW = -0.091CF - 0.062DIVPOS + 0.021TLTD - 0.044LNTA + 0.102ISG - 0.035SG$,, where CF is the ratio of income before depreciation to total assets, $DIVPOS$ is an indicator that the value of one if the firm pays cash dividends to preferred stocks or common stocks, $TLTD$ is the ratio of sum of long-term debt and debt in current liabilities to total assets, $LNTA$ is the natural log of total asset, ISG is the firm's three-digit industry sales growth, and SG is the sales growth of a firm. Less financially constrained firms are those above the TA (below the WW Index) medium while more financially constrained firms are those below it (above it). The sample includes the UK and EU firms in the STOXX 600 Index. t-statistics in parentheses are based on cluster-robust standard errors at the country level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Online Appendix Table B provides the detailed variable definitions.

	High-TA	Low-TA	Low-WW	High-WW
DID	-0.013	-0.059***	-0.011	-0.066***
	(-0.61)	(-3.38)	(-0.45)	(-3.63)
Size	-0.026	0.021	-0.016	0.031
	(-0.35)	(0.54)	(-0.20)	(0.92)
MB	-0.249	0.079	0.037	0.042
	(-1.05)	(1.10)	(0.12)	(0.54)
Capx	-1.448*	0.530	-0.860	0.199
	(-2.04)	(0.92)	(-1.27)	(0.31)
Cash	0.121	-0.250	0.101	-0.288
	(0.58)	(-1.66)	(0.48)	(-1.61)
Cashflow	-1.149***	-0.201	-1.181***	-0.082
	(-3.07)	(-0.42)	(-3.15)	(-0.18)
NetWC	-0.379	0.416**	-0.325	0.380***
	(-1.07)	(2.84)	(-1.20)	(3.53)
Leverage	-0.134	-0.064	-0.306	-0.030
	(-0.52)	(-0.47)	(-0.90)	(-0.24)
HHI	0.606	-0.661*	0.616	-0.701**
	(1.47)	(-2.01)	(1.55)	(-2.24)
SaleGrowth	0.140*	0.054	0.122**	0.045
	(1.87)	(0.66)	(2.23)	(0.67)
ROA	0.001	0.005*	0.002	0.004*
	(0.34)	(2.03)	(0.81)	(2.14)
Constant	0.584	0.108	0.258	0.020
	(0.43)	(0.16)	(0.18)	(0.03)
Observations	1335	1643	1362	1580
Adjusted R^2	0.36	0.37	0.36	0.37
Firm FE	YES	YES		
Year FE	YES	YES		

Fig. 1. Distributional properties of the residuals

This figure plots the distributional properties of the residuals. Panel A depicts the histograms of residuals from the main regression, while Panel B presents a quantile-quantile plot comparing the quantiles of the residuals to those of a normal distribution.

Panel A: Histograms of residuals



Panel B: Quantile-quantile plot