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▶ **To cite this version:**

Jamal Bouoiyour, Refk Selmi. Are UK industries resilient in dealing with uncertainty? The case of Brexit. 2016. hal-01880322

HAL Id: hal-01880322

https://hal-univ-pau.archives-ouvertes.fr/hal-01880322

Preprint submitted on 24 Sep 2018

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Working Papers Series

Centre d'Analyse Théorique et de Traitement des données économiques

CATT WP No. 3
October 2016

ARE UK INDUSTRIES RESILIENT IN DEALING WITH UNCERTAINTY ? THE CASE OF BREXIT

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Are UK industries resilient in dealing with uncertainty? The case of Brexit

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Abstract: Given the European Union (EU)'s central role in regulating various sectors, the decision to leave poses profound questions for UK industries in upheaval. This paper examines –at sectoral level– the dynamics of stock prices surrounding the announcement of the UK's EU membership referendum on 24 June 2016. Assessing seven sectors of British stock index, we show that the Brexit had a significant impact on the valuation of UK companies. While all industries face increasing uncertainty, the referendum outcome had varying sectoral effects. Specifically, the responses of banks and financial services, defense and airlines, real estate and technology to the Brexit event were even more severe than the reactions of oil and gas, pharmaceuticals and consumer goods. The lack of opportunity to benefit from the European passporting rules to establish businesses, to access to EU's Research and Development funds and to hire the skilled workers have been offered to explain the harmful impact of Brexit uncertainty on UK share sectors.

Keywords: Brexit; uncertainty; UK stock market; sectoral-level analysis.

JEL codes: G10; G15.

1. Introduction

The 2016 was a bad year for traders and investors. First, the recession scare in January following the great Chinese currency deterioration, the market decrease of oil price attaining $25 a barrel coupled with sharp credit markets tumbling. Second, the Bank of Japan pursued the European experiment with negative interest rates, which arises a vexing question about the appropriateness of global central banks to help avoiding an untoward event of a real economic downturn. Add to this the geopolitical development; On Friday, 24 June 2016, it was officially announced that the United Kingdom (UK) voted to withdraw from the European Union (EU), resulting in what is commonly known as "Brexit". This result was surprising by the vast majority of capital market participants and even on the day of the referendum, bookmakers' odds supposed a 90 percent chance that the withdrawal of the UK from the EU would fail (Bloomberg 2016). In fact, the historic decision by British voters to pursue Brexit was very shocking for investors and regulators. The traders' panicky knee-jerk response highlights their belief that the decision to leave the Europe would harm the home-grown businesses. Soon after the Brexit results, many experts have predicted that UK stocks will crash markedly given the uncertainty over the potential timing and terms of a managed UK exit from the European Union. David Reid -Portfolio Manager at Black Rock- has gone a step further, forecasting which stock-market sectors will get hit hardest in the onset of Brexit. Some sectors are expected to lose less than others.

To mitigate harmful consequences, UK industries (especially the largest losers from the announcement of Brexit) have to make important economic choices based on the resulting policy environment (Brogaard and Detzel 2015; Schiereck et al. 2016). In fact, the referendum on the UK's EU membership can be viewed as a sharp change in UK government policy. Normally, policy changes lead to a drop of stock prices, especially when the anxiety over such change is greater. Accordingly, Tielmann and Schiereck (2016) provided evidence that Brexit had strong detrimental impacts on UK financials and logistics companies owing to the wider uncertainty with respect to the future UK-EU relationship. Several financial institutions placed their EU headquarter

in the UK to gain from the developed UK financial market (in particular, "Fintech"[1]) and the European passporting rules to undertake investments in other EU members. Nevertheless, the Brexit vote exacerbated fears regarding the prospects of the operations of international financial and banking institutions and the regulatory environment, since it is unclear whether the institutions located in the UK will remain enjoy a full access to EU financial markets.

Although prior research on the impact of sudden events and changes in government policy documented an adverse influence on share markets, there is no "one-sided" evidence on the effects of Brexit on UK investments in different sectors. Recently, Kolaric and Schiereck (2016) investigated the reactions of airline stock prices over the terrorist attacks in Paris and Brussels. By examining 27 of the biggest U.S., Canadian, and European airlines firms, they deduced that the adjustment of stock prices is in line with the assumption of efficient capital markets. The reaction to the attack events seems significant for all the companies studied, due to the unprecedented damages caused by this sudden event and the particular attention these events receive from the media and social networking. Potentially, they showed that the largest companies are more threatened by the attacks than the smaller industries, and thus the effect of a sudden event on the performance of companies depend on their sizes. They also suggested that stocks do not depend to the net income in the year prior to the event. This study complements and contributes to the existing literature by addressing the following questions: How differently does Brexit influence UK industries? Are UK companies resilient in dealing with the great uncertainty surrounding Brexit? Does such effect depend on firms' sizes and profits? To answer these questions, we use the event study methodology to calculate cumulative abnormal returns (CARs) for several sectors of the British equity market (financials, oil and gas, real estate, defense and airlines, pharmaceuticals and biotechnology, consumer goods and technology), and then to test their responses to the Brexit announcement. So far, the empirical research on Brexit remains rather limited, with some analyses focusing on the overall impact of Brexit for different countries (Balis 2016; Bouoiyour and Selmi 2016 a; Ham 2016),

[1] Financial technology (also known as "Fintech") is an industry composed of companies that utilize technological innovation to make financial services more efficient.

while others concentrate on specific sectors, whose core business is directly affected by the UK's withdrawal from EU such as logistics (Tielmann and Schiereck 2016), airlines (Kolaric and Schiereck 2016), defense and aerospace sector (Bouoiyour and Selmi 2016 b). This paper differentiates itself from these researches by answering how will leaving EU affect different UK industries and what would be the investing implications of Brexit.

The structure of the paper is as follows: Section 2 discusses the methodology and the data. Section 3 reports and discusses our main empirical findings. Section 4 offers overall conclusions and some policy implications for UK companies in upheaval.

2. Sample construction and methodology

This research is interested on the UK referendum and evaluates –at sectoral level– the impact of the UK's decision to leave the EU on UK stock market prices. The referendum outcome was not announced until June 24 2016, which we subsequently view as the Brexit announcement day. Our sample data include seven sectors of stock indices. The sector indices offer some insights of the performance of the UK equity market. The selected industries include financials (banks, insurance, reinsurance and financial services), real estate, oil and gas (oil and gas producers, oil equipment, and services, distribution and alternative energy), pharmaceuticals and biotechnology, technology (software and computer services, and technology hardware and equipment), defense and airlines, and consumer goods. Each sector index represents a capitalization-weighted portfolio of the largest UK firms in this sector. The sectoral UK stock market data are available at Datastream database. For defense and airlines, we use NMX2710 share price index where the historical data are available in UK live charts (http://www.livecharts.co.uk/share_prices/historic-data-NMX2710-start-30).

Methodologically, this study carries out the standard market model event study methodology as originally depicted by Dodd and Warner (1983) and Brown and Warner (1985). The cumulative abnormal return (CAR) for a sector *i* during the event

window [τ_1 ; τ_2] surrounding the event day t = 0, where [τ_1 ;τ_2] = ∈ [-5 ;$+5$] , is denoted as:

$$CAR_{i,[\tau_1,\tau_2]} = \sum_{t=\tau_1}^{\tau_2} (R_{i,t} - \hat{\alpha}_i - \hat{\beta}_i R_{M,t}) \quad (1)$$

where $CAR_{i,[\tau_1,\tau_2]}$ is the cumulative abnormal return of share i during the event window [τ_1; τ_2], $R_{i,t}$ is the realized return of stock i on day t[2], $R_{M,t}$ is the return of the benchmark index of sector i, $\hat{\alpha}_i$ and $\hat{\beta}_i$ are the regression estimates from an ordinary least squares (OLS) regression for 240 trading day estimation period until t = −5. Following Kolaric and Schiereck (2016), we employ the Datastream's value-weighted total return stock market index of sector i's country of origin as the benchmark index. As mentioned above we set our event day for the Brexit event to Friday, 24 June 2016, at the close of the trading day in the United Kingdom.

We perform, then, a regression analysis to identify the main determinants of the observed cumulative abnormal return for each sector. The OLS regression to be estimated is expressed as follows:

$$CAR_{i,[\tau_1,\tau_2]} = \delta_0 + \delta_1 Brexit + \delta_2 Size + \delta_3 Netincome + \varepsilon_i \quad (2)$$

where $CAR_{i,[\tau_1,\tau_2]}$ is the dependent variable, *Brexit* is a dummy variable which takes the value of one on the first day of trading after the referendum and zero otherwise, created to capture the immediate risk, *size* is the logarithm of the total assets of a firm in U.S. dollars in the year prior to the event, and the *net income* is the logarithm of the net income of a firm in dollars in the year prior to the event, and ε_i is the error term.

3. Discussion of results

3.1. Main results

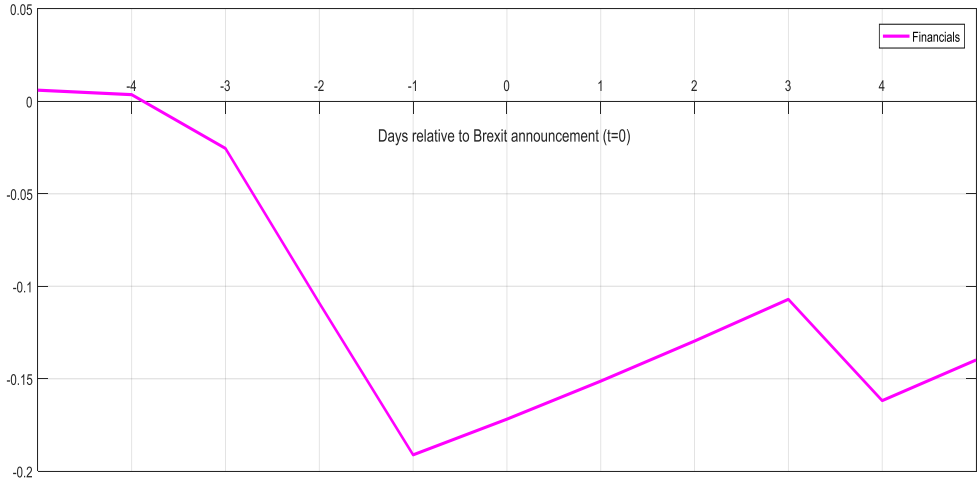
Figure 1 graphically depicts the cumulative abnormal return performance of UK industries for the announcement on 24 June 2016. The standard market model

[2] Daily returns are calculated as the first natural logarithmic difference of the underlying stock price.

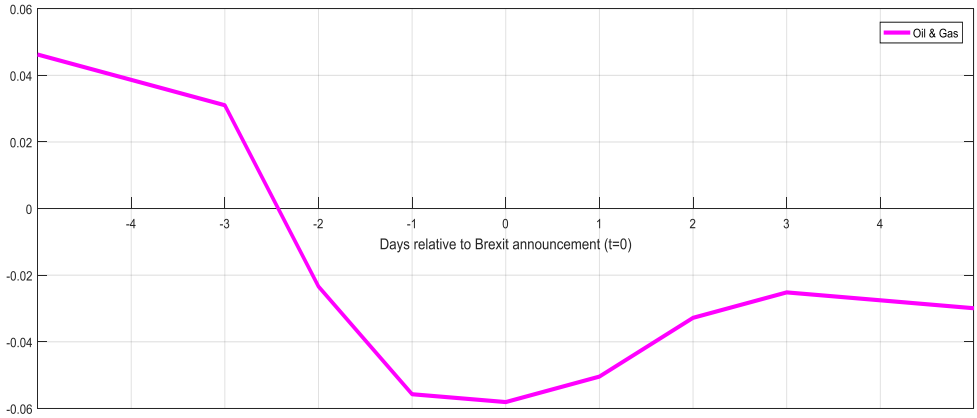
according to Dodd and Warner (1983) and Brown and Warner (1985) is employed for the determination of the CAR. Positive and negative CARs imply favourable and unfavourable outcomes, respectively. We show that the UK stock price responses of different sectors surrounding the Brexit seem dissimilar either for the announcement day CAR or the [−5; + 5] event window CAR. The Brexit is associated to severe stock prices declines for financials, real estate and defense and airlines from the day relative to the announcement of Brexit (t=0). For technology, a drop of the stock price is shown after the Brexit vote or particularly for [0; +5] event window CAR. However, oil and gas, pharmaceuticals and biotechnology and consumer goods do not appear sensitive to the day relative to the Brexit announcement or [0; 0] event window CARs.

Figure 1. Cumulative abnormal return performance by sector

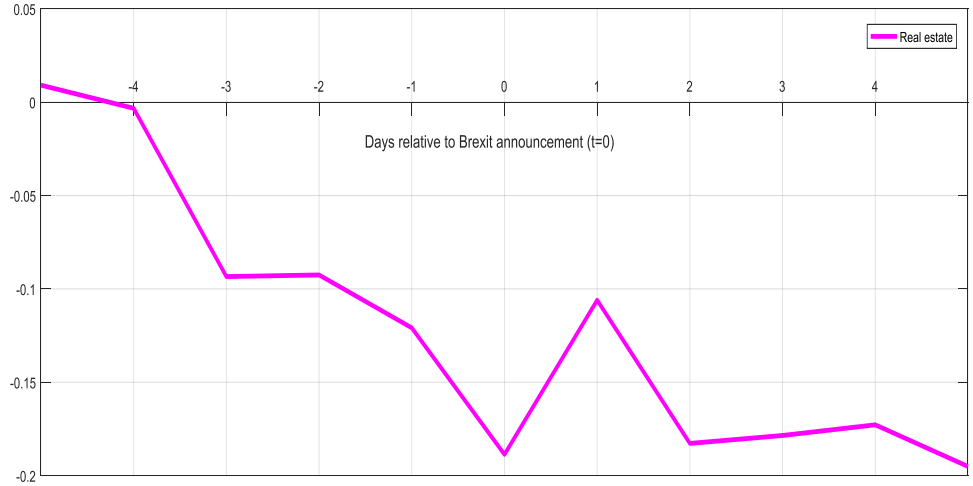
Financials



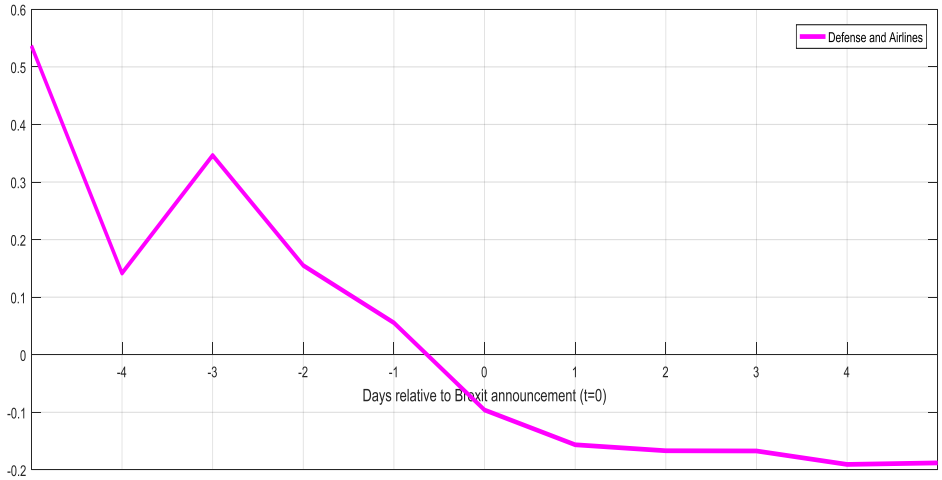
Oil and gas



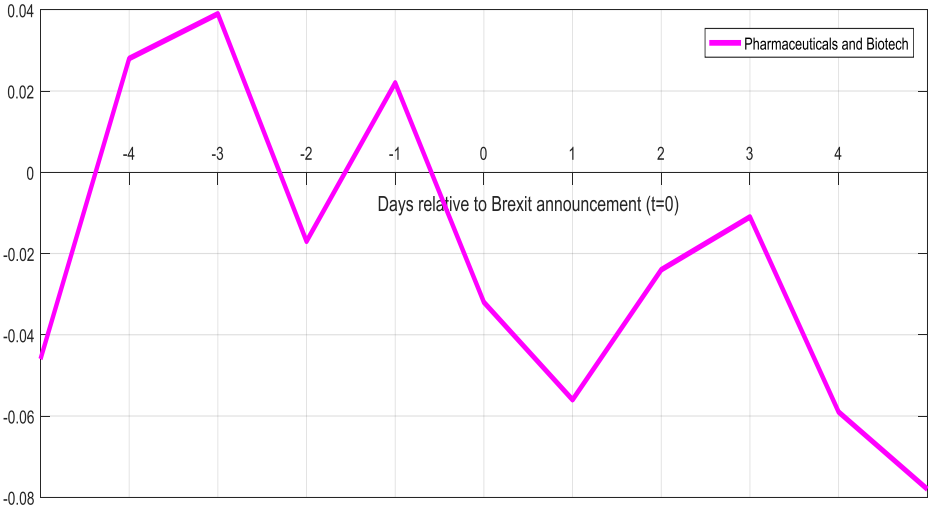
Real estate



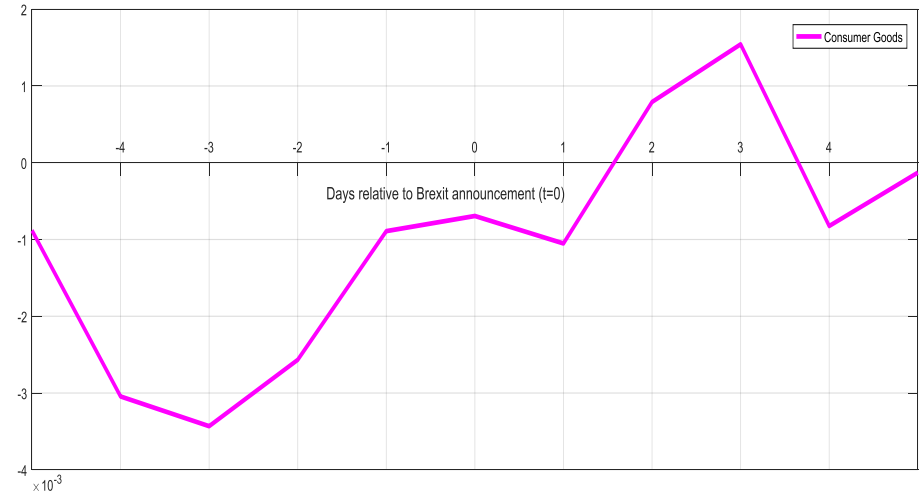
Defense and airlines



Pharmaceuticals and biotechnology



Consumer goods



Technology

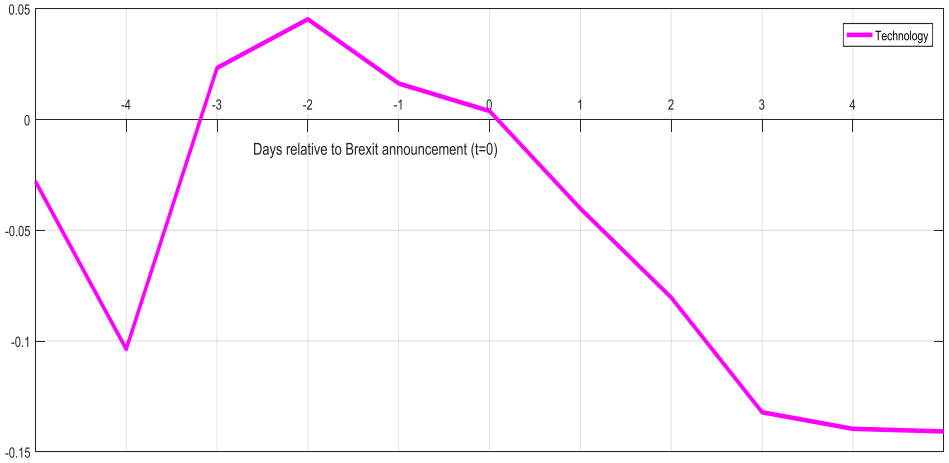


Table 1 takes a look at the stock response to the Brexit announcement for financials, oil and gas, real estate, defense and airlines, pharmaceuticals and biotechnology, consumer goods and technology. The results show that the stock market reactions are negative and significant for almost all the industries under study and irrespective whether [0; 0], [0; +1] and [+1; +5] window event CARs are accounted for, except for oil and gas where we find an insignificant specific-share response for [0; 0] and [+1; +5] window event. But the reaction appears much less detrimental for pharmaceuticals and biotech and consumer goods. In a nutshell, we can distinguish three groups of sectors: The first one includes Financials, Defense & Airlines, Real Estate and Technology where the stock prices fall strongly in the day of

the announcement of Britain's withdrawal from the EU membership and in the post-Brexit announcement by utilizing the [0; 0], [0; +1] and [+1; + 5] event window CAR as the endogenous variable. The second group is formed by Oil & Gas companies where their responses seem insignificant after the Brexit vote, and slightly negative in the day relative to the referendum announcement (t=0). The third group contains the sectors which experienced a moderate influence whatever the window event CAR investigated (i.e., pharmaceuticals and biotech and consumer goods). Because some of these sectors are cyclical while the others are defensive, one can expect that various industries could respond distinctly to changes in the economy and as a result the anxiety over Brexit would have varying sectoral effects. With respect portfolio allocation, investors and traders seek to shift the portfolio into sectors that appear less influenced by sudden events or risks.

Furthermore, the coefficient for *SIZE* is also significant and persistently negative for financials, real estate and defense and airlines across all the windows studied, suggesting that largest companies are likely to be more threatened by the Brexit fear than the smallest industries. The profits of UK industries do not help to consistently explain the stock prices evolution, as the net income's coefficient seems only significant for financials and real estate sectors using the [+1; + 5] event window CAR as the dependent variable.

Table 1. Regression results

	Financials	Oil and gas	Real estate	Defense and airlines	Pharmaceuticals and biotechnology	Consumer goods	Technology
[0,0] window event							
Constant	0.26523***	-0.3472*	0.7483	0.5657	-0.181723	0.068879***	-0.202820
	(0.0003)	(0.0299)	(0.3617)	(0.2963)	(0.4120)	(0.0007)	(0.6700)
Brexit	**-0.03158***	**-0.0026***	**-0.05130***	**-0.0484****	**-0.002376***	**-0.00151*****	**0.037125***
	(0.0359)	**(0.0345)**	**(0.0680)**	**(0.0077)**	**(0.0638)**	**(0.0002)**	**(0.0282)**
Size	-0.00931**	-0.0465	-0.1804**	-0.0692**	-0.055213*	0.168447	-0.410881
	(0.0047)	(0.5109)	(0.0028)	(0.0054)	(0.0955)	(0.5001)	(0.2782)
Net income	-0.03922	0.076	0.116097	0.15922	-0.906306	0.364791	-0.404489
	(0.2569)	(0.1000)	(0.1910)	(0.1467)	(0.0140)	(0.7577)	(0.2696)
Adjusted R^2	0.89	0.76	0.79	0.81	0.79	0.59	0.84
F-value	4.2760	3.3678	4.1317	3.3269	3.3012	3.2546	4.1579
[0,+1] window event							
Constant	0.141563*	0.175537**	0.110998	0.033970	0.021178	0.02378***	0.02317***
	(0.0749)	(0.0091)	(0.8754)	(0.1620)	(0.2743)	(0.0003)	(0.0000)
Brexit	**-0.149329***	**-0.027439**	**-0.15183****	**-0.14188**	**-0.005289***	**-0.002532***	**-0.12951*****
	(0.0670)	**(0.4425)**	**(0.0082)**	**(0.9202)**	**(0.0313)**	**(0.0110)**	**(0.0000)**
Size	-0.09009*	-0.007439	-0.043286*	-0.0239**	-0.003544*	0.100887	-0.04989***
	(0.0130)	(0.1271)	(0.0308)	(0.0056)	(0.0703)	(0.6268)	(0.0000)
Net income	-0.569331	0.008935	0.902787	0.02266	0.063511	0.098799	0.057926
	(0.1580)	(0.2461)	(0.2820)	(0.2735)	(0.1405)	(0.2648)	(0.2356)
Adjusted R^2	0.87	0. 85	0.88	0.79	0.81	0.88	0.84
F-value	3.5103	3.3762	3.3549	3.2698	4. 4561	4.1987	3.3125
[+1,+5] window event							
Constant	0.122108*	0.157355**	0.109503*	0.033970	0.021178	0.007353	0.334376
	(0.0163)	(0.0046)	(0.0286)	(0.1620)	(0.2743)	(0.6539)	(0.5154)
Brexit	**-0.150096***	**0.413582**	**-0.175538***	**-0.18188**	**-0.001289***	**-0.001778****	**-0.141481****
	(0.0995)	**(0.5229)**	**(0.0664)**	**(0.0202)**	**(0.0313)**	**(0.0083)**	**(0.0052)**
Size	-0.009407*	-0.109192	-0.000618*	-0.0239**	-0.013544	-0.004435	-0.003131*
	(0.0586)	(0.1019)	(0.0603)	(0.0056)	(0.5703)	(0.8405)	(0.0940)
Net income	0.034585*	0.031015	0.080618*	-0.02266	0.063511	0.044773	0.098084
	(0.0212)	(0.2018)	(0.0993)	(0.2735)	(0.3405)	(0.2968)	(0.1556)
Adjusted R^2	0.90	0.86	0.84	0.85	0.88	0.79	0.76
F-value	3.1769	6.2187	3.6531	4.2015	2.1456	3.2462	3.2098

Notes: All regressions are controlled for heteroskedasticity and the p-values are given in parentheses. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

3.2. Interpretations

The results indicate that financials is one of the most damaged sectors from Brexit. The UK financial system is strongly interconnected with the Europe. A Brexit could thus jeopardise UK financial stability. The withdrawal from the EU would end passporting rights, making the UK operations of European Economic Area (EEA) banks and European operations of UK banks heavily harder to pursue. With the

Britain's exit from the EU, much of UK activities denominated in Euros might likely to move to the Eurozone. Relocating such activities would undoubtedly generate burly uncertainty into the financial system. Further, barring a negotiated agreement after the Brexit announcement, some sectors like insurance and funds sector would be highly threatened by losing access to the single market. Being cut out from European Union' capital market could make the British financial industry less competitive in longer time horizons.

The Brexit affects also negatively and strongly defense and airlines companies. A lack of investment over geopolitical instability would likely erode the competitive position of defense and aerospace firms. It would adversely impact their revenue and profitability due to the integrated supply chains[3] across Europe, the great dependence of this sector to Europe's Reseach and Development (R&D) funds and the mobility of skilled resources. For example, the increased integration across EU and UK has facilitated the Airbus access to highly skilled workers. This mobility is vital to the operating model and proves the efficacy of an EU dominated supply chain. Airbus has a large proportion of UK workers based in Europe (with wide extent France and Germany, Everitt et al. 2016) that can be deployed at any time. Moreover, the EU employs funding competitions called Framework Programmes to deliver research grants while trying to improve all sectors among European countries including defense and aerospace. UK benefited largely from these grants. For instance, the seventh Framework Programme that runs between 2007 and 2013 awarded around 14 per cent of the total €33 billion funding to the UK economy where almost 6 per cent was attributed to defense and aerospace sector. In this way, Brexit presents a real risk to the UK defense and Airlines, since these companies rely on profound partnerships to share innovative technological and industrial programs (Bouoiyour and Selmi 2016 b).

Besides, the real estate market will face challenging issues with the UK vote to leave Europe. The devaluation of the British pound could trigger inflationary pressures and a rise in interest rates, which would in turn erode disposable income and lead to

[3] The Airbus is an example of a fully integrated supply chain; its wings in Britain, fuselages in France, and tails in Germany and Spain.

less homes being built, especially if accompanied with job losses and an increase in house prices. Accordingly, the UK Head of real estate claimed that "two thirds of investors[4] said that if the UK voted to leave the EU, they would slow down investment into UK property companies during the period of uncertainty as new terms of engagement with Europe are being worked out."

Further, Brexit is likely to exert a strong effect on technology. This outcome is not surprising; London is seen as the financial capital of Europe and the most irresistible city for startups. It has been an attractive location for several big tech industries (for example, Apple, Cisco, IBM and Google) to achieve European operations. With Brexit's onset, London will lose these positions. Also, Startups seeking access to European grants and different EU programs and projects, like for example the Horizon 2020 program, will likely move their operations to European cities. Additionally, UK tech companies will lack the opportunity to participate in a European-funded project for next-generation mobile technology. It is obvious moreover that in the onset of Brexit, EU nationals will need over the next years visas to work and reside in the United Kingdom. These circumstances will harm substantially the capability of UK tech firms to hire the engineers, data scientists, as well as the information technology workers they need from Europe.

Nevertheless, the UK pharmaceuticals and biotechnology and consumer goods-focused companies appear less damaged. One of the potential elements that may explain this outcome is that these companies are among those likely to go unscathed from a weaker pound Sterling since they bring their sales outside the UK. The depreciation of Sterling vis-à-vis the dollar will make the products of these companies more competitive and result in a sharp boost when converted back into British pound. Interestingly, pharmaceuticals are not highly sensitive to macroeconomic and financial uncertainties; even in times of economic distress and political turmoil, people do not stop requiring life-saving drugs. Laying aside these short-term effects for

[4] 25 senior investors have been surveyed by KPMG network. These investors have properties located in the UK within their real estate investment portfolios and the total worth of their global real estate investment portfolios amount approximately $400billion (KPMG report 2016).

pharmaceutical firms, the Britain's withdrawal from the European Union may present a long-term challenge to both Pharma and Biotechnology industries. In particular, the Britain's "divorce" with Europe will have implications for the way drugs are regulated. Potentially, the ambition of Britain to become the third largest biotech cluster in the world, after Boston and San Francisco becomes doubtful, according to the proclamation of the chief executive of the Association of the British Pharmaceutical Industry. Likewise, the Britain's oil and gas industries react slightly to the Brexit announcement since they do business mostly in U.S. dollars around the world; in this way, oil might play a "safe haven" role. It is also expected that after the decision to leave EU, UK will implement its own renewable and low carbon energy policy, and thus, the alternative energy sector will not be highly influenced.

4. Conclusions and some policy implications

The Britain's exit from the European Union and the uncertainty associated with it receive nowadays far-reaching attention. This article seeks to shed some light on the costs of "Brexit" by examining the reactions of different sectors of UK stock market to the Brexit announcement. Our findings indicate that the British industries are not resilient in dealing with uncertainty. The Brexit threatened UK share sectors but with different degrees. Financials, defense and airlines, real estate and technology face series of very difficult challenges following the Brexit vote, with a host of pressing issues facing the sectors, whereas oil and gas, pharmaceuticals and biotechnology and consumer goods experienced a moderate influence.

Several elements can explain how financial sector, defense and aviation, real estate and technology are the biggest losers. Among them, one can cite the Britain's ability to still enjoy European passporting rules to establish investments, to participate in European funded-projects (i.e., the increased doubts over the UK's capability to win future project grants), without ignoring the opportunity to recruit skilled workers. The UK was, in 2014/2015, the most attractive destination for foreign direct investment in the EU with the USA, India and France being the widest contributors. Foreign investors who perceive investment opportunities in UK firms as a gateway to

accessing EU markets can be put off by the current UK's withdrawal. This decision would complicate the investment negotiations with potential partners like China and India. Indeed, when UK belonged to Europe, negotiations were easier given the growing importance of Europe as a world power. Moreover, much of the debate around Britain's membership of the EU has focused on the need to limit the flow of immigration. But how and to what extent such decision will affect the many UK businesses which employ EU migrants and rely abundantly on the international talent? The EU's Office for National Statistics (Eurostat) indicated that 2,108,000 skilled workers from European countries reside in Britain. With potential skills in industries including Fintech, Logistics, Big Data, engineering and information Technology, EU migrants play a vital role in the development of UK economy. Even though, it is unclear up to now what status European migrants would have in the onset of the Brexit and to what extent this decision will impact the extent of movement policy, there are great concerns about the significant effect of Brexit on the ability of UK industries to hire the highly skilled workers that they need. It must be added that a reduction in the movement of migrant labour may result to less homes being built, which can lead to real troubles for the property companies and then to housing crisis.

Mitigating the Brexit costs depends potentially on how the UK and the remaining Member States of the EU might manage their relationships following the announcement of Brexit. With the decision of Britain's electorate to withdraw from the EU, leaders will try to search effective and drastic strategies to anchor their Britain's foreign policy in the next years. For financials, for example, the British government would seek to undertake parallel EU and non-EU compliant frameworks to improve the flexibility of the UK as a financial centre attracting a large variety of global banks and financial services providers. For airlines sector, the continuation of a liberal and deregulated aerospace market within the UK and Europe, implying that all European and British airlines can continue to operate as they yet do, is one of the most important points UK authorities will have to urgently negotiate with their European counterparts. For technology, to preserve its leadership in innovation and long-run support of the digital economy, high tech-companies must call for continued cohesion and collaboration with their EU partners.

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