ECONOMIC DISINTEGRATION AND ENTREPRENEURIAL INVESTMENT:

THE NATURAL EXPERIMENT OF BREXIT

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International trade and international business theory have been developed in a period of increasing globalization, and hence to what extent they explain deglobalization processes, or whether new theory is needed, is an empirical question. We focus on the effect of economic disintegration on entrepreneurial investments—an antecedent of long-term growth, such that we can observe firm decision making over the short term— and leverage the exogenous nature of the Brexit's referendum as a natural experiment to analyze changes in both the UK and the EU (as compared to the US, a region not affected by Brexit but which shared trends with European investments). Results from nearly 35,000 startups and 26,000 investors (from Pitchbook) confirm the main prediction of extant theory: both regions are negatively affected by Brexit's referendum. However, the larger economic effects (with up to 50% reductions in investment dollars) are dominated by two industries: healthcare and financial services. Critically, the relative impact on the UK and the EU is very different: while in healthcare UK startups are more negatively affected, in financial services it is EU startups that are more negatively affected. Qualitative insights from 44 interviews suggest that institutions are the driver of these differences: in healthcare, the European Medicines Agency was transplanted from London to Amsterdam; in financial services, the UK lost passporting (and hence seamless access to the EU market), but kept the advantage of a flexible regulator. We argue that institutions are an important source of competitive advantage in economic integration, and with disintegration the location and nature of these changes in institutions.

Keywords: economic integration, international trade, Brexit, entrepreneurial financing, natural experiment, difference-in-differences

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UK is very strong and has been for some time. There is a strong ecosystem. We have a strong stock market exchange. There is also a lot of money, especially for seed stage. And there is a lot of money lately from corporates, too. . . We have a lot of talent coming from all over the place. The universities are very important, there is nowhere in Europe with so many universities, and they have been very active in setting up incubators, and fostering entrepreneurship, and that is very important. Then the professional services around it. There is a big financial tradition, for over a hundred years, and the professional services are there. And the regulation, which is very welcoming.

—Interview with UK investor (2017)

How quickly the unthinkable became the irreversible. A year ago few people imagined that the legions of Britons who love to whinge about the European Union—silly regulations, bloated budgets and pompous bureaucrats—would actually vote to leave the club of countries that buy nearly half of Britain's exports. Yet, by the early hours of June 24th, it was clear that voters had ignored the warnings of economists, allies and their own government and, after more than four decades in the EU, were about to step boldly into the unknown.

—The Economist (June 25th, 2016)

1 INTRODUCTION

The last few years have been marked by a deceleration and possibly a reversal of globalization, a process that defined the last few decades and served as the empirical basis for international trade theory and the international business literature. To what extent these theories can explain the reverse deglobalization process is an empirical question; and critically, empirical irregularities not explained by current theory can shed light on new (or newfound) mechanisms at play. We take a step in this direction, by focusing on an archetype of the recent deglobalization movements—the economic disintegration of the United Kingdom from the European Union, known as Brexit—and examining the extent to which disintegration adheres to current theoretical predictions to uncover other factors that may be at play.

One of the hallmarks of economic integration is its effect on technology improvement and investment, one of the foundations for long term growth (Balassa 1961, Krugman 1979, Bustos 2011).

We focus on the consequences of Brexit for entrepreneurial investments, as a firm-level short-term outcome that can lead to technological development and productivity gains in the long term. Importantly, at the time the UK voted to leave the EU[1], London was the hub of startup creation and investment in Europe, as the first opening quote refers to. That is, the UK had arguably a comparative advantage relative to other regions in Europe, which in turn had led to specialization in entrepreneurial investment—in 2015, the UK comprised about 40 percent of all EU entrepreneurial firms, according to Pitchbook data, over twice the share of the UK economy in the EU at the time, according to the World Bank. Brexit, hence, is economically important for the investment in startups and technology for it is set to change the balance of comparative advantage.

The mechanisms by which integration and geographic agglomeration lead to growth have been studied by different streams of research. At a macroeconomic level, international trade theory and the literature on economic integration argue for and show economic gains from trade and integration, through economies of scale, comparative advantage, and the diffusion of technology and the productivity improvements that follow (Balassa 1961, Krugman 1979, Rivera-Batiz and Romer 1991, Henrekson et al. 1997, Alesina et al. 2000, Eaton and Kortum 2002, Bustos 2011, Burstein and Vogel 2017). At the firm level, there are benefits to the geographic agglomeration for firms, through a larger pool of resources (scale) that are easy to access, and through technology diffusion as a result of knowledge spillovers within the cluster (Saxenian 1996, Bresnahan et al. 2001, Chung and Alcácer 2002, Stuart and Sorenson 2003a, 2003b, Alcácer and Chung 2007, Delgado et al. 2010, Alcácer and Chung 2014), and specifically there are benefits to colocation of investors and startups (Sorenson and Stuart 2001, Samila and Sorenson 2010, 2011, Alvarez-Garrido and Dushnitsky 2016). Across all these literatures, the high-level mechanisms that

[1] Even though the UK was part of the EU until the actual withdrawal date on January 31st, 2020, for simplicity of exposition we refer to the UK and the EU, with the latter being in fact the EU 27, or the 27 member states that remain in the EU after Brexit: Austria, Belgium, Bulgaria, Croatia, Republic of Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.

explain the benefits of integration and agglomeration are increasing returns to scale, comparative advantage, and technological improvement.

Because economic integration leads to economic gains, we would initially expect that economic disintegration would lead to economic losses for both regions. The more obvious change is a smaller market—both from a demand side but also from a supply side, through less mobility of resources across the disintegrated regions. Following this argument, and because the UK loses more scale than the EU, we would expect that losses for the UK are greater. Indeed, early empirical research suggests that Brexit had negative consequences on growth and investment for the UK and, to some extent, also on the EU (Ramiah et al. 2017, Sampson 2017, Belke et al. 2018, Breinlich et al. 2018, Davies and Studnicka 2018, Bloom et al. 2019, Born et al. 2019, Meyers and Springford 2022, Springford 2022).

However, it is possible that beyond a chance in scale other forces may be at play. One important difference between the process of economic integration into the EU and the disintegration move of Brexit is timing. While integration took decades to develop, time in which institutions were built and organizations and actors gradually adapted their economic decisions to the new institutional environment, disintegration was fast, happening in a handful of years and without the luxury of smooth adaptation to the institutional change. This presents an opportunity to understand economic integration, because frictions may uncover underlying mechanisms to disintegration and possibly also integration.

With disintegration, it is also possible that the comparative advantage of the UK relative to the EU (or even third countries) changes. When the UK voted to leave the EU, London was unquestionably the heart of the startup scene in the EU. With a strong financial, technology, ad healthcare sector, human capital moved to London to start-up. With an established venture capital industry and being one of the centers of global finance, capital also flowed to London. As a result, the UK arguably had a comparative advantage relative to other EU countries and therefore had amassed the most important technology cluster in the continent. Whether this comparative advantage remains after Brexit is, however, an open question.

We hence depart from extant theory—consistent with a negative effect of Brexit on both regions, but a greater negative effect for the UK through a greater loss of economies of scale—yet analyze both quantitative and qualitative data to get a broader understanding of the phenomenon, and search for a surprise—an empirical irregularity—that may help develop additional theory.

Quantitative analyses leverage the unexpected outcome of Brexit's referendum on June 23, 2016 (as the second opening quote describes) as an exogeneous shock, and hence a natural experiment analyzed through difference-in-difference (DD) analyses (e.g., Card 1990, Meyer et al. 1995, Angrist and Krueger 2001, Angrist and Pischke 2009, Athey and Imbens 2022). These analyses are conducted at two levels. First, at the startup level, estimating the investment in each startup before and after Brexit's vote, in the UK and in the EU—these analyses are done both in a cross-section of first round investments, to understand how startups founded in the different economic areas differ, as well as in a panel, to assess the change in investment in each startup. Second, at the investor level, estimating the rate of investment in the investor's geographic mandate[2] and how it changes before and after Brexit's vote, and in the UK and the EU. Because Brexit involves both regions, we need a counterfactual that is not in the economic area—the US is the market of reference for European investors and (as we show) shares the pre-Brexit trends with Europe, and therefore is used as a control for both the UK and the EU. The period of analysis (2014 through 2018) is centered around the vote, and importantly excludes the postponements of Brexit in 2019 as well as the COVID-19 pandemic. These analyses leverage unique access to the entire Pitchbook database, comprising 34,949 startups and 25,957 investors in the period of analysis.

Qualitative analyses enrich and provide insights into the main trends in the data. We conducted a panel of 44 interviews with a variety of investor types (venture capital firms, startups, incubators, accelerators, and industry associations), over time (2017, 2018 and 2019), and across geographies (UK and EU, specifically France—the largest country by startup investment—and Spain—the fastest growing

[2] The geographic area in which the investor has invested the majority of its portfolio.

country by startup investment), with the objective of maximizing theoretical variation to shed light on a wider range of mechanisms.

Quantitative analyses show that both the UK and the EU are negatively affected by the referendum, with greater effects in the UK, consistent with the predictions of economic integration and international trade theories. UK startups receive between 8 and 9.5 percent less equity than before the referendum, and EU startups between 5 and 7 percent less. Overall, UK startups receive between 2.5 and 3 percent less equity than EU startups. These findings are consistent with the predictions of economic integration and international trade theories. Investors with a mandate to invest in the UK shift their focus upon Brexit, with an average 6 percent less focus in the UK; however, investors with more flexibility in where they invest shift their focus away from the UK between a 7 and 13 percent.

Surprisingly the magnitude and also the direction of the effects are highly heterogeneous by industry. Healthcare and financial services experience the largest impact, yet very different for the UK and the EU. In healthcare, the UK is worse off than the EU, with a 28 percent less investment in startups on first round compared to an 8 percent in the EU; investors with a geographic mandate to invest in the UK also reduce their investment in UK life-science startups much faster than those with an EU mandate. In contrast, in financial services, while both regions lose investment very significantly, the UK is better off than the EU, with a 35 percent lesser investment in UK startups compared to a 50 percent lesser investment in EU startups.

Qualitative data from our interviews suggests these differences are driven by the role of institutions in these two industries. In healthcare, the move of the European Medicines Agency (EMA)—EU equivalent to the Food and Drug Administration—from London to Amsterdam was described as a big loss for the UK. In the EU, while long term a potential advantage, it will take time to build the regulatory industry that London had developed over the years. This explains the economically large effects in healthcare in both regions, but a greater loss in the UK. In finance, the loss of passporting regulation (which grants access to the whole EU market with a single financial license) had a negative impact on the

UK and the EU, since both regions lose scale on the market. But in the UK, the effect was alleviated by the increased flexibility of the UK regulator towards financial technology (fintech) startups.

While the literature has acknowledged the important role of institutions in the comparative advantage of countries and their international trade (Krugman 1992, Helpman 2004, Acemoglu and Johnson 2005, Belloc 2006, La Porta et al. 2008, Nunn and Trefler 2014), the role of institutions in economic integration has been less studied. We contribute to this literature by analyzing the impact of transplanting or losing access to institutions upon economic disintegration. Institutions developed for the economic area create (or reinforce) comparative advantage of one region vs. the other, hence leading to specialization. But these institutions are forged over a long time, and actors make economic decisions around the institutional environment. Because disintegration is a fast process (faster than integration at least), institutions are either isolated in one region or transplanted to the other region, and both processes change the relative comparative advantage of both regions. And in fact, may create an absolute disadvantage relative to countries outside of the economic area. We contribute to the literature on clusters (Saxenian 1996, Bresnahan et al. 2001, Chung and Alcácer 2002, Stuart and Sorenson 2003a, 2003b, Alcácer and Chung 2007, Delgado et al. 2010, Alcácer and Chung 2014) and the colocation of startups and investors (Sorenson and Stuart 2001, Samila and Sorenson 2010, 2011, Alvarez-Garrido and Dushnitsky 2016) by showing the role of institutional change in the factors that provide an advantage to a specific region.

Our research has implications for managers who seek to understand the consequences of institutional change and newly raised borders on investment, as well as on policy makers who seek to understand how institutions—which are deeply shaped by policy—impact investment in new technologies.

2 ECONOMIC (DIS)INTEGRATION AND ENTREPRENEURIAL INVESTMENT

It is well established that economic integration leads to long term growth (Rivera-Batiz and Romer 1991, Henrekson et al. 1997, Alesina et al. 2000). The literature on economic integration, and more generally international trade, has discussed three main mechanisms for this effect: a) economies of scale from accessing a larger market for goods and services and for resources (Balassa 1961, Krugman 1979, Rivera-Batiz and Romer 1991); b) comparative advantage of one region relative to another within the integrated region (Balassa 1961, Eaton and Kortum 2002, Burstein and Vogel 2017); and c) the diffusion of technology across the integrated region and increases in productivity that follow (Balassa 1961, Krugman 1979, Bustos 2011).

These three mechanisms (economies of scale, comparative advantage, and technology diffusion) are also relevant in the firm-level literature on the geography of investment in entrepreneurial firms and agglomeration economies. Entrepreneurial scholars have shown that investors prefer to invest in their geographical proximity (Sorenson and Stuart 2001), to be able to monitor their operations and provide advice more effectively (Gorman and Sahlman 1989). This leads to the creation of clusters of entrepreneurial firms, such as Silicon Valley, Route 128 or, notably here, London. While the reasons why clusters form and firms attracted to them are complex (Saxenian 1996, Bresnahan et al. 2001, Chung and Alcácer 2002, Stuart and Sorenson 2003a, 2003b, Alcácer and Chung 2007, Delgado et al. 2010, Alcácer and Chung 2014) and beyond the scope of this work, they generally can be explained as either economies of scale on the supply side (that is, having a larger market of factors of production in a given geography), knowledge spillovers and the technology diffusion and improvement in productivity that follows, and comparative advantage of a region relative to another (which explains why the cluster started in the first place).

Consistent with the macro-level and firm-level theory, we expect the economic disintegration caused by Brexit to have negative effects for both the UK and the EU. However, given the notable reduction in economies of scale for the UK, going from immediate access to a market of over 500 million

people to a core market of 67 million in 2020, the theory would predict that the UK stands to lose more than the EU.

Early work on Brexit suggests that UK's GDP and investment have diminished after Brexit. Sampson (2017) points to the consensus in the literature that "in the long run Brexit will make the United Kingdom poorer because it will create new barriers to trade, foreign direct investment, and immigration", with estimates ranging "between 1 and 10 percent of the UK's income per capita. European Union countries are also likely to suffer from reduced trade, but in percentage terms their losses are expected to be much smaller" (Sampson 2017, p. 174). By the end of 2018, investment in the UK had gradually declined by 11 percent, with a decline in UK productivity between 2 and 5 percent (Bloom et al. 2019), GDP had a cumulative reduction of 2.4 percent, with a cumulative loss of £55 billion (Born et al. 2019). Stocks markets penalized firms that were most exposed to the shock and its consequences (Breinlich et al. 2018, Davies and Studnicka 2018), and while both EU and UK firms were impacted, the latter suffered a greater impact (Belke et al. 2018), though abnormal returns vary by industry (Ramiah et al. 2017). In two recent reports, the Centre for European Reform found that Brexit had, in 2022, 5.5 lower GDP, 11 percent lower investment, and 7 percent less trade of goods and services than it would have had it remained in the EU (Springford 2022), and in fact UK has access to less human capital in STEM fields and as a result less investment in these fields (Meyers and Springford 2022).

In this paper we focus on the micro-foundations for this effect, and specifically firm-level decisions upon Brexit on investment in entrepreneurial firms, for these are one indicator of investment in technological advancement and a long-term impact on productivity. The formation of an entrepreneurial cluster in London and its comparative advantage relative to other EU countries was a process that had developed over decades, drawing resources into the area, building institutions to foster entrepreneurship, and fostering the location of investors and startups in the City. Brexit, however, is poised to alter some factors that possibly contributed to the rise of London's cluster. For instance, there was an expectation of raising barriers to the movement of people between the UK and the EU, which lead to a 32 percent

reduction of long term immigration by EU nationals into the UK (between the vote and the end of 2018), and a 30 percent decrease of long-term immigration for work purposes into the UK, regardless of origin, in the same period (Sturge 2022). While it is difficult to assess how much of this impacted the availability of human capital for entrepreneurial firms, it is possible that it had some impact on the choice to move to the UK to start-up or work on a start-up.

The process of EU integration was gradually developed over a period of four decades, while the Brexit process unfolded over the span of less than four years. Even if a long-term equilibrium would be explained by current theory, economic actors are making decisions under uncertainty without the luxury of a smooth adaptation to the institutional change that is upon them, and this presents an opportunity to study the process by which disintegration unfolds, and possibly shed light on the process of integration. In this work, we depart from extant theory but seek to uncover irregularities in the process at a firm level, irregularities that can provide invaluable information as to the mechanisms by which economic integration leads to growth, or even to explain how disintegration may differ from integration. What these irregularities might be, however, is an open question. We therefore follow here depart from the expectations of previous literature, yet analyze the data looking for a surprise that could inform theory development. As it turns out, the surprise will point to the role of institutions and we will argue the changes in relative comparative advantage.

3 METHODOLOGY

To study the effect of Brexit on startup investment in the UK and in the EU, this paper leverages the shock of Brexit's referendum on June 23, 2016. The main advantage of focusing on the referendum (and not on the actual Brexit) is that the vote to leave the EU an exogenous shock—"unthinkable", as The Economist described it in the opening quote. According to Breinlich et al. (2018) "the referendum result took market participants by surprise. Opinion polls had predicted a close vote but betting markets implied a probability of around 85 per cent that the UK would choose to remain in the EU, reflecting the

conventional wisdom that undecided voters would opt for the status quo." The Wall Street Journal talked of an "epic miscalculation" of the "big Brexit gamble" by PM Cameron, who stepped down the day after the referendum (Gross 2016). The day after the vote the British pound tumbled; in the days to follow, it depreciated 13 percent against the US dollar and 11 percent against the Euro, remaining at that lower level for the rest of the process. Because of its unexpected nature (Ramiah et al. 2017, Breinlich et al. 2018, Davies and Studnicka 2018, Born et al. 2019, Douch and Edwards 2022) the vote is in fact leveraged as a natural experiment in economic, policy, or healthcare studies (Vandoros et al. 2019, Schonfeld and Winter-Levy 2021, Wu et al. 2021). It is reasonable to expect that studying the referendum is a conservative test of the effects of the eventual disintegration, for in this period of transition we observe firm's strategic decision making as they positioned for the change, under uncertainty, but still operating on the old regime with the UK being a full member of the EU, hence with freedom of movement of people, capital, goods and services within the European Union.

We leverage a mixed methods approach, analyzing both a large quantitative dataset that includes both the startup (nearly 35,000 startups) and investor levels of analysis (nearly 26,000 investors, with over 89,000 investor-quarter observations), as well as qualitative data, in order to uncover possible irregularities. Quantitatively, we estimate DD of the UK and the EU, before and after Brexit's referendum. Because both the UK and the EU are affected by the process of Brexit, we need a control that would have otherwise evolved in parallel to Europe. The United States, a point of reference for European investors, is a good candidate as control for the general trend of startup investment in Western economies, with a size comparable to the European Union, with many similarities in institutions that are relevant for startups, and yet sufficiently removed from the process of Brexit. Therefore, DD analyses compare how UK and EU evolved compared to the US, and we then compare the magnitude of both changes. Qualitatively, we gathered data from 44 interviews with venture capitalists, incubators, industry associations, and startups, both in the UK and the EU and along three years after the referendum, with the

goal of providing richer insight into a very complex process with also interrelated effects on actors' decision making in the UK and in the EU.

3.1 Quantitative and qualitative data

Our initial data spans early-stage investments in startups worldwide from Pitchbook's database, the most comprehensive database for startup investments, and the source of data for the reports of the National Venture Capital Association. In different analyses we focus either on investments in the UK, the EU, and the US, or on investments by investors with a UK, EU, or US geographic mandate. The period of analysis (from January 1st, 2014, to December 31st, 2018) is roughly centered around the referendum (June 23rd, 2016) and excludes other major shocks with the potential to confound the effect—specifically, the three postponements of Brexit during 2019, the actual Brexit date on January 31st, 2020, and the effect of the COVID-19 pandemic. In our analyses, we focus on the roughly 70 percent of the observations in Pitchbook with information on the dollar amount invested in each startup. Not only is the investment amount an economically relevant variable, correlated with how profitable investors expect the startup to be, but also startups with investment information are more complete in the database and likely more accurate. Analyses of the difference in means between initial and final samples show no economically meaningful differences. The final samples span 34,959 startups—of which 4,219 are in the UK, 8,561 in the EU, and 22,179 in the US—, founded after 2013 and observed for the first and second round of investment (if any); and 25,957 unique investors—of which 2,295 have a UK geographic mandate, 5,146 with an EU mandate, and 18,516 with a US mandate—mounting to 89,009 investor-quarter observations.

We enrich quantitative analyses with qualitative data from 44 interviews with investors, startups, and industry associations. We sought to capture the reactions of actors as the Brexit process was unfolding, and therefore conducted interviews over time, observing the same actor over time whenever possible. The objective was to increase the range of mechanisms observed, and therefore we sought to increase the variety of actors, locations and industries (Eisenhardt and Graebner 2007). We conducted interviews: across geographies (25 in UK, 12 in France, and 7 in Spain), over time (14 in 2017, 18 in

2018, and 12 in 2019), across industries (18 in technology, 18 in healthcare/life sciences, 6 in financial services, and 2 in other) and with different types of actors (19 venture capitalists, 6 corporations, 5 startups, 4 incubators, 2 universities, and 2 industry associations). All interviews were conducted in person, in the site of the actor, and in almost all occasions with a partner or CEO. Interviews were semi-structured—with the goal of gaining insight into a variety of processes—and lasted approximately 30 minutes.

3.2 Methodology

We leverage the natural experiment from Brexit's referendum through a DD analysis, a quasi-experimental method that allows us to get closer to estimating causality, important to develop theory (e.g., Card 1990, Meyer et al. 1995, Angrist and Krueger 2001, Angrist and Pischke 2009, Athey and Imbens 2022). Because both the UK and the EU are treated, albeit in different ways, we choose US as a control group, as explained above. Therefore, we run two sets of DD analyses: UK vs. US, and EU vs. US. To compare the coefficients of interest in both regressions, we estimate seemingly unrelated regressions and perform a Chow test. As we will show later, the US meets the parallel trends assumption, and is therefore a good counterfactual for both economies. In robustness, we also compare the UK and the EU directly, with similar results.

The main analyses are at the startup and investor levels. At the startup level, we fist examine the cross-section of 34,949 startups that receive their first round of investment either before or after the referendum—4,219 in the UK, 8,561 in the EU, and 22,179 in the US—to assess whether the referendum had an effect on the equity received on that initial investment round. The sample was balanced using coarsened-exact matching.[3] Startups that receive more equity are those that are more competitive in the

[3] Coarsened-exact matching on age, industry, before/after referendum, across the three geographies was performed. This semi-parametric technique is common in the literature because it does not impose many restrictions on the matching but simply trims observations that are causing an imbalance (Blackwell et al. 2009, Iacus et al. 2011, 2012, Aggarwal and Hsu 2014). Our original sample was highly balanced: the CEM processed trimmed 252 from the US, 14 from the UK, and 9 from the EU. The sample numbers reported are after the matching.

market, or in other words, those that are more desirable by investors—may it be because of a higher quality, higher expected benefit relative to the risk, or some other characteristic of the startup that is attractive to investors. Hence, this analysis sheds light on whether the desirability of startups to investors changes with the referendum in the UK and the EU. Startups have choice on where to start-up, and therefore the results of these analyses provide information on differences in the attractiveness of the region as well as in the mix of startups in the region. Second, we perform a set of panel analyses with the subset of startups that received their first round of investment before the referendum, and that receive the second round of investment either before or after the referendum. The panel-data sample consists of 10,134 startups—of which 1,360 are UK startups, 2,164 are EU startups, and 6,610 are US startups. Because these analyses control for fixed unobserved characteristics of the startups, it allows us to better identify the effect of the referendum on startup investment in the UK or EU.

At the investor level, our goal is to understand how Brexit's referendum impacted the decision to invest in a geographic area. Because international investments are common and because investors may choose headquarters that are close to the source of money or to benefit from a certain regulatory regime, and not necessarily close to the investment, we choose not to focus on the headquarters of the investor and instead define the geographic mandate for their investment. Investment has typically a defined area of interest, be it a geographic region and/or an industry. In some cases, for instance with fundraising in venture capital and private equity, this mandate is regulated through the organizational contract that establishes the fund. In addition, through investing in a region, investors develop networks that are critical for startup investment (Sorenson and Stuart 2001, Hochberg et al. 2007, Guler and Guillén 2010, Alvarez-Garrido and Guler 2018). As a result of these mechanisms, the investment mandate of the investor is relatively stable over time; however, some investors, such as corporations and angels, have more flexibility to change their patterns of investment because the mandate is not regulated by a contract. The goal of this set of analyses is, hence, to analyze whether investors with a geographic mandate to invest in the UK, the EU, or the US, change their investment patterns upon Brexit's referendum. The sample

comprises a total of 25,957 investors, 2,295 with a mandate to invest in the UK, 5,146 in the EU, and 18,516 in the US.[4]

3.3 Measures

At the startup level, the dependent variable $Investment_{it}$ is defined as the deal size, or amount invested in startup i at time t, with time measured in quarters and investment measured in USD millions. We consider the investment in the first and in the second round of investment of the startup. The main variables for the DD analyses are an indicator of $After\ Brexit\ referendum_t$, which indicates the second quarter of 2016 and after,[5] and an indicator of where the startup is headquartered (UK, EU or US). Note that startups may choose to headquarter in one country or another in order to attract investment, and hence the location of the startup headquarters provides information of the attractiveness of a region to a startup. We control for whether the startup has revenue and whether the lead investor is a VC—both of which may correlate with the quality or value of the startup, and therefore with investment—, as well as by the age of the startup. Finally, following Pitchbook's industry classification, we categorize each startup as: IT, healthcare, financial, business-to-business (B2B), business-to-consumer (B2C), energy, or materials& resources. These are exclusive categories which describe the startup's main business. Depending on the analysis, we either control for industry or we split regressions by industry.

At the investor level, the dependent variable $Rate\ invested\ in\ mandate_{jt}$ measures the percentage of deal size in the country of investor j's geographic mandate at time t. We define an investment mandate as 50 percent or more of the investments in the last 10 years in a country, or in the case of the EU, a region. To understand how the effect varies by industry, we consider the variable conditional on industry—in other words, within all investments in an industry, we calculate the *Rate invested in*

[4] Coarsened-exact matching on investor type, before/after referendum, across the three geographic mandates revealed the sample was highly balanced.

[5] While the referendum was at the end of the second quarter, we conservatively include this quarter in the "after" period in case some investors held long-term investment decisions in this last quarter awaiting for the referendum's result.

$mandate_{jt,\ ind}$ (for investor *j*, time *t*, and industry *ind*). As in the previous analyses, the main variables of interest for the DD analysis are the $After\ Brexit\ referendum_t$ variable, and variables that indicate the mandate of the investor (UK, EU, and US). We either split the sample by, or control for, the type of investor: whether it is a VC or PE (both of which raise funds as vehicles of investments, funds that typically have a contractual geographic mandate); a corporation (investing directly or through a corporate venture capital arm); an angel; or other type, which includes accelerators and incubators, government and universities, among others. Finally, we control for the country in which the investor is headquartered using region fixed-effects—the regions being UK, EU, US and rest of the world. Table 1 lists and summarizes the variables.

[Table 1 about here]

4 RESULTS

4.1 Startup level

Table 2 presents descriptive statistics for the startup level, specifically for round 1 of investment, split by the origin of the startup. There are a total of 34,949 unique startups in the sample. Not surprisingly, the US is significantly larger in size, with 22,179 startups and a larger average investment of 3.10 USD millions. The UK is very large compared to the EU: it has about half the size of the EU, with 4,219 startups. The mean investment in the UK over the whole period is 1.49 USD millions, while the EU is 2.27 USD millions.

[Table 2 about here]

The first set of DD analyses studies the effect of Brexit's referendum on investment on the cross-section of startups that received the first round of investment either before or after the referendum. On Table 3, we estimate the effect of starting up in the UK vs. the US (Model 1) and the effect of starting up in the EU vs. the US (Model 2). We find that both effects are negative and significant: after the referendum, UK startups receive 8.1 percent less investment than a US startup, and EU startups receive

4.9 percent less investment than a US startup. With a Chow test we compare the size of both coefficients: after the referendum, a UK startup is 3.2 percent worse than an EU startup. Figure 1 tests the assumption of parallel trends: the US has parallel linear trends with both the UK and the EU before Brexit's referendum.

[Table 3 and Figure 1 around here]

Next, we analyze the effect of the referendum on a panel of startups, such that the first round of investment happened before the referendum, and the second round happened either before or after the referendum. The main advantage of this analyses is that it controls for fixed unobserved characteristics of the startup. Table 4 presents the results of the main DD analyses: UK startups receive 9.4 percent less investment than US startups after the referendum (Model 1), and EU startups 6.8 percent less than US startups (Model 2) with a gap of UK relative to EU of 2.6 percent lower investment. Overall, Tables 3 and 4 show consistent results: startups in the UK receive less investment after the referendum, and so do EU startups (albeit the effect is smaller).

[Tables 4 around here]

Next, Table 5 and 6 repeats these DD analyses split by industry. The results show that the effect of Brexit's referendum on investment in the UK and the EU is highly heterogeneous by industry. In healthcare and finance, where institutions are significantly affected by Brexit, the effect is economically large. Table 5 shows that, after the referendum, UK healthcare startups are 27.8 percent worse than US startups, while EU startups are only 8.1 percent worse than US startups; the UK vs. EU gap is estimated at 19.1 percent. In Finance, UK startups are 35.2 percent worse than US startups after the referendum, and EU startups are 50.2 percent worse than the US, which result in a relative advantage of UK startups vs. EU startups of 15 percent. In a sector such as IT, which accounts for 40 to 49 percent of startups (depending on the region), the effect is economically smaller than the average: the UK is 2.1 percent worse than the US, with no statistically significant effect for the EU.

[Table 5 and 6 around here]

The results on Table 6, a panel data analysis, are generally consistent but with two differences. First, healthcare startups see lower investment in the UK and in the EU, but comparatively they are better off in the UK. Jointly with the cross-section analyses on Table 5, this may indicate that investors are allocating more resources to healthcare startups in which they had already invested relative to new investments. For IT startups, the investment on second round is significantly reduced compared to first round in both regions, going from a 1-2 percent impact to a 10-12 percent impact. Interestingly, UK startups is slightly better off than the EU startups on the second round. Differences between UK and EU startups in IT, while statistically significant, are economically less relevant.

4.2 Investor level

Table 7 presents descriptive statistics for the investor-quarter level of analysis, split by the mandate of the investor (UK, EU, or US). On average, between 81 and 88 percent of the portfolio is invested in the investor mandate. Most investors are venture capital or private equity firms (35 to 42 percent, depending on the geographic mandate), followed by angel (32 to 42 percent).

[Table 7 about here]

Table 8 shows DD analyses for the panel of observations by investor over time (quarters). Investors with a UK mandate invest 5.6 percent less (per quarter) in the UK than investors with a US mandate in the US (Model 1); investors with an EU mandate do not significantly change their mandate compared to the US (Model 2). This effect is heterogenous by investor type. VC and PE investors, which have less flexibility to change their mandate, exhibit a smaller change: investors with a UK mandate invest 2.9 percent less in their mandate than investors with a US mandate (Model 3); the effect is 1.9 percent less for EU investors (Model 4). Corporations and angels, which are able to change their geographic focus more easily, exhibit a larger impact of Brexit referendum. Corporations and angels with a UK mandate invest between a 7 and 8 percent less in their mandate than investors with an EU mandate, respectively. In other words, we observe a larger impact of Brexit referendum on those investors that are less constrained to invest in a particular region. Figure 2 shows the effect, graphically, for investors with

UK mandate (Panel A) and with an EU mandate (panel B); upon the referendum, the investors with a UK mandate depart from investors with a US mandate, while the effect is less marked for investors with an EU mandate. The US meets the assumption of parallel trends.

[Insert Tables 8 and 9 and Figure 2 about here]

Table 9 repeats the DD analyses split by industry, showing again that the effect is heterogeneous by industry. In healthcare, and consistent with previous analyses, investors with a UK mandate reduce their healthcare investment in the UK by 7.1 percent compared to investors with a US mandate; this is 5.1 percent less than investors with an EU mandate. In contrast, in finance or in IT, there is no statistically significant change in the focus of the investment mandate.

4.3 Robustness

The results are robust to different specifications. We estimate DD models considering the UK as treatment and the EU as control, and hence effectively estimating the net effect of Brexit's referendum on both regions. The results are qualitatively and quantitatively robust to using US as a control for both treatment and calculating the net effect with a Chow test. These results are presented in the Appendix Tables 1, 2 and 3. In addition, at the investor level the main results focus on the amount of investment; the results are robust to considering the count of investments instead. These regressions are presented in the Appendix Table 4 and 5. Other specifications were also robust. At the investor level, there is often at most one investment opportunity per quarter, and therefore the rate of investment is commonly 0 or 1. Results are robust to estimating instead a Probit panel model (and approximating the dependent variable to 0 or 1 as needed). Finally, startups in the sample are founded after 2013; results are not sensitive to changing that threshold to 2012 or 2014.

5 QUALITATIVE INSIGHTS

The quantitative analyses show that both the UK and the EU are negatively affected by the referendum (compared to the US), and that on average the UK suffers more than the EU, as extant theory had

predicted. Interestingly, however, these analyses show significant industry heterogeneity, with UK startups in healthcare receiving less investment after Brexit compared to EU startups in first round and more in second round, while in financial services, UK startups are comparatively better than EU startups (though startups lose investment in both areas).

Our interviews provide support for the importance of institutional change in both healthcare and financial services as a result of Brexit. In healthcare, most interviewees discussed the movement of the EMA, which had been headquartered in London since 1995, and which would inevitably move to the EU after Brexit—effectively, moving to Amsterdam in March 2019. The EMA had attracted regulatory professionals to London and worked closely with the Medicines and Healthcare products Regulatory Agency (MHRA), and therefore the UK lost an important institution (Richards and Hudson 2016, Kupferschmidt 2017). The presence of the EMA is a contributing factor to the strength of healthcare entrepreneurial firms in the UK—other factors being strong universities in life-sciences as well as the presence of two major pharmaceutical firms (AstraZeneca and GSK). Indeed, about 40 percent of EU startups in healthcare in 2015 were British. All EU interviewees were very concerned with how the move of the EMA would impact startups. Consider for instance the following quotes:

> In the UK, you know the EMA, it has moved to Amsterdam. And this is a big big disadvantage. And it is not about the 2,000 people. It is a whole industry that is moving! All CROs, lawyers that are required to submit the patent applications… all this ecosystem, moved away. This is the worst thing that could happen to the UK. I have seen the same thing around FDA in Bethesda, there are a lot of companies helping with the IND… All these companies need to be around the decision making.
>
> —EU biotech entrepreneur

> But also they are losing the EMA, and that is going to put their research behind by 10 years. Because they are losing a lot of expertise that is moving to Belgium.
>
> —EU biotech investor

Overall, this is consistent with the large negative effects in healthcare, both in the UK and the EU, ranging from 20 to 50 percent lower investment compared to before the vote, but with a greater relative impact for UK entrepreneurial investment. The greater investments on healthcare UK startups on the

second round could also reflect a focus to help current investments develop faster while the EMA was still based in London.

London has long been regarded as the global leader in financial services and fintech investment (Clarke 2021), amounting to about 55 percent of EU fintech startups in 2015. One important factor is the openness of the British regulator (the Financial Conduct Authority, or FCA), welcoming of new innovations in the financial industry. As interviewees pointed out in our conversations, one example of this flexible approach is the Open Banking regulation, with an initial implementation in March 2017 and full implementation in January 2018. This regulation forces the major nine banks in the UK to share transaction data, hence facilitating the launch of new financial innovations, and lowering the barriers to entry to entrepreneurial firms. The attractiveness of the UK regulator was complemented by the financial integration that the EU granted, also known as *passporting*, such that a financial license in one EU country allowed the firm to operate in the whole EU territory (BBA 2017). With Brexit, however, there was significant uncertainty as to whether passporting would continue to include the EU, and finally was excluded from Brexit's deal and from Brexit's Trade and Cooperation Agreement with the EU. For British entrepreneurs in the financial sector, the loss of passporting meant the need to obtain a financial license and open an office in the EU, while the increased openness from the British regulator meant access to data that fosters innovation.

In finance, UK fintech entrepreneurs complained from the loss of passporting and the increased costs that it implied, among other things the delay in the expansion in the EU. Consider the following two quotes from UK fintech entrepreneurs, both of which had to delay expansion into the EU due to the uncertainty about the loss of passporting:

> We have been postponing our plans to expand into Europe because of Brexit and passporting. We would have gone to Europe two years ago. But we had a few accounts from Germany and with the original Brexit we got a letter from the regulator saying 'You are going to be infringing the law because you don't have a license to operate.' We had to pull out from the little we had in Europe, and we are now pursuing a banking license. But a banking license is a terrible thing. It is a two year process. The banking license in the UK had 22,000 pages... And so we are working on it, but it takes long. And we need to wait for that until we can go into Europe.
>
> —UK fintech entrepreneur

> I have the license here in the UK. Passporting is a form, and I put my name, and license number, and there is a list of countries, and I check the countries that I want to do business on, and then I give to the FCA [Financial Conduct Authority], the regulator here. And they take care of it for me, and then they come back and say "you can now operate in these countries." But with Brexit we may lose that, and now I need an office in the EU.
>
> —UK fintech entrepreneur

However, all UK entrepreneurs and UK investors agreed that the UK remained a very strong financial cluster for entrepreneurial fintech firms because of the more friendly regulation, which for interviewees more than compensated the loss of passporting.

> One advantage that the UK has, and that other places don't have, is that for FinTech you need to have the financial sector, the tech sector and the regulator. And we have all that in London. We are lucky because the UK is 60 million, and London has 10 million. And we have the Government, the regulator, the financial and the tech. And you need everything to be together. You go to Germany and that is not the case, the financial is in Frankfurt, the Government is in Berlin, and the tech is somewhere else. You need everything to be in one place.
>
> —UK fintech entrepreneur

> For fintech, the reason to be here [London] is the confluence of money, regulation and talent.
>
> —UK fintech investor

This positive net balance is consistent with our quantitative results in the financial industry, where the UK is relatively better than the EU. The loss of passporting, and the reduced market that UK and EU fintech startups can reach, is consistent with the very significant loss in investment for fintech startups (upwards of 20 percent compared to before the referendum).

6 CONCLUSION: ECONOMIC DISINTEGRATION AND THE ROLE OF INSTITUTIONS

We argue that the quantitative and qualitative data support a relevant role of institutions in the process of economic integration, and the process of disintegration involves transplanting these institutions or losing access to them and therefore changing the balance of comparative advantage.

In healthcare, one of the reasons for the UK's comparative advantage was the presence of the EMA in London, and the regulatory industry that have developed around it. With Brexit, this institution is transplanted to the EU, which in the short term reduces the comparative advantage of the UK relative to the EU; and as the institution establishes in Amsterdam and the industry develops, may increase the comparative advantage of the EU relative to the UK. Of course, the EMA is not the only reason why the UK had a comparative advantage in healthcare entrepreneurial investment (strong universities and an established pharmaceutical industry are others), but it was an important factor, as the data suggests.

In financial services, the UK's comparative advantage stemmed from the strong financial sector, a regulator that favored the creation of startups and innovation in the sector, and the benefits from the EU passporting policy by which UK financial entities had seamless access to the EU market. With Brexit, the institution of passporting is lost for UK financial firms, and therefore the costs of accessing the larger EU market increase. However, the regulator's importance in the financial services industry cannot be understated, and therefore the UK retains the comparative advantage relative to the EU, as the data suggests.

Further analyses will be required to understand the full effect of Brexit on entrepreneurial investment and the time horizon for the effect, as well as to differentiate this effect from the effects of COVID-19 on entrepreneurial investing. Additional research will also be required to examine in more detail each of the mechanisms underlying the effect of economic disintegration, such as how movement of human capital or financial resources has impacted entrepreneurial investment, or how investors are able to internationalize their portfolio and therefore impact entrepreneurial investment on a given region. Furthermore, in this paper we have focused on the before and after the referendum, but more needs to be

understood about how the uncertainty about the process of Brexit, and the degree to which this uncertainty has impacted decision making and in turn economic growth.

This paper has contributed to the economic integration and international trade theories by examining the effect of disintegration on entrepreneurial investment, an area that has previously received little attention in the literature. We build on the literature on international entrepreneurship (Stuart et al. 1999, Sorenson and Stuart 2001, Sørensen 2007, Guler and Guillén 2010, Alvarez-Garrido and Guler 2018), which shows that entrepreneurial financing faces barriers and frictions when investing internationally, as well as the literature on clusters that speaks to the benefits of having the activity concentrated in one region (Alcácer and Chung 2007, Delgado et al. 2010, Samila and Sorenson 2011, Alcácer and Chung 2014, Alcácer and Delgado 2016), to argue and show that entrepreneurial investment also benefits from economic integration. We have shown that the effect of disintegration on certain institutions that are relevant to entrepreneurs have an economically significant impact, hence advancing the stream of literature that has focused on the role of institutions on economic integration (Hall and Soskice 2001, Belloc 2006, Nunn and Trefler 2014), as well as the entrepreneurship literature that has examined how these institutions affect investment (La Porta et al. 1997, 1998, Jeng and Wells 2000). The paper has also contributed to the stream of theory that analyzes the effects of Brexit on economic growth in Europe (Ramiah et al. 2017, Sampson 2017, Belke et al. 2018, Breinlich et al. 2018, Davies and Studnicka 2018, Bloom et al. 2019, Born et al. 2019). Finally, we contribute to practice and policy making to showing that the economically significant and detrimental effects of economic disintegration also extend to investment in entrepreneurial firms which in turn may have an impact on innovation. While more research is required to fully understand the economic impact long term, there are lessons to be learned today as policy makers worldwide are taking certain steps towards economic disintegration.

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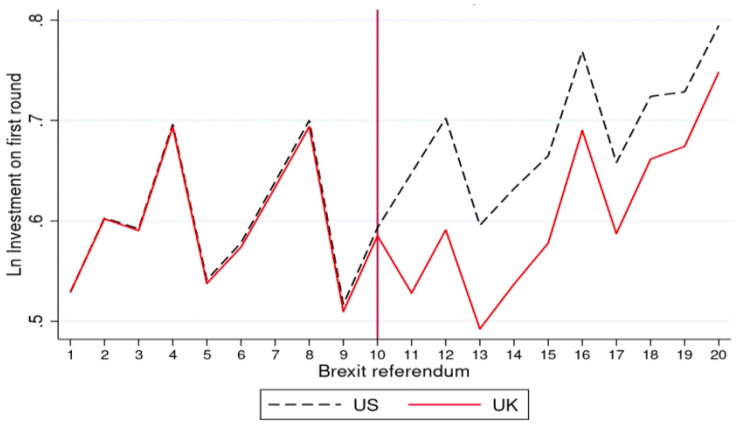
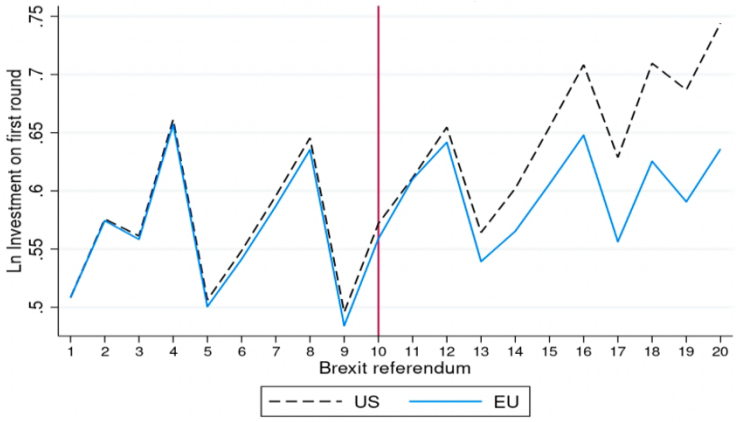
Figure 1. DD parallel trends assumption: amount invested in first round, startup level

Panel A. UK (treatment) vs. US (control)



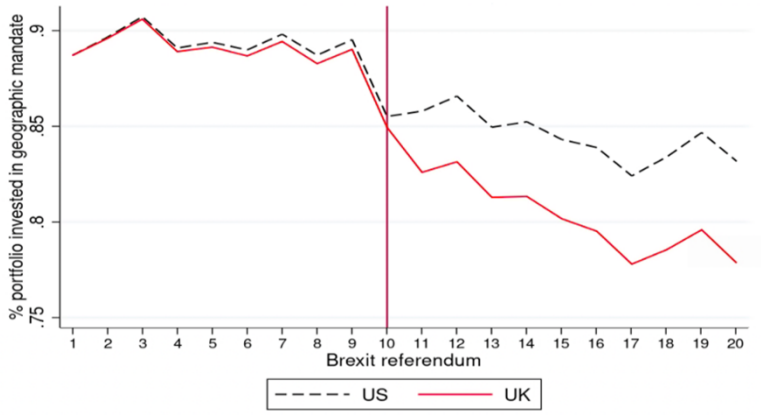
Panel B. EU (treatment) vs. US (control)



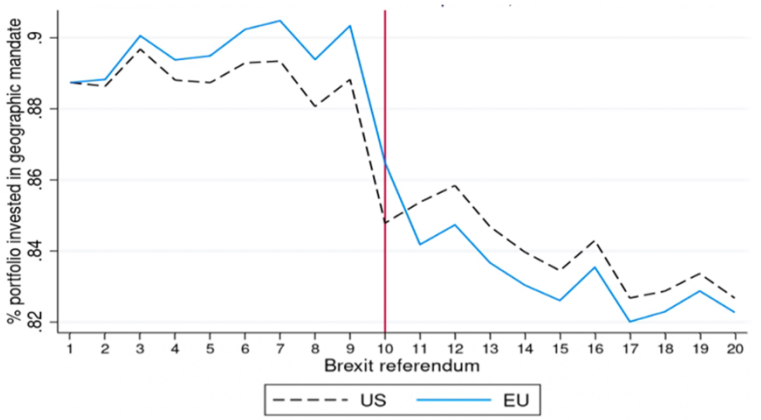
Note. These graphs assess the assumption of parallel trends of treatment (UK startup on panel A, EU startup on panel B) and control (US startup), by plotting linear trends (corrected with controls and time interactions). A startup is from the UK / EU / US when it is headquartered in the UK / EU / US.

Figure 2. DD parallel trends assumption: rate invested in geographic mandate, investor level

Panel A. UK (treatment) vs. US (control)



Panel B. EU (treatment) vs. US (control)



Note. These graphs assess the assumption of parallel trends of treatment (UK investment mandate in panel A, EU investment mandate in panel B) and control (US investment mandate), by plotting linear trends (corrected with controls and time interactions). An investor has an investment geographic mandate in the UK / EU / US when in the 10 years prior to Brexit referendum 50 percent or more of investments are in the UK / EU / US.

Table 1. Variable description

Level	Variable	Description
Time	After Brexit referendum$_t$	1 after 2016 Q2 (time measured in quarters)
Startup	(DV) Investment$_{it}$	Deal size, or amount invested in startup *i* at time *t*, in USD millions. Logged in analyses.
	UK$_i$	1 if startup *i* is headquartered in the UK, 0 if in the US
	EU$_i$	1 if startup *i* is headquartered in the EU, 0 if in the US
	Startup has revenue$_i$	1 if startup has revenue or profits
	Lead investor is a VC$_{it}$	1 if lead investor in startup *i* at time *t* is a venture capital firm
	Startup age$_{it}$	Startup *i* age, in years
	Startup industry$_i$	Exclusive industry classification from Pitchbook for the main industry of the startup: internet technology (IT), healthcare, financial services, business-to-business (B2B), business-to-consumer (B2C), energy, and materials-and-resources
Investor	(DV) Rate invested in mandate$_{jt}$	Rate of deals (in USD) invested in the investor's geographic mandate out of all deals by investor *j* in time *t*. Geographic mandate in a region is defined as having 50 percent or more of investments in that region in the 10 years before Brexit referendum (2006-2015).
	(DV) Rate invested in mandate$_{jt,\ ind}$	Rate of deals (in USD) invested in the investor's geographic mandate out of all deals by investor *j* in time *t* in industry *ind*. Industries follow Pitchbook's classification (see above)
	UK$_j$	1 if the geographic mandate of investor *j* is the UK, 0 if it is the US
	EU$_j$	1 if the geographic mandate of investor *j* is the EU, 0 if it is the US
	VC&PE$_j$	1 if investor *j* is a venture capital or private equity firm
	Corporation$_j$	1 if investor *j* is a corporation (includes corporate venture capital)
	Angel$_j$	1 if investor *j* is an angel investor
	Other type$_j$	1 if investor *j* is not VC&PE, Corporation nor Angel; this includes accelerators and incubators, government, or universities
	Region f.e.	Indicators of whether the investor is headquartered in the UK, EU, US or rest of the world.

Note. Data source: Pitchbook. DV indicates dependent variable.

Table 2. Descriptive statistics at startup level of analysis, observed at first round of investment

Panel A: Descriptive statistics

	Subsample by startup origin	UK			EU			US		
		N_i	mean	se	N_i	mean	se	N_i	mean	se
1.	(DV) Investment$_i$	4,219	1.49	9.51	8,561	2.27	76.76	22,179	3.10	26.80
2.	After Brexit referendum$_t$	4,219	0.55	0.50	8,561	0.54	0.50	22,179	0.50	0.50
3.	Startup has revenue$_i$	4,219	0.46	0.50	8,561	0.52	0.50	22,179	0.43	0.49
4.	Lead investor is a VC$_i$	4,219	0.21	0.40	8,561	0.20	0.40	22,179	0.20	0.40
5.	Startup age$_i$	4,219	1.15	1.01	8,561	1.19	1.07	22,179	1.06	1.00
6.	Industry: IT	4,219	0.41	0.49	8,561	0.40	0.49	22,179	0.39	0.49
7.	Healthcare	4,219	0.13	0.34	8,561	0.12	0.33	22,179	0.17	0.38
8.	Financial	4,219	0.03	0.18	8,561	0.02	0.14	22,179	0.02	0.15
9.	B2B	4,219	0.14	0.35	8,561	0.16	0.37	22,179	0.16	0.36
10.	B2C	4,219	0.26	0.44	8,561	0.25	0.44	22,179	0.23	0.42
11.	Energy	4,219	0.02	0.13	8,561	0.02	0.14	22,179	0.01	0.12
12.	Materials&Resources	4,219	0.01	0.11	8,561	0.02	0.14	22,179	0.01	0.11

Panel B: Correlations

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1.	(DV) Investment$_i$											
2.	After Brexit referendum$_t$	*0.001*										
3.	Startup has revenue$_i$	0.013	0.204									
4.	Lead investor is a VC$_i$	0.011	0.040	0.075								
5.	Startup age$_i$	*0.001*	0.208	0.282	0.048							
6.	Industry: IT	-0.018	-0.022	0.030	0.053	-0.018						
7.	Healthcare	0.018	0.040	-0.058	0.025	0.019	-0.347					
8.	Financial	0.046	*-0.003*	*-0.002*	*-0.002*	-0.013	-0.128	-0.068				
9.	B2B	*-0.007*	0.018	-0.034	-0.028	-0.014	-0.348	-0.184	-0.068			
10.	B2C	*-0.009*	-0.024	0.044	-0.050	0.016	-0.452	-0.240	-0.088	-0.240		
11.	Energy	*0.010*	*-0.008*	*-0.003*	-0.020	0.011	-0.104	-0.055	-0.020	-0.055	-0.072	
12.	Materials&Resources	*0.001*	*0.008*	*0.004*	*-0.006*	*0.007*	-0.098	-0.052	-0.019	-0.052	-0.068	-0.016

Note. Total number of startups, N_i=34,949. In panel analyses, there are 2 observations per startup. Correlations in italics are not significant at 5 percent.

Table 3. DD at the startup level, cross-section at first round of investment

DV: Ln Investment$_i$	(1)	(2)
… vs. US (control)	UK	EU
UK_i * After Brexit referendum$_t$	-0.081**	
	(0.001)	
EU_i * After Brexit referendum$_t$		-0.049*
		(0.003)
UK_i	-0.162**	
	(0.000)	
EU_i		-0.214**
		(0.003)
After Brexit referendum$_t$	0.084*	0.082*
	(0.006)	(0.002)
Startup has revenue$_i$	0.037	0.047
	(0.014)	(0.025)
Lead investor is a VC_i	0.451	0.421
	(0.084)	(0.117)
Startup age$_i$	0.075+	0.080*
	(0.011)	(0.003)
Constant	0.419*	0.411**
	(0.017)	(0.003)
Industry f.e.	Yes	Yes
Observations	26,398	30,739
R-squared	0.103	0.112
Log-likelihood	-30,321	-34,228
*Chow Test, H_0: UK_i * $After_t$ –EU_i * $After_t$ =0*		-0.032**

Note. We estimate a DD model (OLS, with s.e. clustered on country in parentheses) on the cross-section of startups at their first round of investment. Model 1 compares the UK (treated) to the US (control), and Model 2 the EU (treated) to the US (control) The Chow test compares the effect of the DD on both regressions; the UK has 3.2 percent lower investment than the EU after Brexit Referendum.

†p<0.10, *p<0.05, ** p<0.01, *** p<0.001

Table 4. DD at the startup level, panel of first and second round investment

DV: Ln Investment$_i$ … vs. US (control)	(1) UK	(2) EU
UK$_i$ * After Brexit referendum$_t$	-0.094***	
	(0.006)	
EU$_i$ * After Brexit referendum$_t$		-0.068***
		(0.002)
UK$_i$	-0.260***	
	(0.001)	
EU$_i$		-0.250***
		(0.005)
After Brexit referendum$_t$	0.092**	0.090***
	(0.032)	(0.025)
Startup has revenue$_i$	0.105***	0.102***
	(0.001)	(0.004)
Lead investor is a VC$_i$	0.384***	0.380***
	(0.058)	(0.063)
Startup age$_i$	0.162***	0.164***
	(0.017)	(0.011)
Constant	0.479***	0.465***
	(0.012)	(0.009)
Industry f.e.	Yes	Yes
Observations	15,940	17,546
Number of startups	7,970	8,773
R-squared	0.174	0.179
*Chow Test, H_0: UK$_i$ * After$_t$ –EU$_i$ * After$_t$ =0*		-0.026***

Note. We estimate a DD model (random effects panel data, since referendum is fixed in time, with s.e. clustered on country in parentheses) on the panel of startups on the first and second round of investments. The panel is such that the first round happens before the referendum, and the second round before or after the referendum. Model 1 compares the UK (treated) to the US (control), and Model 2 the EU (treated) to the US (control) The Chow test compares the effect of the DD on both regressions; the UK has 2.6 percent lower investment than the EU after Brexit Referendum.
†p<0.10, *p<0.05, ** p<0.01, *** p<0.001

Table 5. DD at the startup level, cross-section at first round of investment, by industry

DV: Ln Investment$_i$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Industry	IT	IT	Health	Health	Finance	Finance	B2B	B2B	B2C	B2C	Energy	Energy	Mat&Res	Mat&Res
… vs. US (control)	UK	EU	UK	EU	UK	EU	UK	EU	UK	EU	UK	EU	UK	EU
UK_i * After Brexit referendum$_t$	-0.021**		-0.278*		-0.352*		-0.090*		0.003		-0.095†		-0.090	
	(0.000)		(0.009)		(0.008)		(0.003)		(0.003)		(0.014)		(0.030)	
EU_i * After Brexit referendum$_t$		-0.011		-0.081†		-0.502**		-0.036*		-0.023*		0.134†		-0.125
		(0.004)		(0.007)		(0.003)		(0.001)		(0.000)		(0.016)		(0.058)
UK_i	-0.215**		-0.116*		-0.102†		-0.142*		-0.143*		0.018*		-0.143†	
	(0.002)		(0.003)		(0.013)		(0.009)		(0.003)		(0.001)		(0.021)	
EU_i		-0.271**		-0.273**		0.112**		-0.215**		-0.141**		-0.232*		-0.171
		(0.004)		(0.003)		(0.001)		(0.000)		(0.001)		(0.008)		(0.040)
After Brexit referendum$_t$	0.066**	0.067*	0.171†	0.166*	0.230†	0.247*	0.028†	0.024†	0.076	0.065*	-0.098*	-0.102*	0.081	0.076
	(0.001)	(0.002)	(0.015)	(0.006)	(0.025)	(0.006)	(0.003)	(0.002)	(0.012)	(0.005)	(0.003)	(0.007)	(0.033)	(0.018)
Startup has revenue$_i$	0.065	0.060	-0.081*	-0.064	0.304	0.271	0.038	0.054	0.020	0.052	0.355*	0.332	0.154	0.157
	(0.021)	(0.010)	(0.003)	(0.029)	(0.098)	(0.051)	(0.027)	(0.042)	(0.011)	(0.034)	(0.020)	(0.054)	(0.099)	(0.077)
Lead investor is a VC_i	0.439	0.410	0.658†	0.624	0.218	0.283†	0.346	0.315	0.380	0.353	0.405	0.321*	0.476	0.417
	(0.087)	(0.119)	(0.058)	(0.105)	(0.074)	(0.036)	(0.128)	(0.147)	(0.073)	(0.096)	(0.118)	(0.007)	(0.128)	(0.168)
Startup age$_i$	0.081*	0.085*	0.080	0.090†	0.092	0.044	0.073	0.077†	0.070	0.080**	-0.076	-0.048	-0.000	0.010
	(0.004)	(0.002)	(0.027)	(0.009)	(0.043)	(0.046)	(0.015)	(0.007)	(0.018)	(0.001)	(0.029)	(0.054)	(0.010)	(0.017)
Constant	0.415*	0.419*	0.602*	0.594*	0.648†	0.689*	0.436*	0.434*	0.326†	0.309**	0.572*	0.563*	0.461†	0.458*
	(0.015)	(0.020)	(0.035)	(0.019)	(0.056)	(0.017)	(0.024)	(0.017)	(0.030)	(0.002)	(0.039)	(0.036)	(0.061)	(0.033)
Observations	10,381	12,130	4,407	4,891	678	711	4,063	4,838	6,140	7,220	386	501	343	448
R-squared	0.103	0.119	0.094	0.099	0.067	0.049	0.054	0.067	0.070	0.076	0.065	0.054	0.059	0.068
Log-likelihood	-11,051	-12,334	-6,197	-6,762	-983.4	-1,074	-4,377	-4,932	-5,974	-6,942	-502.7	-640.6	-432.8	-534.1
Chow Test														
*H_0: UK_i * $After_t$ – EU_i * $After_t$ =0*		-0.010†		-0.197**		0.150**		-0.054**		0.026*		-0.228**		0.034

Note. As in Table 3, but sample split by industry. The Chow test compares the effect of the DD on both regressions.
†p<0.10, *p<0.05, ** p<0.01, *** p<0.001

Table 6. DD at the startup level, panel of first and second round investment, by industry

DV: Ln Investment$_i$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Industry	IT	IT	Health	Health	Finance	Finance	B2B	B2B	B2C	B2C	Energy	Energy	Mat&Res	Mat&Res
… vs. US (control)	UK	EU	UK	EU	UK	EU	UK	EU	UK	EU	UK	EU	UK	EU
UK_i * After Brexit referendum$_t$	-0.102***		-0.048***		-0.187***		-0.119***		-0.048***		-0.187***		-0.210***	
	(0.010)		(0.002)		(0.009)		(0.016)		(0.004)		(0.017)		(0.035)	
EU_i * After Brexit referendum$_t$		-0.120***		-0.139***		-0.230***		0.032***		0.059***		-0.127***		-0.087*
		(0.002)		(0.001)		(0.004)		(0.001)		(0.004)		(0.004)		(0.035)
UK_i	-0.328***		-0.227***		-0.374***		-0.188***		-0.214***		-0.129***		-0.003	
	(0.004)		(0.002)		(0.001)		(0.005)		(0.001)		(0.012)		(0.018)	
EU_i		-0.340***		-0.220***		-0.130***		-0.210***		-0.175***		-0.242***		-0.148***
		(0.004)		(0.001)		(0.007)		(0.002)		(0.001)		(0.005)		(0.024)
After Brexit referendum$_t$	0.084+	0.082*	0.167***	0.156***	0.058	0.064	0.046*	0.072	0.065***	0.049***	-0.015	-0.026	0.174***	0.205**
	(0.050)	(0.041)	(0.028)	(0.008)	(0.040)	(0.047)	(0.021)	(0.058)	(0.014)	(0.012)	(0.041)	(0.016)	(0.019)	(0.064)
Startup has revenue$_i$	0.150***	0.137***	0.043***	0.031**	0.345***	0.312***	0.064	0.088***	0.055***	0.054***	0.175	0.271***	0.059	0.131***
	(0.012)	(0.008)	(0.007)	(0.010)	(0.018)	(0.070)	(0.039)	(0.009)	(0.008)	(0.007)	(0.113)	(0.042)	(0.154)	(0.025)
Lead investor is a VC_i	0.387***	0.386***	0.415***	0.430***	0.507***	0.508***	0.306**	0.339***	0.394***	0.350**	0.249***	0.198*	0.360*	0.325+
	(0.061)	(0.057)	(0.030)	(0.010)	(0.119)	(0.095)	(0.100)	(0.054)	(0.051)	(0.114)	(0.026)	(0.094)	(0.176)	(0.173)
Startup age$_i$	0.189***	0.193***	0.142***	0.150***	0.216***	0.222***	0.199***	0.174***	0.113***	0.126***	0.115***	0.108***	0.104***	0.073**
	(0.030)	(0.021)	(0.017)	(0.003)	(0.010)	(0.005)	(0.002)	(0.037)	(0.007)	(0.013)	(0.007)	(0.015)	(0.030)	(0.023)
Constant	0.430***	0.432***	0.598***	0.590***	0.636***	0.648***	0.347***	0.356***	0.375***	0.371***	0.405***	0.385***	0.344***	0.350***
	(0.041)	(0.040)	(0.021)	(0.009)	(0.041)	(0.053)	(0.037)	(0.045)	(0.012)	(0.005)	(0.049)	(0.012)	(0.054)	(0.053)
Observations	6,374	6,988	2,962	3,144	412	420	1,998	2,282	3,708	4,124	250	302	236	286
Number of startups	3,187	3,494	1,481	1,572	206	210	999	1,141	1,854	2,062	125	151	118	143
R-squared	0.203	0.217	0.123	0.130	0.199	0.174	0.143	0.149	0.146	0.135	0.069	0.097	0.127	0.117
Chow Test		0.017**		0.100***		0.09		-0.153***		-0.112***		-0.042***		-0.076***
*H_0: UK_i * $After_t$ –EU_i * $After_t$ =0*														

Note. As in Table 5, but sample split by industry. The Chow test compares the effect of the DD on both regressions.
†p<0.10, *p<0.05, ** p<0.01, *** p<0.001

Table 7. Descriptive statistics at investor-quarter level of analysis

Panel A. Descriptive statistics

	Subsample by geographic mandate	UK				EU				US			
		N_{jt}	N_j	mean	se	N_{jt}	N_j	mean	se	N_{jt}	N_j	mean	se
1.	(DV) Rate invested in $mandate_{jt}$	6,737	2,295	0.81	0.38	16,550	5,146	0.83	0.36	65,722	18,516	0.88	0.31
2.	(DV) Rate invested in $mandate_{jt,\ IT}$	3,323	1,359	0.79	0.39	7,869	2,919	0.79	0.39	35,678	11,214	0.87	0.32
3.	(DV) Rate invested in $mandate_{jt,\ Healthcare}$	1,414	506	0.83	0.37	3,396	1,334	0.82	0.38	15,869	5,672	0.90	0.28
4.	(DV) Rate invested in $mandate_{jt,\ Finance}$	384	245	0.80	0.40	642	404	0.74	0.44	3,564	1,880	0.81	0.38
5.	(DV) Rate invested in $mandate_{jt,\ B2B}$	1,511	732	0.84	0.36	3,711	1,761	0.85	0.35	14,110	6,036	0.86	0.34
6.	(DV) Rate invested in $mandate_{jt,\ B2C}$	1,888	880	0.83	0.37	5,127	2,153	0.85	0.35	18,823	7,260	0.85	0.34
7.	(DV) Rate invested in $mandate_{jt,\ Energy}$	266	141	0.85	0.36	752	442	0.88	0.32	1,815	1,044	0.83	0.37
8.	(DV) Rate invested in $mandate_{jt,\ Mat\&Res}$	208	121	0.86	0.34	499	302	0.88	0.31	1,575	922	0.86	0.35
9.	After Brexit $referendum_t$	6,737	2,295	0.40	0.49	16,550	5,146	0.43	0.50	65,722	18,516	0.40	0.49
10.	$VC\&PE_j$	6,737	2,295	0.35	0.48	16,550	5,146	0.42	0.49	65,722	18,516	0.42	0.49
11.	$Corporation_j$	6,737	2,295	0.04	0.20	16,550	5,146	0.06	0.24	65,722	18,516	0.05	0.21
12.	$Angel_j$	6,737	2,295	0.35	0.48	16,550	5,146	0.23	0.42	65,722	18,516	0.32	0.46
13.	Other $type_j$	6,737	2,295	0.23	0.42	16,550	5,146	0.26	0.44	65,722	18,516	0.18	0.38

Panel B. Correlations

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1.	(DV) Rate invested in $mandate_{jt}$												
2.	(DV) Rate invested in $mandate_{jt,\ IT}$	0.858											
3.	(DV) Rate invested in $mandate_{jt,\ Healthcare}$	0.913	0.7676										
4.	(DV) Rate invested in $mandate_{jt,\ Finance}$	0.396	0.482	0.483									
5.	(DV) Rate invested in $mandate_{jt,\ B2B}$	0.747	0.5351	0.666	0.229								
6.	(DV) Rate invested in $mandate_{jt,\ B2C}$	0.719	0.6107	0.682	0.145	0.539							
7.	(DV) Rate invested in $mandate_{jt,\ Energy}$	0.654	0.5391	0.502	0.113	0.501	0.355						
8.	(DV) Rate invested in $mandate_{jt,\ Mat\&Res}$	0.799	0.8068	0.798	0.473	0.496	0.525	0.430					
9.	After Brexit $referendum_t$	-0.134	-0.128	-0.098	-0.087	-0.106	-0.110	-0.093	-0.120				
10.	$VC\&PE_j$	-0.045	-0.028	-0.029	-0.033	-0.038	-0.042	0.043	0.012	0.144			
11.	$Corporation_j$	-0.026	-0.035	*-0.008*	-0.059	-0.020	-0.023	*-0.028*	*0.000*	-0.017	-0.193		
12.	$Angel_j$	0.097	0.091	0.081	0.142	0.107	0.094	0.067	*0.095*	-0.168	-0.552	-0.152	
13.	Other $type_j$	-0.018	-0.027	*-0.013*	-0.071	-0.026	-0.026	*-0.008*	-0.058	*0.003*	-0.415	-0.114	-0.325

Note. Total number of observations, N_{jt}= 89,009. Total number of unique investors, N_j=25,957. Pairwise correlations calculated for each DV and independent variables; correlations among DV and among independent variables calculated for the whole sample. Correlations in italics are not significant at 5 percent.

Table 8. DD at the investor level, rate of investments (in USD) in geographic mandate, total and by investor type

DV: Rate invested in mandate$_{jt}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Investor type	All	All	VC&PE	VC&PE	Corporation	Corporation	Angel	Angel
… vs. US (control)	UK	EU	UK	EU	UK	EU	UK	EU
UK mandate$_j$ * After Brexit referendum$_t$	-0.056**		-0.029***		-0.127***		-0.071**	
	(0.019)		(0.000)		(0.004)		(0.024)	
EU mandate$_j$ * After Brexit referendum$_t$		-0.003		-0.019***		-0.047***		-0.000
		(0.021)		(0.001)		(0.013)		(0.017)
UK mandate$_j$	0.059		0.043		0.017		0.035	
	(0.119)		(0.168)		(0.066)		(0.075)	
EU mandate$_j$		0.058		0.104		0.095+		0.005
		(0.124)		(0.181)		(0.055)		(0.049)
After Brexit referendum$_t$	-0.082***	-0.082***	-0.036***	-0.037***	-0.198***	-0.198***	-0.093***	-0.092***
	(0.001)	(0.003)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.002)
Constant	0.841***	0.845***	0.611***	0.618***	0.814***	0.816***	0.924***	0.929***
	(0.010)	(0.029)	(0.002)	(0.036)	(0.022)	(0.032)	(0.002)	(0.011)
Region f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investor type f.e.	Yes	Yes	No	No	No	No	No	No
Observations	72,459	82,272	29,857	34,416	3,450	4,198	23,085	24,516
Unique investors	20,811	23,662	4,341	5,163	1,620	2,040	10,601	11,265
R-squared	0.103	0.079	0.189	0.156	0.122	0.105	0.054	0.058
Chow Test		-0.046***		-0.009***		-0.088***		-0.072***
*H_0: UK_i * $After_t$ –EU_i * $After_t$ =0*								

Note. We estimate a DD model (random effects panel data, since referendum is fixed in time, with s.e. clustered on geographic mandate in parentheses) on the rate of dollar investment in the geographic mandate on a given quarter. Geographic mandate in the UK (EU/US) is defined as having invested over 50 percent of the fund in the UK (EU/US) in the 10 years before the referendum. Model 1 compares the UK (treated) to the US (control), and Model 2 the EU (treated) to the US (control), and so on. The Chow test compares the effect of the DD on both regressions.
†p<0.10, *p<0.05, ** p<0.01, *** p<0.001

Table 9. DD at the investor level, rate of investments (in USD) in geographic mandate by industry

DV: Rate invested in mandate$_{jt, ind}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Investment in industry	IT	IT	Health	Health	Finance	Finance	B2B	B2B	B2C	B2C	Energy	Energy	Mat&Res	Mat&Res
… vs. US (control)	UK	EU	UK	EU	UK	EU	UK	EU	UK	EU	UK	EU	UK	EU
UK mandate$_j$	-0.027		-0.071***		0.003		-0.044**		-0.019		-0.047***		0.019	
* After Brexit referendum$_t$	(0.017)		(0.005)		(0.013)		(0.013)		(0.014)		(0.007)		(0.016)	
EU mandate$_j$		-0.013		-0.015**		-0.019		0.016		0.014		0.013		0.052***
* After Brexit referendum$_t$		(0.016)		(0.005)		(0.019)		(0.013)		(0.012)		(0.013)		(0.008)
UK mandate$_j$	0.028		-0.017		0.180		0.098		0.082		0.147		0.060	
	(0.115)		(0.151)		(0.152)		(0.134)		(0.114)		(0.153)		(0.117)	
EU mandate$_j$		0.033		0.014		0.073		0.115		0.102		0.196		0.209
		(0.114)		(0.145)		(0.159)		(0.128)		(0.136)		(0.155)		(0.131)
After Brexit referendum$_t$	-0.075***	-0.076***	-0.039***	-0.038***	-0.042***	-0.041***	-0.055***	-0.056***	-0.064***	-0.066***	-0.052***	-0.060***	-0.054***	-0.066***
	(0.000)	(0.002)	(0.000)	(0.002)	(0.003)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.004)	(0.001)	(0.008)
Constant	0.848***	0.850***	0.876***	0.881***	0.768***	0.792***	0.835***	0.833***	0.840***	0.836***	0.796***	0.764***	0.825***	0.800***
	(0.008)	(0.024)	(0.006)	(0.029)	(0.011)	(0.040)	(0.010)	(0.023)	(0.012)	(0.024)	(0.024)	(0.008)	(0.025)	(0.010)
Region f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investor type f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	39,001	43,547	17,283	19,265	3,948	4,206	15,621	17,821	20,711	23,950	2,081	2,567	1,783	2,074
Unique investors	12,573	14,133	6,178	7,006	2,125	2,284	6,768	7,797	8,140	9,413	1,185	1,486	1,043	1,224
R-squared	0.097	0.087	0.095	0.07	0.120	0.117	0.107	0.0884	0.108	0.081	0.119	0.076	0.151	0.117
Chow Test		-0.007		-0.051***		0.024*		-0.052***		-0.027**		-0.045***		-0.004
*H_0: UK_i * $After_t$ –EU_i * $After_t$ =0*														

Note. We estimate a DD model (random effects panel data, since referendum is fixed in time, with s.e. clustered on geographic mandate in parentheses) on the rate of dollar investment in the geographic mandate on a given quarter conditional on an industry. Geographic mandate in the UK (EU/US) is defined as having invested over 50 percent of the fund in the UK (EU/US) in the 10 years before the referendum. Model 1 compares the UK (treated) to the US (control), and Model 2 the EU (treated) to the US (control), and so on. The Chow test compares the effect of the DD on both regressions.
†p<0.10, *p<0.05, ** p<0.01, *** p<0.001

Appendix Table 1. DD at the startup level, cross-section at first round of investment, UK vs. EU

DV: Ln Investment$_i$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Industry	All	IT	Healthcare	Financial	B2B	B2C	Energy	Mat & Res
… vs. EU (control)	UK	UK	UK	UK	UK	UK	UK	UK
UK_i * After Brexit referendum$_t$	-0.031†	-0.003*	-0.210*	0.190*	-0.064*	0.026†	-0.309†	0.084†
	(0.003)	(0.000)	(0.010)	(0.014)	(0.002)	(0.002)	(0.025)	(0.011)
UK_i	0.054*	0.057*	0.164*	-0.215†	0.086*	-0.003	0.257*	0.004
	(0.002)	(0.001)	(0.005)	(0.023)	(0.001)	(0.001)	(0.015)	(0.004)
After Brexit referendum$_t$	0.039	0.052*	0.102	-0.314†	-0.009	0.054	0.007	-0.106*
	(0.010)	(0.002)	(0.024)	(0.036)	(0.010)	(0.029)	(0.002)	(0.003)
Startup has revenue$_i$	0.092*	0.103	-0.012	0.446†	0.111*	0.071	0.213†	-0.001
	(0.002)	(0.027)	(0.022)	(0.050)	(0.002)	(0.051)	(0.021)	(0.065)
Lead investor is a VC$_i$	0.203*	0.172*	0.399*	0.252	0.056	0.200*	0.460	0.206*
	(0.008)	(0.012)	(0.025)	(0.113)	(0.042)	(0.012)	(0.141)	(0.016)
Startup age$_i$	0.060	0.081†	0.033	0.063	0.053	0.059	0.041	0.021
	(0.018)	(0.010)	(0.045)	(0.130)	(0.017)	(0.027)	(0.017)	(0.017)
Constant	0.215†	0.180***	0.409†	0.732†	0.266†	0.206	0.285*	0.421†
	(0.025)	(0.000)	(0.044)	(0.114)	(0.024)	(0.047)	(0.007)	(0.054)
Industry f.e.	Yes	No	No	No	No	No	No	No
Observations	12,783	5,167	1,574	315	1,989	3,268	256	214
R-squared	0.070	0.075	0.053	0.065	0.028	0.052	0.089	0.032
Log-likelihood	-11,365	-3,812	-1,819	-463.6	-1,657	-2,590	-295.5	-182.9

Note. We estimate a DD model (OLS, with s.e. clustered on country in parentheses) on the cross-section of startups at their first round of investment, for UK and EU firms. This regression estimates the net effect of Brexit on the UK relative to the EU.
†p<0.10, *p<0.05, ** p<0.01, *** p<0.001

Appendix Table 2. DD at the startup level, panel of first and second round investment, UK vs. EU

DV: Ln Investment$_i$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Industry	All	IT	Healthcare	Financial	B2B	B2C	Energy	Mat & Res
… vs. EU (control)	UK	UK	UK	UK	UK	UK	UK	UK
UK_i * After Brexit referendum$_t$	-0.034***	0.000	0.096***	-0.034***	-0.185***	-0.109***	-0.069**	-0.127**
	(0.003)	(0.005)	(0.000)	(0.002)	(0.006)	(0.001)	(0.026)	(0.042)
UK_i	-0.006**	0.015***	-0.007***	-0.232***	0.029***	-0.042***	0.103***	0.111***
	(0.002)	(0.002)	(0.001)	(0.007)	(0.002)	(0.005)	(0.005)	(0.026)
After Brexit referendum$_t$	0.085***	0.063*	0.067	-0.065*	0.184***	0.108**	-0.099***	0.125
	(0.024)	(0.031)	(0.046)	(0.027)	(0.031)	(0.037)	(0.017)	(0.089)
Startup has revenue$_i$	0.102***	0.151***	0.020	0.198*	0.054	0.069***	0.197	-0.008
	(0.002)	(0.031)	(0.031)	(0.094)	(0.078)	(0.007)	(0.210)	(0.182)
Lead investor is a VC$_i$	0.229***	0.232***	0.365***	0.292***	0.175†	0.183***	0.062†	0.080*
	(0.021)	(0.030)	(0.048)	(0.050)	(0.096)	(0.050)	(0.037)	(0.036)
Startup age$_i$	0.128***	0.132***	0.117***	0.214***	0.137***	0.126***	0.087***	0.072
	(0.016)	(0.025)	(0.035)	(0.032)	(0.040)	(0.028)	(0.018)	(0.065)
Constant	0.214***	0.174***	0.421***	0.603***	0.230***	0.216***	0.205**	0.339***
	(0.033)	(0.017)	(0.031)	(0.003)	(0.015)	(0.015)	(0.070)	(0.056)
Industry f.e.	Yes	No	No	No	No	No	No	No
Observations	7,050	2,834	926	190	1,016	1,812	142	130
Number of startups	3,525	1,417	463	95	508	906	71	65
R-squared	0.130	0.145	0.079	0.123	0.116	0.120	0.087	0.070

Note. We estimate a DD model (random effects panel data, since referendum is fixed in time, with s.e. clustered on country in parentheses) on the cross-section of startups at their first round of investment. This regression estimates the net effect of Brexit on the UK relative to the EU.
†p<0.10, *p<0.05, ** p<0.01, *** p<0.001

Appendix Table 3. DD at the investor level, by investor type and by industry, UK vs. EU

DV: Rate invested in mandate$_{jt,\ ind}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Investor type	All	VC&PE	Corporation	Angel	All	All	All	All	All	All	All
Industry	All	All	All	All	IT	Health	Finance	B2B	B2C	Energy	Mat&Res
… vs. EU (control)	UK	UK	UK	UK	UK	UK	UK	UK	UK	UK	UK
UK mandate * After Brexit referendum$_t$	-0.045	-0.009***	-0.044**	-0.071*	-0.010	-0.047***	0.019	-0.049***	-0.035*	-0.047***	-0.039*
	(0.028)	(0.000)	(0.015)	(0.029)	(0.024)	(0.006)	(0.018)	(0.015)	(0.017)	(0.012)	(0.020)
UK mandate	0.026	0.001	-0.066	0.019	0.016	0.033	0.039	0.006	-0.009	-0.051	0.008
	(0.154)	(0.255)	(0.060)	(0.074)	(0.152)	(0.209)	(0.191)	(0.156)	(0.134)	(0.146)	(0.187)
After Brexit referendum$_t$	-0.087***	-0.057***	-0.235***	-0.095***	-0.089***	-0.056***	-0.075***	-0.047***	-0.050***	-0.038***	-0.030***
	(0.005)	(0.000)	(0.013)	(0.008)	(0.006)	(0.001)	(0.001)	(0.003)	(0.004)	(0.008)	(0.001)
Constant	0.895***	0.686***	0.955***	0.928***	0.876***	0.862***	0.859***	0.929***	0.921***	0.927***	0.957***
	(0.028)	(0.006)	(0.030)	(0.013)	(0.029)	(0.008)	(0.034)	(0.036)	(0.047)	(0.091)	(0.039)
Region f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investor type f.e.	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	23,287	9,269	1,318	6,173	11,192	4,810	1,026	5,222	7,015	1,018	707
Unique investors	7,441	1,576	774	3,164	4,278	1,840	649	2,493	3,033	583	423
R-squared	0.097	0.088	0.172	0.075	0.079	0.114	0.067	0.088	0.100	0.088	0.057

Note. Unlike in Table 8, we perform a DD analysis of UK vs. EU for the rate of investment in the geographic mandate (in USD)
†p<0.10, *p<0.05, ** p<0.01, *** p<0.001

Appendix Table 4. DD at the investor level, percentage of investments in geographic mandate by investor type

DV: Percentage of investments in mandate$_{jt}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Investor type	All	All	VC&PE	VC&PE	Corporation	Corporation	Angel	Angel
… vs. US (control)	UK	EU	UK	EU	UK	EU	UK	EU
UK mandate$_j$ * After Brexit referendum$_t$	-0.053**		-0.026***		-0.116***		-0.068**	
	(0.020)		(0.000)		(0.005)		(0.025)	
EU mandate$_j$ * After Brexit referendum$_t$		-0.000		-0.019***		-0.043**		0.005
		(0.021)		(0.001)		(0.014)		(0.018)
UK mandate$_j$	0.062		0.048		0.017		0.036	
	(0.122)		(0.170)		(0.069)		(0.076)	
EU mandate$_j$		0.066		0.119		0.097+		0.006
		(0.127)		(0.182)		(0.058)		(0.051)
After Brexit referendum$_t$	-0.080***	-0.080***	-0.033***	-0.033***	-0.201***	-0.202***	-0.093***	-0.091***
	(0.001)	(0.003)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.002)
Constant	0.839***	0.843***	0.604***	0.611***	0.810***	0.812***	0.921***	0.926***
	(0.010)	(0.028)	(0.002)	(0.037)	(0.022)	(0.032)	(0.002)	(0.012)
Region f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investor type f.e.	Yes	Yes	No	No	No	No	No	No
Observations	72,459	82,272	29,857	34,416	3,450	4,198	23,085	24,516
Unique investors	20,811	23,662	4,341	5,163	1,620	2,040	10,601	11,265
R-squared	0.112	0.0842	0.212	0.174	0.126	0.108	0.0548	0.0582
Chow Test		-0.043***		-0.005***		-0.086***		-0.075***
*H_0: UK_i * $After_t$ –EU_i * $After_t$ =0*								

Note. We estimate a DD model (random effects panel data, since referendum is fixed in time, with s.e. clustered on geographic mandate in parentheses) on the percentage of investments (count) in the geographic mandate on a given quarter. Geographic mandate in the UK (EU/US) is defined as having invested over 50 percent of the fund in the UK (EU/US) in the 10 years before the referendum. Model 1 compares the UK (treated) to the US (control), and Model 2 the EU (treated) to the US (control), and so on. The Chow test compares the effect of the DD on both regressions.

†p<0.10, *p<0.05, ** p<0.01, *** p<0.001

Appendix Table 5. DD at the investor level, percentage of investments in geographic mandate by industry

DV: Percentage of investments in mandate$_{jt, ind}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Industry	IT	IT	Health	Health	Finance	Finance	B2B	B2B	B2C	B2C	Energy	Energy	Mat&Res	Mat&Res
… vs. US (control)	UK	EU	UK	EU	UK	EU	UK	EU	UK	EU	UK	EU	UK	EU
UK mandate$_j$ * After Brexit referendum$_t$	-0.028†		-0.060***		0.001		-0.043***		-0.020		-0.042***		0.025	
	(0.015)		(0.004)		(0.012)		(0.013)		(0.013)		(0.008)		(0.016)	
EU mandate$_j$ * After Brexit referendum$_t$		-0.015		-0.015**		-0.010		0.016		0.012		0.019		0.050***
		(0.015)		(0.005)		(0.019)		(0.013)		(0.011)		(0.013)		(0.008)
UK mandate$_j$	0.025		-0.021		0.174		0.097		0.081		0.149		0.057	
	(0.113)		(0.151)		(0.147)		(0.134)		(0.114)		(0.155)		(0.117)	
EU mandate$_j$		0.037		0.016		0.063		0.116		0.104		0.193		0.209
		(0.111)		(0.146)		(0.160)		(0.128)		(0.137)		(0.155)		(0.132)
After Brexit referendum$_t$	-0.069***	-0.070***	-0.038***	-0.037***	-0.042***	-0.041***	-0.052***	-0.053***	-0.059***	-0.061***	-0.051***	-0.058***	-0.053***	-0.065***
	(0.000)	(0.001)	(0.000)	(0.002)	(0.003)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.004)	(0.001)	(0.007)
Constant	0.855***	0.857***	0.877***	0.881***	0.769***	0.794***	0.837***	0.834***	0.843***	0.838***	0.794***	0.763***	0.826***	0.802***
	(0.008)	(0.023)	(0.007)	(0.029)	(0.010)	(0.043)	(0.010)	(0.022)	(0.012)	(0.023)	(0.024)	(0.009)	(0.025)	(0.010)
Region f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investor type f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	39,001	43,547	17,283	19,265	3,948	4,206	15,621	17,821	20,711	23,950	2,081	2,567	1,783	2,074
Unique investors	12,573	14,133	6,178	7,006	2,125	2,284	6,768	7,797	8,140	9,413	1,185	1,486	1,043	1,224
R-squared	0.100	0.089	0.099	0.077	0.121	0.117	0.108	0.089	0.115	0.086	0.121	0.077	0.150	0.116
Chow Test		-0.006		-0.039***		0.011		-0.052***		-0.025**		-0.048***		0.005
*H_0: UK_i * $After_t$ –EU_i * $After_t$ =0*														

Note. We estimate a DD model (random effects panel data, since referendum is fixed in time, with s.e. clustered on geographic mandate in parentheses) on the rate of dollar investment in the geographic mandate on a given quarter conditional on an industry. Geographic mandate in the UK (EU/US) is defined as having invested over 50 percent of the fund in the UK (EU/US) in the 10 years before the referendum. Model 1 compares the UK (treated) to the US (control), and Model 2 the EU (treated) to the US (control), and so on. The Chow test compares the effect of the DD on both regressions.

†p<0.10, *p<0.05, ** p<0.01, *** p<0.001