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The effect of 'Brexit' on bank lending: Evidence from the syndicated loan market

Abstract

This paper researches the effect of the Brexit referendum on lending activity in the United Kingdom. Using data from the syndicated loan market, the analysis suggests that Brexit induced a 22 percent drop in loan issuances in the UK market as compared to its control group. The paper goes on to examine this reduction at the level of individual lenders. On average, the share of a bank's newly issued loans going to British companies reduces after the referendum. This development is especially evident for foreign banks who have a significant amount of business in the United Kingdom. In other words, the Brexit vote is detrimental to the lending business of the banks active in Europe's largest syndicated loan market. Altogether, these results add to the limited academic literature on the economic effects of Brexit by providing insights into bank lending based on the first six months after the referendum.

Keywords: Brexit, loan origination, syndicated loan market, policy uncertainty

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1. Introduction

“It is time for the British people to have their say. It is time to settle this European question in British politics” (Cabinet Office, 2013). With these words, the British Prime Minister David Cameron promised the people of the United Kingdom the choice to either remain in or exit the European Union. This remarkable decision fell to the background of the public debate for a while, but after the Conservatives won the elections in 2015, the date for the referendum was set to June 23rd, 2016. On June 24th, 2016, it became clear that the United Kingdom would be breaking away from the European Union. 52 percent of the public had voted in favor of what has become to be known as the ‘Brexit’.

The consequences of the decision of the British electorate to leave the European Union were, and still are, the topic of a lively debate. The economic implications are of course no exception. Prior to the referendum, *The Economist* (2016) published a report that mentioned the following: “Should the UK vote to leave the EU on June 23rd, the country’s economy will be plunged into uncertainty”. This uncertainty would directly manifest itself in the volatility of financial markets and in the ‘long’ run also affect the real economy (The Economist Intelligence Unit, 2016). The report gave an accurate prediction of various short-term developments. Uncertainty skyrocketed as measured by the Economic Policy Uncertainty Index, a statistic based on the frequency of keywords in newspaper articles that signal economic uncertainty (Bloom, Davis, & Scott, 2016). The pound sterling and the FTSE 100, an important index of the London Stock Exchange, both experienced a sharp fall immediately after the outcome of the vote became evident. Furthermore, the Bank of England announced in August 2016 that it would lower the interest rate from 0.5 to 0.25 percent, buy UK corporate bonds for a total amount of ten billion pounds and increase the volume of its asset purchase program as a reaction to the deteriorated GDP growth forecasts.

Clearly, the majority vote for a Brexit comes along with economic implications. However, the exact form and scope of these consequences remain, to a large extent, unclear. Therefore, this paper aims to give further insights into the economic consequences of the referendum by investigating the effect it has had on bank lending. For this purpose, the following research question is examined:

“To what extent does the outcome of the Brexit referendum influence the number and volume of syndicated loan issuances in the United Kingdom, both at an aggregate level and that of individual lenders?”

Investigating this question is important for several reasons. First, bank loans are the primary debt source for British firms and syndicated loans, specifically, have become increasingly

important over the past years (Marshall, McCann, & McColgan, 2016). Determining whether Brexit and the accompanying uncertainty affect the issuance of these types of loans can thus provide information on changes in firm or bank behavior. Second, the United Kingdom may be the first country to leave the European Union, but it is definitely not the only country with a political party promoting such course of action. These parties often make dubious and unsubstantiated claims about the economic implications of leaving the EU. For example, Geert Wilders, leader of the Dutch Party for Freedom, stated that the economy would considerably grow after a ‘Nexit’ (Meeus, 2016). Therefore, it is important that the public debate is well informed and backed up by scientific research. However, limited research has been done. This paper builds upon the scarce empirical literature on the economic and financial consequences of leaving the European Union by using more data and taking a closer look at lending activity at the level of individual banks.

Using data from WRDS-Thomson Reuters’ LPC DealScan and Bloomberg Finance, this paper evaluates the above research question. For three years prior to the referendum until the end of 2016, the datasets contain information on the number and dollar amounts of issuances in the twenty largest syndicated loan markets. Furthermore, they provide the number of facilities issued by a set of 55 banks and the corresponding borrowers’ countries of incorporation. The analysis of this information suggests that the UK syndicated loan market experiences a 22 percent drop in loan issuances after the vote to leave the EU as compared to a control group. In line with this result, individual banks tend to lend less to British firms post-Brexit. However, the reduction in the share of business with British companies differs substantially between these lenders. The banks with the strongest ties to UK-based companies lose a substantial amount of business in this market as measured by the fraction of loans issued to British firms.

The remainder of the paper is structured as follows. The second section relates this article to theory and existing literature, and operationalizes important concepts. The data and methodology are covered in section three. In the fourth and fifth part, the results are presented, discussed and related to the hypotheses. The paper concludes with final remarks followed by a recommendation for future research.

2. Theoretical Framework

Economic theory suggests that uncertainty can be detrimental to economic growth. From the perspective of companies, economic uncertainty could reduce consumer confidence,

investment spending and complicates day-to-day decisions such as hiring new employees. In other words, business activity can slow down as a result of heightened insecurity about future conditions (Bo, Lensink, & Sterken, 1999). From the perspective of financial intermediaries, and in this case especially banks, the costs associated with screening a potential borrower increase when uncertainty rises. Therefore, banks could decide to reduce their lending activity in a given market as the result of a shock to policy uncertainty (Mishkin, 2004). Either way, lending activity suffers under such conditions as firms postpone borrowing and banks are more reluctant to provide debt. With this theory in mind and additional insights from previous literature, the paper evaluates the hypotheses introduced below.

Given that the average level of uncertainty increased after the referendum, as illustrated by the Economic Policy Uncertainty Index (Bloom et al., 2016) in Figure 1, it is not unreasonable to think that syndicated lending in the UK market declined. Furthermore, prior to Brexit, various studies anticipated that leaving the EU would slow down economic activity (Dhingra, Ottaviano, & Sampson, 2016; Kierzenkowski, Pain, Rusticelli, & Zwart, 2016). Again, this could lead to a drop in the issuance of syndicated loans. To determine whether syndicated lending has indeed slowed down after the referendum, the following hypothesis is evaluated:

Hypothesis I: “At a market level, the vote to leave the European Union has a negative impact on syndicated lending in the United Kingdom.”

Within any market, the lenders and borrowers are the entities that make the deals and issue the facilities. Therefore, at the level of the individual banks a similar effect is expected, and a hypothesis analogous to the first is investigated:

Hypothesis II: “At the level of individual lenders, the fraction of newly issued loans with a UK-based borrower decreases after the referendum.”

Besides researching the direction of the effect, it is interesting to look at differences between the banks. The British syndicated lending market is the largest in Europe and any adverse developments are bad for the business of lenders, especially for those with strong ties to British companies. The surprising decision of the electorate to resign EU membership resulted in short-run declines in the stock prices of financial intermediaries. This decline was most noticeable for the European banks. Moreover, the increase in CDS spreads of European banks indicated that their riskiness had risen (Kiesel, Kolaric, & Schiereck, 2016). Precisely the banks with the strongest ties to the UK economy had the largest reactions on the financial

markets and perhaps it is also these banks whose lending business is affected the most by Brexit. In order to determine whether the banks with higher exposure to the developments in the UK also undergo a larger reduction in the share of their lending going to British corporations, the following hypothesis is tested:

Hypothesis III: “*Banks with strong ties to British firms experience a larger drop in the fraction of loans with a UK-based borrower.*”

To evaluate these hypotheses, this research paper uses data from the syndicated loan market and it is therefore important to describe some basic characteristics and clarify key concepts. First of all, a syndicated loan is arranged between one borrower and multiple lenders. This arrangement or contract is referred to as a deal and each deal can consist of multiple ‘facilities’. Facilities are basically loans that take on various forms such as term or revolving loans (Wharton Research Data Services, 2016). Typically, a borrower will assign a mandate to one or more banks to arrange the deal. These ‘senior’ banks are then responsible for finding other financial institutions that are prepared to provide funds, usually in the role of a participant. The types of lenders active in this market include commercial banks, investment banks, pension funds, mutual funds and various other financial intermediaries. The structure of this type of lending allows these financial intermediaries to share the risks associated with syndicated loans and lending in general. Furthermore, syndicated loans are an opportunity to diversify the loan portfolio and supplement one’s income with the various fees associated with arranging and maintaining a deal (Simons, 1993). Finally, the reason, besides data availability, to use the syndicated loan market is that over the past decades this market has considerably grown in the United Kingdom and has become a significant source of funding for British firms. The following numbers illustrate this. From January 2014 until November 2014 the total value of new loans provided by the UK’s major financial institutions to British firms was approximately 120 billion pounds. During that same period, the aggregate volume of newly issued syndicated loans to UK businesses was estimated to have an equal value (Bank of England, 2015).

The terms market level, bank level, exposure and lending fraction reoccur throughout the remainder of the text and are important for its understanding. A market consists out of the deals syndicated within the country in which the market is ‘situated’. Thus, comparisons at the market level are concerned with differences between syndicated loan issuances between countries. In contrast, the bank level refers to facilities issued by individual lenders, irrespective of the country of syndication. Facilities can be funded by multiple banks, but for simplicity this

paper assigns a facility to a lender if it has participated in it. Hereby, the number of facilities issued by a bank is a measure of its lending activity. Exposure is a term used to describe how strong the tie is between a bank and the British lending market and thus also any developments in it. It is simply the percentage of facilities issued to a UK firm over a period of one and a half years before Brexit. Finally, the only difference between the lending fractions and exposure is that the lending fractions are calculated on a semi-annual basis.

By researching the three conjectures introduced in this section, this article relates itself to the existing literature in several ways. First, it relates to research on the possible consequences of leaving the EU (Dhingra et al., 2016; Kierzenkowski et al., 2016). However, this paper builds upon these works by looking at what has happened so far as opposed to deliberating on what could happen. Several others have empirically investigated actual consequences of the Brexit vote (Berg, Saunders, Schäfer, & Steffen, 2016; Kiesel et al., 2016). By either looking at another aspect of the financial markets or using more data, additional insights are given in this text. Second, this work extends the body of literature that uses syndicated loan markets to examine the effect that crises have on bank lending (Ivashina & Scharfstein, 2010; De Haas & Van Horen, 2013). It does so by looking at a crisis of political nature instead of a financial crisis. Lastly, a link can be made to research regarding the effect of policy uncertainty on economic growth and investment (Bo et al., 1999; Leahy & Whited, 1996). Brexit caused a spike in uncertainty and the findings in this paper are related to the work of these authors.

3. Data & Methodology

The data used for this research is obtained from the WRDS-Thomson-Reuters' LPC DealScan database and Bloomberg Finance. WRDS-Thomson-Reuters' LPC DealScan contains detailed information on syndicated loans and is described as "the world pre-eminent source for extensive and reliable information on the global commercial loan market" (Wharton Research Data Services, 2010). Furthermore, Bloomberg Finance provides data and news covering an extensive range of companies, financial products and markets. These two databases are used to create two datasets, one at the market level and the other at the level of individual banks. Each dataset covers the period of interest, namely July 1st, 2013 until December 31st, 2016.

3.1 Market level

The first dataset contains panel data at the market level. For each of the following countries, DealScan provides the information necessary to determine the number of deals made per quarter and the corresponding sum of the dollar amounts: Australia, Canada, China, France, Germany, Hong Kong, India, Italy, Japan, the Netherlands, Norway, Russia, Singapore, South Korea, Spain, Sweden, Switzerland, Taiwan, the United Kingdom and the United States. Together, these countries form the twenty largest syndicated loan markets (Berg et al., 2016). Put differently, for each country the dataset provides information on loan issuances per quarter and it covers a total of 35,257 deals with a combined dollar amount of 15.1 trillion. Table 1 provides descriptive statistics for each market such as the number of deals made and the quarterly averages. On a side note, all dollar amounts mentioned in this paper are expressed in 2015 dollars. Additionally, for the purpose of selecting a control group, the time series of deals made per quarter from 2000 until 2015 is collected for each market.

3.2 Bank level

The second part of the analysis takes a closer look at the individual lenders. As a benchmark, a bank needs at least 4000 observations during the entire timespan of the database in order to be considered¹. Those that fulfil this requirement are then taken up into the dataset. 55² banks meet this requirement and additional information concerning their lending activity over the period of July 1st, 2013 until December 31st, 2016 is gathered. Table 2 displays various descriptive statistics for each bank. The selection consists out of prominent North American, European, Asian and Australian banks. For each of these lenders the number of facilities issued per half year is recorded and for each facility, the corresponding borrower's country of incorporation is noted. Using the country of incorporation and facilities issued between

¹ This benchmark is implemented to ensure a minimum level of observations. As a first step, all the facilities in the database from 1981 until the present are downloaded. The banks who have 4000 observations are then taken into consideration.

² The following banks/lenders were also included in the initial dataset but were dropped for one or more of the following reasons: 1. Acquired by/merged with one of the banks in the above list prior to the period of interest 2. It is a subsidiary of one of the banks in the above list, in which case it is combined with its parent. 3. The bank is not an active lender in the period of interest or has too few observations. Allied Irish Bank, Bank of Scotland, Bank One Corp., BMO Capital Markets Financing Inc., Chase Manhattan Bank, Chemical Bank, Dresdner Bank, First Chicago, Fuji Bank, General Electric Capital Corp., Industrial Bank of Japan, LaSalle Bank, Le Credit Lyonnais, Merrill Lynch & Co., National City Bank, Nations Bank, Natixis SA, Portigon AG, Union Bank NA, Wachovia Bank.

01/01/2015 – 06/23/2016, a lender’s pre-Brexit exposure to the UK economy is calculated using the following fraction:

$$Exposure = \frac{Number\ of\ facilities\ issued\ to\ a\ UK\ based\ borrower}{Total\ number\ of\ facilities\ issued}$$

The majority of the banks have an exposure between one and ten percent, with a couple of exceptions in both directions. For the UK banks, the mean of this fraction is 24 percent whilst various American banks are well below one percent. Furthermore, the second dataset contains several other variables. For each bank and time period, the return on common equity, debt to equity and net loans to total assets ratios are collected using Bloomberg Finance. They represent the profitability, leverage and liquidity of the financial institutions, respectively. All in all, the second dataset covers 174,747 facilities, spread over 55 banks and seven half years.

A rough look at the data suggests a drop in the lending activity in the UK market after Brexit. Before the referendum, an average of 118 deals was made per quarter. This average drops to 92 in the last half year of 2016. Figure 2 illustrates this development and compares it to the trend in quarterly number of issuances in the remaining top twenty markets. In terms of volume, the average drops from 106 to 66.4 billion dollars per quarter. This also implies a reduction in the average monetary amount of the deals. A similar decline should then also be observed when looking at the banks and this is indeed the case. 43 out of 55 banks have a lower percentage of their issuances going to a UK-based firm after the referendum. For example, the average lending fraction of Commerzbank AG drops from 8.0 to 3.9 percent.

Methodology

To evaluate the hypotheses requires a more formal analysis of the data. At the market level, the methodology of Berg et al. (2016) is closely followed. For the individual banks, this method is slightly adjusted and it borrows an idea from Acharya, Eisert, Eufinger & Hirsch (2016). A key feature of the analysis throughout is that it treats the outcome of the referendum as an exogenous policy uncertainty shock to the United Kingdom’s syndicated loan market. The methodology set out below aims to capture the effect of this shock on syndicated lending.

3.3 Market level

Having an exogenous shock makes the use of a difference-in-differences regression an appropriate method to compare the post-Brexit development of lending in the UK market to

that of a control group. Using the panel data at market level, the following difference-in-differences regressions is estimated to verify the first hypothesis:

$$Y_{m,t} = \beta_1(UK * Brexit) + \alpha_m + \alpha_t + \varepsilon_{m,t} \quad (1)$$

where $Y_{m,t}$ stands for the natural logarithm of the number of loans issued per quarter in a certain market or the natural logarithm of the total dollar amount issued per quarter in a specific market. UK and $Brexit$ are both dummies and respectively indicate whether the market is that of the United Kingdom and if the quarter takes place after Brexit or not. Together, they form the ‘treatment’ variable denoting if the dependent variable belongs to the UK market after it has been struck by the exogenous shock. The regression controls for market and time fixed effects. This is done to control for any pre-existing and time-invariant differences between the markets and any systematic time effects that are not attributable to the event of interest. Hereby, β_1 more accurately captures the change in quarterly issuances driven by the outcome of the vote. The market fixed effects capture time-invariant and pre-existing differences between the markets whilst the time fixed effects control for time-varying factors that impact each market (Stock & Watson, 2015). Furthermore, to eliminate the possibility that the results are driven by reduced levels of lending in the UK during the last two quarters of each year, the regression controls for country x quarterly (seasonal) fixed effects. Finally, the error terms are clustered at the market level to ensure that the errors are in line with the assumptions of fixed effects regressions on heteroscedasticity and autocorrelation (Stock & Watson, 2015).

The largest threat to the internal validity of the above regression is that the control group does not represent a good counterfactual. In other words, β_1 will only give a reliable estimate of the effect of the referendum if the control group truthfully represents what would have happened in the UK market in the case that Brexit had not taken place. Berg et al. (2016) propose selecting this group based on the correlation between the time series of the natural logarithm of the number of loans issued per quarter in the UK and each other market. By doing so, the control group is based on the development of the variable of interest and implicitly matched on the factors that determine the number of loan issuances. Using the largest twenty syndicated loan markets, which include the control group that Berg et al. (2016) use, these correlations are calculated for the periods 2000-2015 and 2011-2015. Table 3 presents the outcomes. Based on the first time period, the ten control markets used for this research are: the United States, France, Germany, Sweden, the Netherlands, China, Norway, Singapore,

Canada and Switzerland. Reassuringly, this group largely composes the selection of countries based on the 2011-2015 correlations. Only Sweden and Switzerland drop out of the selection. This indicates that the markets that track the UK remain steady over time. Additionally, Figure 3 provides visual evidence that this group closely tracks the UK market in the quarters prior to the referendum. Combined with Berg's et al. (2016) finding that there are no significant trend differences prior to Brexit, the above makes a good case that the parallel trends assumption is reasonable to make.

3.4 Bank level

After evaluating the post-referendum market development, the paper continues with examining the impact of Brexit on lending to British firms by the individual financial intermediaries active in the syndicated loan markets. The idea is straightforward: determine whether the degree to which a bank is exposed to the UK economy and thus also to Brexit, helps explain the change in its lending to British firms. This part of the analysis intends to verify the third hypothesis. Once again, a difference-in-differences regression is estimated for this purpose:

$$Y_{b,t} = \beta_1(Exposure_b * Brexit) + \beta_2 Brexit + \beta_3 Controls_{b,t} + \alpha_b + (\alpha_t) + \varepsilon_{b,t} \quad (2)$$

where $Y_{b,t}$ is a bank's semi-annual fraction of facilities going to a firm with its headquarters in the UK. The reason to use fractions is to level the playing field between banks, i.e., control for the total amount of loans issued by a bank per period. *Brexit* is simply a dummy that equals one if the referendum has taken place and zero otherwise. Furthermore, the regression is estimated using $Exposure_b$ as a dummy variable indicating whether a bank has a high or low exposure but it is also estimated using $Exposure_b$ as a continuous variable. The dummy equals one in the case that the bank's exposure prior to Brexit is higher than the median exposure of all banks. Additionally, the continuous measure is used because it provides a more refined indicator of the 'treatment' intensity as opposed to a binary variable. Combined with the *Brexit* dummy, the interaction between the two gives a measure for how strong a bank's ties are with British firms at the time of the shock. β_1 , the corresponding coefficient to this interaction term, displays whether banks with higher exposure experience a larger percentage point drop in their lending fractions.

The control variables incorporated in this regression are the debt to equity ratio, the net loans to total assets ratio and return on common equity. Leverage, liquidity and profitability

are not an exhaustive list of bank attributes but they do capture fundamental differences between banks. If these differences are correlated with the exposure of a bank and also impact the dependent variable, β_1 could be over- or understated. To account for this possibility, the regression includes these characteristics. Furthermore, adding individual lender characteristics that potentially explain the outcome variable can reduce standard errors (Pischke, 2016). For example, since banks do not dismiss the possibility of an impairment on ‘British’ assets (Deutsche Bank, 2016), it could be the case that banks with higher leverage avoid the UK market for the time being. Lastly, the regression includes bank- and time fixed effects and clusters the errors at the bank level for the same reasons these features are included in the market level regression. In the case that time fixed effects are used, the *Brexit* dummy is excluded from the regression.

The difference-in-differences regression at bank level will be estimated using two sets of banks. Once including all the banks and once excluding the British banks. The reason behind this is that Giannetti & Laeven (2012) suggest that during a financial crisis in a given country, the home bias in the loan origination of that countries’ lenders substantially increases. Even though Brexit is a crisis of a different nature, perhaps the factors put forward by Giannetti & Laeven (2012), such as familiarity considerations, also play a role here. By running the regression twice, additional insight at the bank level could be obtained.

4. Results

4.1 Market level

The results of the difference-in-differences regression at the market level are presented in Tables 4 and 5. Using the data up to and including the third quarter of 2016, the baseline regression in Table 4, column 1 estimates that the UK market experiences a 20.3 percent ($e^{-0.227} - 1$) drop in the number of quarterly syndicated loans relative to the control group. The baseline regression only controls for the market and quarterly fixed effects. Adding the country x quarterly fixed effects in column 2 further increases the size of the drop to 23.6 percent. When looking at the results based on the natural logarithm of the quarterly dollar amounts in column 3 and 4, the reduction increases to 35.5 percent and a similar further increase is observed when controlling for the seasonal fixed effects. These reductions are statistically significant and given the average number and monetary amount of quarterly deals, it is evident that these are also economically significant. Table 5 illustrates that including the last quarter of 2016 does not drastically change the results. Regarding the number of quarterly

deals, the relative drop is approximately 22 percent, and when looking at the dollar amounts, it equals 39 percent. The finding that the reduction extends into the fourth quarter of 2016 indicates that the Brexit induced drop in loan origination is persistent over the first half year after the referendum. One important development to keep in mind is that the pound sterling immediately depreciated after the referendum and has not recovered since. This is illustrated in Figure 4. Thus, the coefficients based on dollar amounts also capture the exchange rate fluctuation. Nevertheless, these results indicate that the vote to leave the European Union was followed by a significant reduction in lending activity in the British syndicated loan market as compared to its controls.

4.2 Bank level

The overall reduction at the market level should translate into fewer facilities going to UK-based companies. The results from the difference-in-differences regression at the individual lender level indeed reflect this but also provide insights into how treatment intensity, or exposure to the effects of the vote, influences the reduction in business with British firms per bank. Using a binary indicator for high or low exposure banks, the regression suggests a 1.5 percentage point larger drop for the high exposure banks as compared to the banks with below median exposures. This result is statistically significant and is robust to the inclusion of bank characteristics, time fixed effects and the exclusion of banks incorporated in the United Kingdom. However, since the binary indicator is a very crude measure of ‘treatment’ intensity, the results from the regression with a continuous exposure variable, see Table 6, are more interesting. When including all banks and controlling for bank and time fixed effects, the coefficient is not significantly different from zero. This result is displayed in column 1 and suggests that the reduction in the share of business done with British firms is relatively stable across banks with varying levels of exposure. Furthermore, this outcome does not change when controlling for bank characteristics, as shown in column 2. However, column 3 and 4 display that running the same regression on the data excluding the UK banks changes everything. The newly estimated coefficient equals -0.467 and is statistically significant. The interpretation is that a ten percentage point increase in exposure, on average, leads to a 4.67 percentage point larger reduction in the fraction of facilities issues to a UK-based firm. In other words, foreign banks that are more active lenders in the UK experience a significant reduction in the share of their business done with British companies after the referendum. Once again, adding the bank characteristics does not alter these results.

It should be mentioned that the coefficients on the debt to equity ratio, the net loans to total assets ratio and return on common equity are highly insignificant in each of the performed regressions. Besides, the addition of these control variables tends to reduce the adjusted R-squared. Furthermore, it is possible that the attributes constitute ‘bad controls’. A ‘bad control’ is a variable that is affected by the treatment itself (Angrist & Pischke, 2008). For example, the profitability of UK banks might be affected by all the uncertainty induced by the vote to leave the European Union. For these reasons, the results from the regressions excluding the bank characteristics are preferred.

One concern with the results at the bank level is that exposure is measured within the same period as the lending fractions. Since they are calculated in a similar fashion, this could give rise to endogeneity because high lending fractions imply high exposure and vice versa. In order to alleviate this concern, the same regression is estimated using a pre-determined measure of exposure. For each bank, the fraction of facilities issued to a UK-based firm is calculated once more from January 1st, 2012 until June 30th, 2013. By doing so, the exposure is determined outside the period of interest and the lending fractions, the dependent variable, no longer directly influence it. However, this method does entail a trade-off. The idea is to estimate to what extent ‘treatment’ intensity determines the reduction in the share of business done with British firms and ideally one has this measure as close as possible to the date of the referendum. Thus, taking a pre-determined measure of exposure mitigates endogeneity concerns but reduces its accuracy. To get an idea of the loss of precision, Table 8 ranks the banks in both periods based on their exposures. Reassuringly, 43 out of 55 banks remain within five places of their original rank and the big picture remains intact. However, a loss of precision is inevitable. Using the pre-determined exposures, the difference-in-differences regression is re-estimated and the results are presented in Table 7. The magnitude of the coefficients changes substantially compared to the original regression (Table 6) but they still suggest that banks with higher exposures experience a larger percentage point reduction in the share of their lending business done with British firms.

5. Interpretation and Discussion

With the Brexit negotiations only just having started, the expectation is that the UK will officially leave the EU around March 2019, two years after Article 50 was invoked. Until then, the United Kingdom remains a member of the European Union and thus still benefits from access to the single market and any other economic agreements. In other words, Brexit has not

yet structurally changed the economic ties between the UK and the EU. However, as mentioned before, the Brexit shock led to a considerable increase in policy uncertainty in the second half year of 2016 and these heightened levels of insecurity are potentially detrimental to lending and business activity.

The results at the market level support the suggestion that lending and business activity have slowed down after the Brexit referendum. The analysis indicates that Brexit has induced a large and persistent drop in syndicated lending in the UK market as compared to its control group. In absolute terms, the average quarterly dollar amount of loans issued has dropped from \$106 billion to \$66 billion. Furthermore, given that in over 88 percent of the cases it holds that a deal's country of syndication coincides with the borrower's country of incorporation, the results at the market also suggest a significant reduction in syndicated lending to British firms. Overall, the results indicate that Brexit has a negative impact on syndicated loan origination in the United Kingdom and they are in line with the first hypothesis.

The Brexit invoked reduction in syndicated lending could prove to be harmful to the British economy. The majority of loans made in this specific market are used for financing investments and other corporate projects (Wharton Research Data Services , 2010; Almeida , Campello, & Hackbarth, 2011). Moreover, the syndicated loan market is an important source of debt for British firms and the combination of these two facts suggests that companies have, at least to some extent, postponed investment decisions or have failed to obtain the financing for them. This line of reasoning is supported by Reuters (2016) who report that syndicated lending to British firms has reduced by half during a period of Brexit induced uncertainty as compared to the prior year. Furthermore, it is in agreement with Bernanke (1983) and Bloom et al. (2016) that uncertainty gives rise to firms postponing investment decisions. Altogether, this sketches a grim picture for syndicated loans and their corporate purposes in the near future as policy uncertainty is likely to remain high until Brexit negotiations are near completion.

The results at the bank level are in accordance with those discussed above but they also provide additional insights into the lending activity of individual financial institutions. Of the 55 lenders in the dataset, 43 show a reduction in their fraction of loans issued to British firms after the vote to leave the EU. Over the 174747 facilities issued by the 55 banks from July 1st, 2013 until December 31st, 2016, the segment issued to British firms drops from 5.5 percent to 3.5 percent after Brexit. These findings support the second hypothesis. However, when looking at the change in lending fractions after Brexit, there are substantial differences between lenders with different levels of exposure to the British economy. First, the regression including the UK banks estimates a far lower coefficient as opposed to the regression that only incorporates

foreign banks (-0.036 vs. -0.467). This is because the regression examines whether it holds that banks with higher exposures display a larger reduction in their lending fraction. Given that the UK banks, on average, have considerably higher exposures but display similar reductions (or even increases) as compared to the foreign banks, the relationship put forward by the third hypothesis and tested for in the regression does not hold. In other words, the combination of the British banks' high exposure and similar reductions in their lending fractions diminishes the estimate of this relationship. This finding motivates the question of why the banks who do the most business in the UK display similar reductions in their lending activity. Perhaps it is indeed the case that the effect is distributed quite evenly across banks. However, one would expect that it is exactly these banks who are hit hardest by the overall reduction in syndicated lending. A possible explanation could be that UK banks are included in most syndicates (group of lenders) due to their knowledge of and close ties to the British market. Even though there is a significant reduction in lending in absolute terms, the British banks remain part of the syndicate in most loans issued in the UK market, thereby keeping their lending fraction quite stable. Or, perhaps borrowers who used to do business with foreign banks now decide to switch to British banks as they are better equipped and more willing to do business given the situation at hand. These results do not provide unambiguous support for the 'flight home' effect introduced by Giannetti & Laeven (2012) but they do not dismiss the possibility that the British banks' familiarity and knowledge of the market dampen the reduction in the fraction of business done with British firms.

When only considering the foreign banks, the result of the difference-in-differences regression changes substantially. The estimated coefficient indicates that indeed the banks with the higher exposure undergo a larger reduction in their lending fractions. A one standard deviation increase in exposure (0.027) leads to, on average, a 1.26 ($0.026 * -0.467$) percentage point larger reduction in a bank's fraction of facilities issued to British firms. Constituting 33.5 percent of the pre-Brexit average lending fraction, this increase in reduction is not only statistically significant but also economically. In other words, considering all loans issued per period per bank, there is a larger drop in the fraction of issuances going to UK borrowers for foreign banks with higher exposures to the Brexit shock. For these lenders, primarily the mainland European banks, British borrowers represent a significant share of their syndicated loan portfolios. After Brexit, these portfolios undergo a more meaningful shift away from UK incorporated firms. For example, of all loans issued per period by Banco Santander, 14.3 percent were issued to UK-based companies. After the referendum, this dropped to 6.2 percent. In contrast, a low exposure lender such as JP Morgan Chase & Co displays a drop from 3.4

percent to 2.4 percent. These two banks illustrate the overall difference between the changes in lending of high and low exposure banks and indicate that after Brexit, foreign banks who have strong ties to the UK stomach economically significant changes in the fraction of loans with a British borrower. For these banks, Brexit has a larger impact on their lending business.

On the whole, the results concerning the third hypothesis are more ambiguous. First of all, it depends on whether one looks at all the banks or only the foreign banks. Second, as was discussed in the results section, there is a trade-off between exogeneity and the precision of the exposure measure. If one opts for exogeneity and takes a pre-determined measure of exposure, the sign of the coefficient remains constant but the magnitude changes. Since it is problematic to conclude which option is best, stipulating the strength of the relationship proposed by hypothesis three is difficult. To conclude, the third hypothesis oversimplifies reality and cannot be accepted in its current form.

Although the results provide initial evidence on the effects of Brexit on syndicated lending, a couple of remarks concerning their limitations are necessary. First, the results at the market level are only as good as the control group's ability to reflect what would have happened in case the vote had turned out differently. This paper took care in the selection of control markets but finding the perfect counterfactual is near to impossible. Second, this research does not stipulate whether the reduction in lending manifests itself through the supply or demand side channel. It simply follows the finding of Berg et al. (2016) that demand is a driver of the reduced issuances. Third, the nature of the syndicated loan market entails that most borrowers are large entities and that the loans are considerably larger than their traditional bilateral counterpart. Additionally, the dataset at the bank level contains the leading European, American, Asian and Australian banks. Therefore, the results do not directly say anything about the effect of Brexit on lending to small and medium-sized enterprises by 'smaller' banks. It is possible that Brexit has a similar effect but at the same time, smaller firms might be even more reluctant to borrow. Lastly, due to data availability, the results are based on only the first six months after the referendum whilst it is likely that the effect is not limited to this time period.

6. Conclusion

Using the United Kingdom's syndicated loan market as a testing ground, this paper researches how the decision to leave the European Union, a policy uncertainty shock, affects lending activity. The analysis indicates that Brexit induced a 22 percent drop in the quarterly number of issuances in the UK market relative to the selected control markets. The

combination of a reduction in lending and the fact that syndicated loans are an important source of financing for British firms suggests that these companies are putting off investment decisions or fail to obtain the financing for them. Either way, this paper suggests that the heightened levels of economic policy uncertainty could put a downward pressure on business activity in the United Kingdom through a bank lending channel. Furthermore, with uncertainty likely to remain high for the duration of the Brexit negotiations, this downward pressure will continue to play its role in the near future.

The reduction in lending at the market level translates into less business in the UK for lenders active in this syndicated loan market. By investigating a bank's percentage of loans issued to British firms before and after Brexit, the analysis determines that foreign banks who have stronger ties to the British economy undergo a statistically and economically significant larger shift away from British firms with respect to their newly issued loans as compared to banks with lower exposure. In fact, it is mainly the European banks that fall under this category and thus see a substantial decrease in their business in Europe's largest syndicated loan market. Surprisingly, the British banks show a relatively low reduction despite the fact that British companies constitute a major share of their borrowers. All in all, both the results at the market and bank level provide insights into one aspect of the economic and financial consequences of the decision to leave the European Union.

Before the referendum researchers of various institutes made an effort to map out the possible economic effects of Brexit. However, quantifying these effects proved to be difficult given the novelty of this event. The results above stem from one of the scarce efforts in the academic literature so far that attempts to empirically determine one of the economic consequences of Brexit. It has provided insights on lending activity based on the first six months after the referendum. However, Brexit and its implications have only just started unfolding and various consequences depend on the outcome of the Brexit negotiations. Therefore, further research on the economic effects of leaving the EU is still to be done. A recommendation for future study would be to build upon this paper by examining the real effects of the Brexit induced reduction in lending. What exactly does a sustained period of depressed lending imply for economic growth, investment levels and employment? Understanding these implications and other economic consequences are not only important for the United Kingdom but the European Union as a whole. As the possibility of other members leaving in the future cannot be ruled out, it is essential that the public debate is well informed of the economic implications of such a decision.

7. References

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Table 1: Descriptive statistics for each constituent of the twenty largest syndicated loan markets for the period 2013 Q3 – 2016 Q4

Market	Total Number of Deals	Total Deal Amount in Billions, \$ 2015	Percentage of Total Number of Deals	Average Number of Deals per Quarter	Average Deal Amount per Quarter in Billions, \$ 2015
Australia	773	328	2.19	55	23.4
Canada	1676	718	4.75	120	51.3
China	2068	182	5.87	147	13.0
France	1075	700	3.05	77	50.0
Germany	1284	870	3.64	92	62.1
Hong Kong	752	266	2.13	54	19
India	846	106	2.40	60	7.6
Italy	492	264	1.40	35	18.9
Japan	7256	108	20.58	518	7.7
Netherlands	405	303	1.15	29	21.6
Norway	294	100	0.83	21	7.1
Russia	145	119	0.41	10	8.5
Singapore	357	141	1.01	26	10.1
South Korea	256	27	0.73	18	2.0
Spain	805	351	2.28	58	25.1
Sweden	185	101	0.52	13	7.2
Switzerland	176	292	0.50	13	20.9
Taiwan	810	54	2.30	58	3.9
UK	1598	1400	4.53	114	100.0
USA	14004	8670	39.72	1000	619.3

Table 1 provides descriptive statistics for each of the twenty largest syndicated loan markets for the period of July 1st, 2013 until December 31st, 2016. Total number of deals is the quantity of deals made in a market over the given time period. Total deal amount is the sum of dollar amounts of all the deals, in billions of 2015 dollars. The percentage of total number of deals is the share of each country in all deals issued amongst the constituents. The last two columns are the average deals and amounts per quarter and are calculated by dividing the relevant number in the first two columns by 14.

Table 2: Descriptive statistics for each lender for the period 2013 Q3 – 2016Q4

Bank	Observations Prior to Brexit	Observations Post-Brexit	Average Lending Fraction Prior to Brexit (%)	Average Debt to Equity Ratio (%)	Average Net Loans to Total Assets (%)	Average Return on Common Equity (%)
ABN AMRO Bank	911	214	5.6	784.3	68.0	9.46
Australia & New Zealand Banking Group	1999	173	2.7	267.8	65.3	13.93
Banco Bilbao Vizcaya Argentaria	596	181	4.7	444.5	54.7	5.36
BNP Paribas SA	5016	959	7.0	587.9	34.6	5.05
Banco Santander	2538	454	14.3	423.8	59.1	6.84
Bank of America Merrill Lynch	8941	1431	3.2	217.8	41.8	4.68
Bank of Montreal	3149	604	0.7	195.1	49.9	13.34
Bank of New York Mellon	741	128	2.0	148.2	16.1	8.20
Bank of Nova Scotia	2124	355	1.1	233.25	53.0	15.25
Bank of Tokyo Mitsubishi UFJ	7752	1263	3.3	297.1	44.9	7.13
Barclays PLC	4680	717	18.7	438.8	32.9	0.54
Bayerische Landesbank	702	121	4.8	961.8	57.7	-0.86
Canadian Imperial Bank of Commerce	1140	153	2.5	124.5	61.5	19.30
Chang Hwa Commercial Bank	1185	179	1.4	161.8	68.5	9.05
Citibank	3339	533	2.5	251.9	36.0	6.02
Comerica Bank	1087	162	0.5	50.24	69.1	7.05
Commerzbank AG	2231	304	8.0	641.7	38.6	1.86

Commonwealth Bank of Australia	1488	221	6.0	390.2	74.1	17.61
Crédit Agricole	3097	452	6.4	910.38	20.8	5.88
Crédit Mutuel	795	139	6.5	762.0	41.3	8.2
Credit Suisse AG	3141	578	4.2	883.8	31.1	-0.99
DBS Bank	1139	199	3.2	125.2	62.5	11.03
DZ Bank AG	699	110	1.9	1131.2	31.1	12.09
Danske Bank	526	99	4.6	1103.8	54.6	6.89
Deutsche Bank	4725	774	5.1	405.4	24.5	-2.82
Fifth Third Bank	2587	402	1.0	107.3	65.7	10.88
Goldman Sachs	3085	583	6.0	504.97	13.9	9.47
Groupe BPCE	2442	385	3.4	755.2	52.6	5.86
HSBC	7063	1062	13.9	518.5	33.3	5.28
ING Bank	2183	265	7.7	678.5	64.6	9.74
Intesa Sanpaolo SpA	887	156	3.7	445.2	49.5	1.04
JP Morgan Chase & Co.	7609	1268	3.4	278.4	32.1	9.35
KBC Bank	524	140	6.5	284.6	49.6	11.88
KeyBank	1732	297	0.2	98.1	61.2	8.24
Lloyds Bank	1466	166	56.0	261.9	56.1	1.39
Mizuho Bank	6635	1099	2.6	585.4	38.7	9.98
Morgan Stanley	2717	440	4.7	501.2	15.3	6.33
National Australia Bank	1248	200	6.2	388.1	58.6	9.49
Nordea Bank AB	904	170	2.3	873.8	48.7	11.63
Northern Trust	926	114	0.2	88.4	28.1	10.48
PNC Bank	3278	521	0.6	115.7	58.7	9.64
Rabobank	1775	354	4.7	532.5	67.3	4.88
Regions Bank	1705	196	0.2	41.6	64.0	6.74
Royal Bank of Canada	3225	546	3.7	229.3	45.2	18.43

Royal Bank of Scotland	2942	191	26.2	325.5	35.9	-8.72
Société Generale	2688	449	6.4	881.7	29.2	5.24
Standard Chartered Bank	1900	271	4.5	268.2	40.7	1.91
Sumitomo Mitsui Banking Corporation	7374	1307	3.1	359.2	42.0	9.99
SunTrust Bank	2744	470	0.7	82.6	71.5	7.77
Toronto Dominion Bank	1612	299	0.6	162.0	49.9	14.04
UBS AG	1506	211	7.6	289.6	31.2	8.19
US Bank	3772	611	0.2	122.9	61.9	14.55
UniCredit SpA	2223	292	4.6	638.4	52.4	-8.72
Wells Fargo	6612	1038	1.7	146.8	52.2	13.06
Westpac Banking Corporation	1456	180	1.5	374.5	76.8	15.16

Table 2 provides descriptive statistics for each of the 55 banks included in the data set. The average lending fraction prior to Brexit indicates the percentage of the pre-Brexit observations that correspond to a UK-based lender. The debt to equity ratio, net loans to total assets ratio and return on common equity represent the leverage, liquidity and profitability of a bank.

Table 3: The ten markets with the highest correlation with the number of quarterly issuances in the UK's syndicated loan market

Market	Period 2000-2015	Market	Period 2011-2015
1. USA	0.6446***	1. Italy	0.7515***
2. France	0.5684***	2. France	0.7207***
3. Germany	0.5089***	3. The Netherlands	0.6401***
4. Sweden	0.4909***	4. Germany	0.5777***
5. The Netherlands	0.4525***	5. Hong Kong	0.5523**
6. China	0.4040***	6. Norway	0.5392**
7. Norway	0.4018***	7. China	0.5350**
8. Singapore	0.3906***	8. Canada	0.4794**
9. Canada	0.3819***	9. USA	0.3442
10. Switzerland	0.3108**	10. Singapore	0.3087

Table 3 presents the correlations between the natural logarithm of the quarterly number of issuances in the UK market and each other market. 1, 5 and 10% significance levels are indicated by ***, **, *, respectively.

Table 4: Difference-in-differences regression at market level, 2013 Q3 - 2016 Q3

	Log Number of Loan Issuances		Log Dollar Amount of Loans	
	(1)	(2)	(3)	(4)
UK * Brexit	-0.227**	-0.269***	-0.438***	-0.488***
Market fixed effects	Yes	Yes	Yes	Yes
Quarter fixed effects	Yes	Yes	Yes	Yes
Country * Quarter of the year fixed effects	No	Yes	No	Yes
Observations	143	143	143	143
Adjusted R-squared	0.963	0.966	0.906	0.887

Table 5: Difference-in-differences regression at market level, 2013 Q3 – 2016 Q4

	Log Number of Loan Issuances		Log Dollar Amount of Loans	
	(1)	(2)	(3)	(4)
UK * Brexit	-0.251**	-0.248**	-0.494***	-0.507***
Market fixed effects	Yes	Yes	Yes	Yes
Quarter fixed effect	Yes	Yes	Yes	Yes
Country * Quarter of the year fixed effects	No	Yes	No	Yes
Observations	154	154	154	154
Adjusted R-squared	0.961	0.966	0.903	0.889

Tables 4 and 5 present the results from the difference-in-differences regression at market level [equation 1: $Y_{m,t} = \beta_1(UK * Brexit) + \alpha_m + \alpha_t + \varepsilon_{m,t}$] using either the first (2016 Q3) or both quarters (2016 Q3 & Q4) after the referendum. The coefficient of interest is found in the row belonging to the interaction effect UK * Brexit. In each table, column one and two present the results using the log of quarterly number of loan issuances as the dependent variable. Columns three and four present the results using the log of quarterly dollar amounts as the dependent variable. Furthermore, columns two and four display the results including seasonal fixed effects whereas each column includes market and quarterly fixed effects. 1, 5 and 10% significance levels are indicated by ***, **, *, respectively.

Table 6: Difference-in-differences regression at the bank level using exposures calculated over 2015 Q1 – 2016 Q2

	Lending Fractions			
	(1)	(2)	(3)	(4)
Continuous Exposure* Brexit	-0.036	-0.042	-0.467***	-0.482***
UK banks included	Yes	Yes	No	No
Bank fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Bank characteristics	No	Yes	No	Yes
Observations	385	385	350	350
Adjusted R-squared	0.901	0.901	0.653	0.651

Table 7: Difference-in-differences regression at the bank level using exposures calculated over 2012 Q1 – 2013 Q2

	Lending Fractions			
	(1)	(2)	(3)	(4)
Continuous Exposure* Brexit	-0.129**	-0.135**	-0.294***	-0.297***
UK banks included	Yes	Yes	No	No
Bank fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Bank characteristics	No	Yes	No	Yes
Observations	385	385	350	350
Adjusted R-squared	0.903	0.903	0.650	0.646

Table 6 presents the results of the difference-in-differences regression [equation 2: $Y_{b,t} = \beta_1(Exposure_b * Brexit) + \beta_2 Brexit + \beta_3 Controls_{b,t} + \alpha_b + (\alpha_t) + \varepsilon_{b,t}$] using a continuous treatment indicator that is based on bank exposures calculated over 2015 Q1 – 2016 Q2. Table 7 differs by using the exposures calculated over 2012 Q1 – 2013 Q2. The coefficient of interest is found in the row belonging to the interaction effect Continuous Exposure * Brexit. Columns one and two include the UK banks in the regression, whilst columns three and four exclude the UK banks. Furthermore, columns two and four control for the bank characteristics whereas each column includes bank and time fixed effects. 1, 5 and 10% significance levels are indicated by ***, **, *, respectively.

Table 8: Exposure level rankings for two time periods: 01/01/2012 – 30/06/2013 (Period 1) and 01/01/2015 – 23/06/2016 (Period 2)

Bank	Period 1	Period 2	Difference in Positions
ABN AMRO Bank	29	12	17
Australia & New Zealand Banking Group	34	37	3
Banco Bilbao Vizcaya Argentaria	31	27	4
BNP Paribas SA	12	10	2
Banco Santander	2	5	3
Bank of America Merrill Lynch	33	35	2
Bank of Montreal	51	48	3
Bank of New York Mellon	41	40	1
Bank of Nova Scotia	42	47	5
Bank of Tokyo Mitsubishi UFJ	38	29	9
Barclays PLC	5	3	2
Bayerische Landesbank	24	21	3
Canadian Imperial Bank of Commerce	32	36	4
Chang Hwa Commercial Bank	36	45	9
Citibank	37	32	5
Comerica Bank	52	49	3
Commerzbank AG	11	7	4
Commonwealth Bank of Australia	9	11	2
Crédit Agricole	14	9	5
Crédit Mutuel	10	15	5
Credit Suisse AG	28	28	0
DBS Bank	39	26	13
DZ Bank AG	19	42	23
Danske Bank	20	25	5
Deutsche Bank	26	22	4
Fifth Third Bank	46	43	3
Goldman Sachs	22	18	4
Groupe BPCE	17	20	3
HSBC	4	4	0
ING Bank	8	14	6
Intesa Sanpaolo SpA	25	34	9
JP Morgan Chase & Co.	30	33	3
KBC Bank	7	6	1
KeyBank	53	52	1
Lloyds Bank	1	1	0
Mizuho Bank	43	38	5

Morgan Stanley	40	24	16
National Australia Bank	6	16	10
Nordea Bank AB	21	44	23
Northern Trust	54	51	3
PNC Bank	49	50	1
Rabobank	18	23	5
Regions Bank	55	53	2
Royal Bank of Canada	27	30	3
Royal Bank of Scotland	3	2	1
Société Generale	13	8	5
Standard Chartered Bank	16	17	1
Sumitomo Mitsui Banking Corporation	35	31	4
SunTrust Bank	50	46	4
Toronto Dominion Bank	47	55	8
UBS AG	15	13	2
US Bank	48	54	6
UniCredit SpA	23	19	4
Wells Fargo	45	41	4
Westpac Banking Corporation	44	39	5

Table 8 ranks the lenders based on their exposures in both periods. The higher the exposure, the higher the ranking. The last column indicates the number of positions shifted between the two periods of measurement.

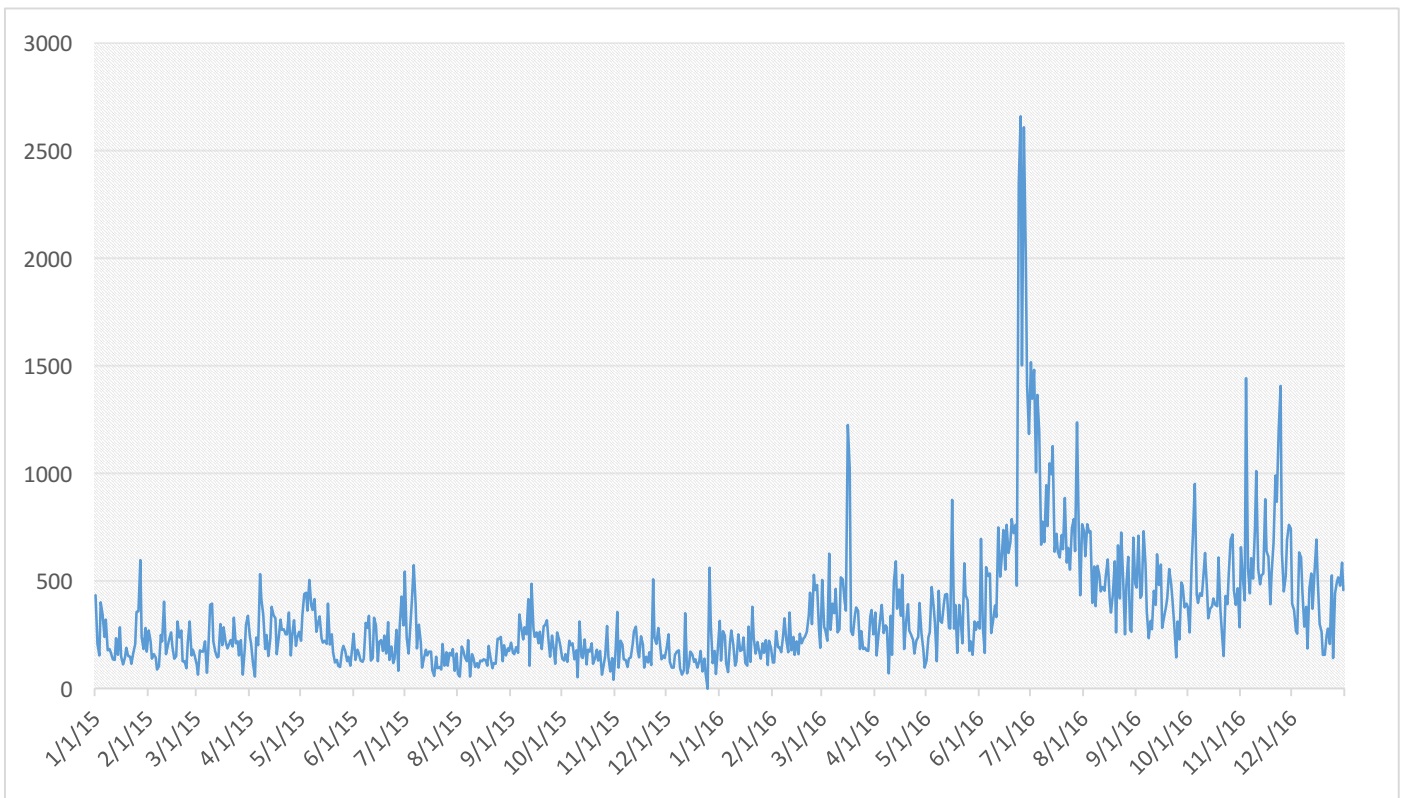


Figure 1: Economic Policy Uncertainty Index for the years 2015 and 2016

Figure 1 displays the Economic Policy Uncertainty Index developed by Bloom, Davis & Scott (2016). Their measure is based on a newspaper word count that searches for words associated with policy uncertainty.

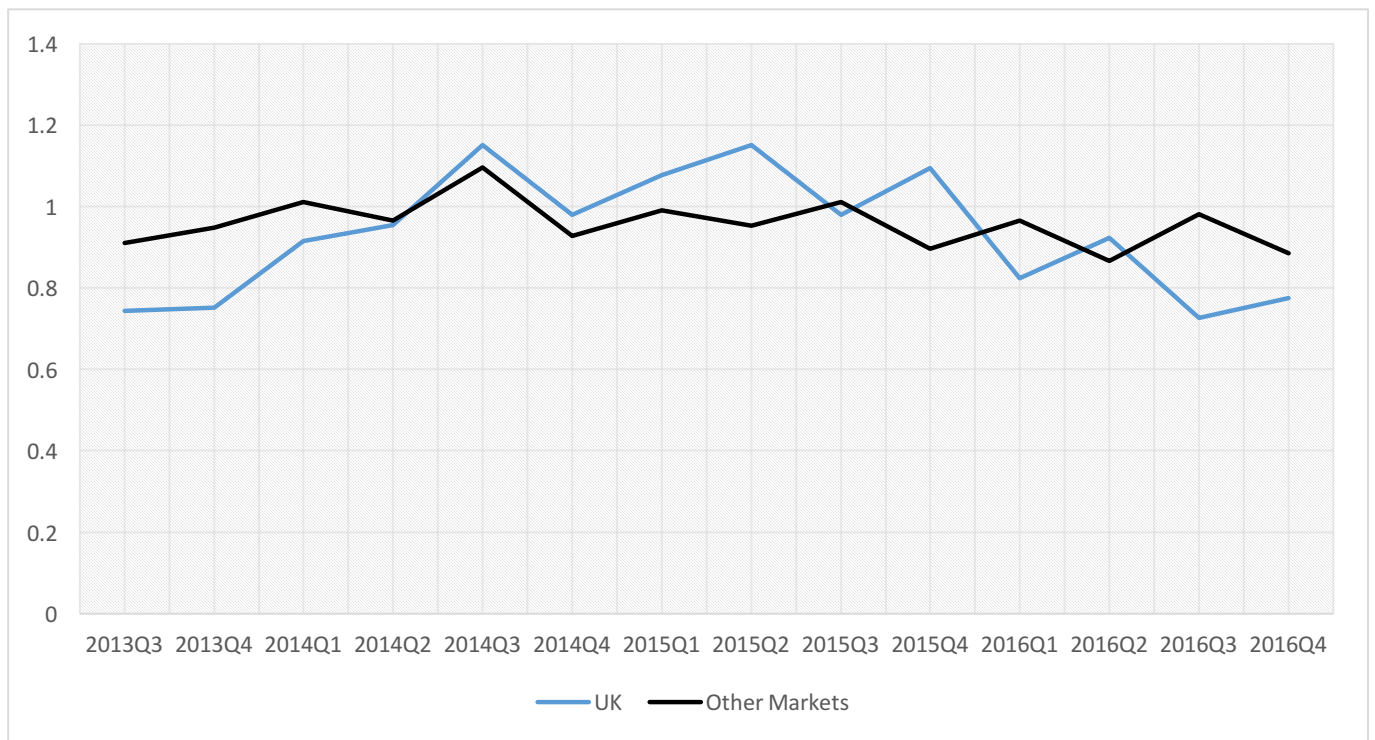


Figure 2: The trend in the number of quarterly issuances in the UK and the other nineteen largest markets

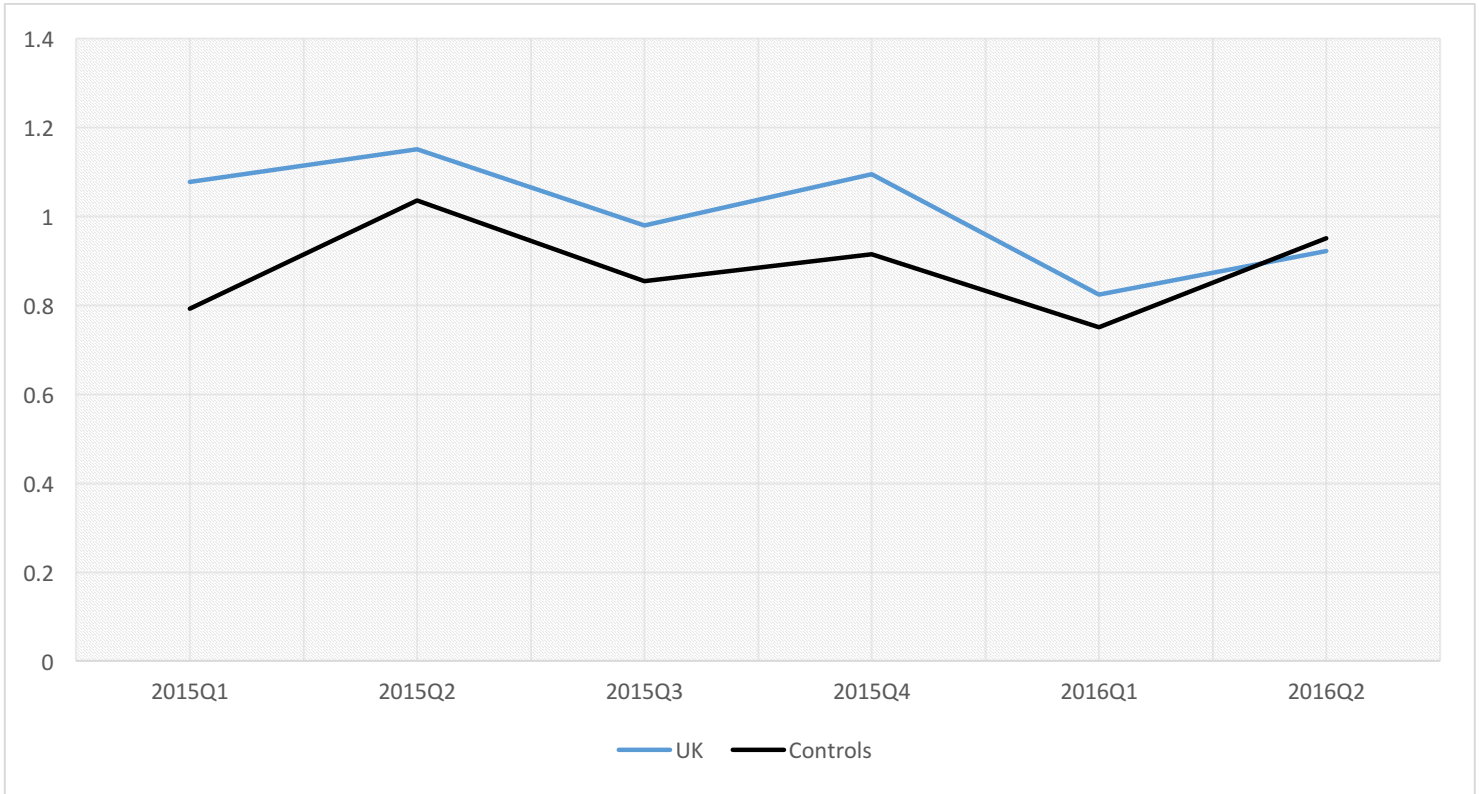


Figure 3: Pre-referendum trend in the number of quarterly issuances in the UK and control markets

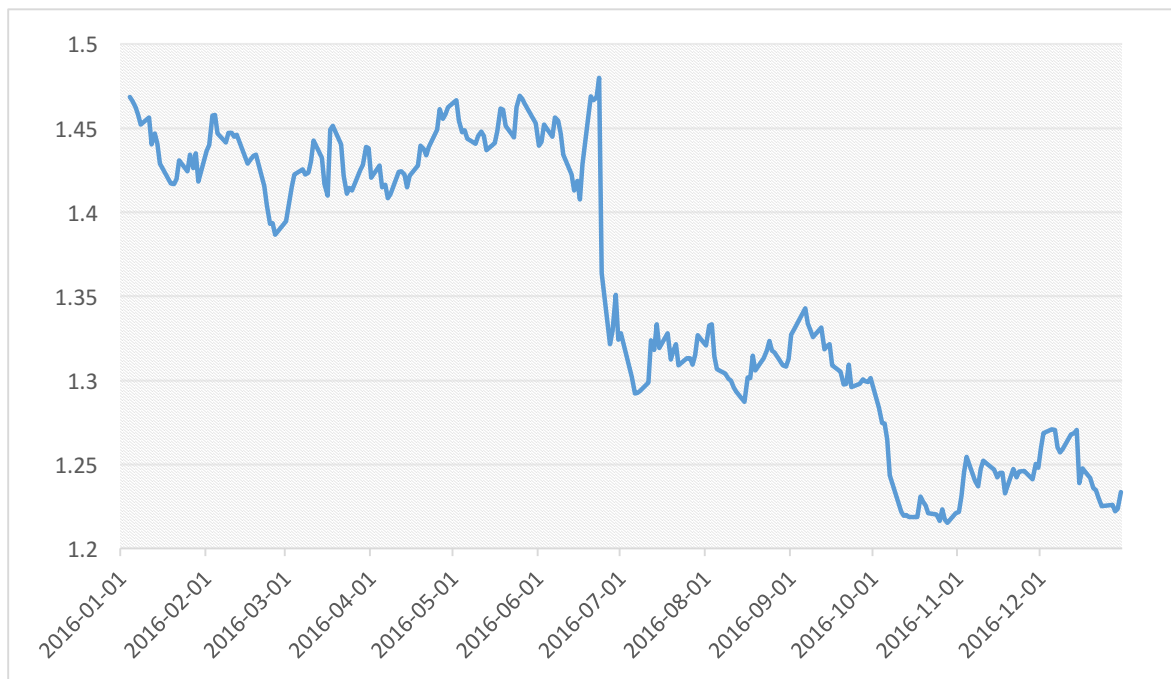


Figure 4: Exchange rate: One US dollar to one UK pound³

³ Data retrieved from: Board of Governors of the Federal Reserve System (US), U.S. / U.K. Foreign Exchange Rate [DEXUSUK], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/DEXUSUK>, June 6, 2017.