Brexit: The Effect of Uncertainty on Payout Policy

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Abstract

This thesis delves into the impact of Brexit on the payout policy of British firms. My findings support some facets of the information content hypothesis of dividends. Namely, I find evidence that the Brexit caused a decrease in the number of British dividend paying firms, but an increase in the dividend payout of the firms that kept on paying. My findings also support several aspects of the flexibility and option hypotheses. In particular, I show that more British firms announced a share repurchase after the Brexit and less of them actually repurchased shares. Finally, in line with the option hypothesis, I show evidence that the market reaction to share repurchase announcements decreased after the Brexit, but firms that are more likely to repurchase shares do not necessarily receive a better market reaction to their announcements. [1]

Keywords: *Brexit*, *Cash-Flow Uncertainty*, *Payout Policy*, *Dividends*, *Share Repurchases*

JEL: *G35*

[1] The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.

Contents

1 Introduction

On the 23^{rd} of June 2016, citizens of the United Kingdom unexpectedly voted for leaving the European Union. Experts estimated that leaving the EU would shave 2% off the UK's GDP (Ellyatt, 2018). Meaning that the total output of British firms was going to be affected and that British managers in general would be less tempted to invest in expansionary projects. However, since the Brexit withdrawal agreement was only signed four years later, it long remained unclear what the effect of Brexit would be on individual companies. Managers could choose to keep this cash on the firm's balance if they feel that their firm's earnings will be severely affected. However, an expected 2% decrease in total output implies that for a large range of firms output will not be affected. Especially for these types of firms, cash will keep entering the firm and, if following Jensen (1986), this increases agency costs and is not in the best interest of the shareholders. Alternatively, managers could choose to return cash to shareholders through dividends or a share repurchase.

Even though the Brexit withdrawal agreement was signed on the 24^{th} of January 2020, economic consequences for Britain still have to fully unravel. Whereas the deal included zero-tariffs and zero quotas, the implementation of a new protocol at customs might turn out to be quite detrimental for trade (Phinnemore, 2020). With plenty of uncertainties down the road for Britain, it interesting to find out whether British firms adjusted their payout policy to the uncertainties. Therefore, I am interested in answering the following question:

Did the Brexit influence the payout policy of British firms?

My main assumption is that the Brexit increased the cash flow uncertainty of British firms. With cash flow uncertainty I refer to the fact that it was long unknown what a Brexit deal would look like, if it would be signed at all, and what it would mean for an individual firm. Following the information content hypothesis, a decrease in expected future earnings should lead to a decrease in dividends paid. Therefore, I expect that firms which can not afford to pay dividends, stop paying them. Alternatively, the firms which can afford to pay dividends will try to signal strength by not cutting them and in some cases even increase them. However, in times of great uncertainty, plenty of firms with ample cash might be more interested in a flexible solution. A share repurchase is such a flexible solution, as it can be announced, but may never get completed. However, I do not expect the market to undervalue British stocks and I do expect managers to keep cash on the balance in anticipation of a crisis. Therefore, I argue that more share repurchases will be announced and less will be completed after the Brexit. When viewing share share repurchase announcement as options, announcing more of them and completing less of them should on aggregate lead to lower option value and thus to a poorer market reaction. If this mechanism holds on aggregate, one would also expect that types of firms that are more likely to complete a share repurchase should also receive a better market reaction.

In order to test the effect of uncertainty on payout policy, it makes sense to compare changes in British payout policy to changes in payout policy of a country that did not experience the same levels of uncertainty. I find evidence that the economic policy uncertainty of the United States is less related to the British levels of uncertainty than for instance France. Therefore, I create a sample on dividend

policy by extracting data on Worldscope constituent lists of the USA and the UK from Thomson Reuters Datastream. I extract its share repurchases counterpart from Thomson One SDC by obtaining a list of share repurchase announcements from American and British firms between 2010 and 2021. I supplement the share repurchases dataset by retrieving share price data from SDC that enable me to calculate the market reaction to share repurchase announcements of British firms.

I find evidence that because of Brexit, less British firms issued dividends, but the ones that continued to pay, increased payout. Furthermore, the results point to the conclusion that a greater number of British firms announced a share repurchase after the Brexit, but a smaller number of them completed them. In line with the option hypothesis of share repurchases, I find that the market reaction to these announcements is poorer after the Brexit than before, but this difference is only significant in regression analysis. Finally, I show evidence that profitable firms are more likely to complete a share repurchase than less profitable firms, but that they receive a poorer market reaction, which appears to contradict the option hypothesis.

I contribute to the existing literature in several ways. Most importantly, I analyse the impact of Brexit on payout policy, which has to my knowledge not been done before. I add on the papers of (Bradley, Capozza, & Seguin, 1998) and (Kale & Noe, 1990) by analysing the relationship between cash flow uncertainty and dividend policy. I add to (Bhattacharya & E. Jacobsen, 2016) by exploring the flexibility hypothesis of share repurchases and how it applies to the Brexit. Finally, I add to the option hypothesis (D. L. Ikenberry & Vermaelen, 1996), which suggests that a share repurchase announcement can be regarded as an option.

The structure of the rest of this paper consists of four sections. Section 2 discusses the literature on the Brexit, payout policy and the effect of uncertainty on payout policy. Section 3 covers the data and methodology used to test the effects of uncertainty on payout policy. Section 4 reports the finding to the analyses and shows my interpretation of these finding. Section 5 concludes this paper and discusses the possibilities of future research.

2 Theoretical Framework

This section discusses the literature on both Brexit and payout policy. I first cover the events leading up to Brexit and discuss the possible implications of leaving the EU. Next, I discuss the basics of payout policy and the ways in which dividends and share repurchases differ. Finally, I discuss the impact of uncertainty on both payout methods and go into further depth on the option hypothesis of share repurchases.

2.1 Brexit

This section discusses all major events leading up to the Brexit vote and Britain actually leaving the EU. Thereafter, I describe the uncertainties in the process leading up to the Brexit deal and discuss possible implications of the Brexit deal.

2.1.1 Brexit timeline

In January 1972, then Prime Minister Edward Heath signed the Treaty of Accession, which was the starting point of Britain being included into the economics and politics of the European mainland. Already in 1975, the first referendum was held on whether to stay in the EU, which resulted in a majority in favour of staying. From 1993 onward, the rise of Euroscepticism relaunched with the formation of the UK Independence party (UKIP). Even so, it was only from late 2015 onward that Brexit really got going. All major events associated with Brexit were perfectly captured from 2015 to 2021 by Nigel Walker (2021), of which I highlight the most important.

In December of 2015, the European Union Referendum Act receives Royal Assent, which is approval of the Royal Family and meant that a vote was to be organised. The date of the vote was set at the 23^{rd} of June,2016. Surprisingly, the vote turned out to be in favour of leaving and then Prime Minister David Cameron resigned a day later. A month later, Theresa May became the new Prime Minister and in April of 2017, she called for an early general election in June as to solidify her mandate to get Brexit done. Her conservative party won this election and therefore she could get going with Brexit negotiations. Until early 2019, the PM was constantly negotiating with all parties involved, but Brexit simply would not fly. In the first months of 2019, parliament got to vote on the PM's progress in three Meaningful votes, all resulting in a nay.

On May 23, 2019, UKIP won the European parliament elections and May was forced to announce her resignation a day later. On July 23, Boris Johnson won the conservative party's leadership race and pledged in December later that year, to get Brexit done. The Brexit withdrawal agreement was signed on the 24^{th} of January and the UK left the European bloc several days later.

From close inspection of the Brexit timeline, one has to conclude that the entire Brexit process was completely unpredictable and filled with unexpected twist and turns. It long remained a mystery whether Brexit would get done, and if so, in what ways it would shape Britain's economy. In the next section, I will discuss the literature on the potential economic implications of Britain leaving the EU.

2.1.2 Implications of Brexit

When the vote turned out to be in favour of leaving the EU, many speculated about the way in which Brexit would come about. The two mainstream scenarios were known as a hard and a soft Brexit (Dhingra, Machin, & Overman, 2017), both of which predicted negative economic impacts, harshest in case of a hard Brexit. A soft Brexit would have entailed leaving the EU, but staying in the single market and the customs union (Djukanovic, 2018). Thereby facilitating trade at the costs of following some EU regulation. In case of a hard Brexit, the goal would be to make sure that the UK is freed of all EU imposed regulations, thereby sacrificing the single market.

Predicting the exact economic effects of Brexit in the short-run turned out to be relatively hard, but in the long run, experts believed that the British economy could primarily be affected in three major ways (Ebell & Warren, 2016). In the first place, as trade between the UK and the mainland will become harder and more expensive, trade volume with EU countries will decrease. Secondly, there will be a reduction in foreign direct investment as the UK's attractiveness decreases as a result of leaving the single market

with the EU (Dhingra, Ottaviano, Sampson, & Van Reenen, 2016). Thirdly, the net fiscal contribution of the UK to the EU will decrease. The UK was one of the largest net contributors to the EU, with a net contribution of around 9 billion pounds, meaning that leaving the EU is also a large cost-saver (Felbermayr, Fuest, Gröschl, & Stöhlker, 2017).

This decrease in attractiveness could be detrimental for Britain. As total foreign direct investment is worth over a trillion pounds, half of which comes from EU countries (Dhingra et al., 2016). In the past three years the inflows of FDI in the UK have drastically declined from $ 101 billion in 2017, to $65 billion in 2018, to $59 billion in 2019 (United Nations Conference on Trade and Development, 2020). Investors might return when the clouds have cleared, but the damage may have already been done.

On trade, the consequences might be smaller than earlier expected, as the deal includes zero-tariffs and zero-quotas for trade of EU members with the UK (Phinnemore, 2020). However, new protocol was set in place at customs, including a greater number of regulatory checks (Phinnemore, 2020). Moreover, the movement of people, capital and services will, to a greater extent, be restricted. To work in the EU, British people need to comply with all rules on immigration and will need a work permit (European Labour Authority, 2021). This requirement is also set in place in the opposite direction. One example of a manifestation of this, is the fact that the UK will no longer be involved in the Erasmus program, which is a European exchange program.

So, although many of Brexit's implications will only show in the future, it appears that Brexit has already made quite some dents in the British economy. As these implications of Brexit most likely differ per firm, it is up to the managers to make an educated guess what it will mean for a firm's output. Using this guess, managers can determine how much of the remaining cash should remain on the balance and how much should be returned to the shareholders. In the next section, I go over the literature on payout policy, explain the differences between the two methods and show how they relate to the uncertainties created by Brexit.

2.2 Payout policy

When a firm generates profit, its managers need to decide what to do with the associated cash inflows. In the first place, managers can choose to invest this cash into new projects. In making this decision, managers should evaluate their investment possibilities by their net present value, which is calculated by discounting the future cash flows of a potential project with the required rate of return and then subtracting the initial investment (Jagerson, 2021). Managers should then choose to invest in the highest positive NPV projects. However, if Brexit causes total British output to decrease, this would mean that both the number of NPV projects and their corresponding values should decrease.

In the second place, managers could choose to hold on to cash as to create a buffer. However, it is typically not in the shareholders' best interest if managers have cash in abundance. As the interest of the managers are not perfectly aligned with the interests of the shareholders, there are agency costs to free cash flow (Jensen, 1986). The more cash at the disposal of the manager, the greater these costs. Therefore, managers should be inclined to return cash to the shareholders.

In deciding how to return cash to the shareholders, managers have two options. Managers can either

choose to issue dividends or repurchase company stock. When managers decide that they want to do so, they first have to get approval from the shareholders. If the board gets approval to issue dividends, they declare that a particular amount, either in cash or in stock, will be returned to the (common) shareholders on a particular date (Beers, 2020). When management want to get approval for doing a share repurchase, they have to write a share repurchase program. This program should at least contain: the period in which they want to repurchase shares; the maximum number of share to be acquired; why they want to acquire the share; what they will do with the share once repurchased and how they will actually purchase the shares (Skadden, 2020).

However, the main difference between these two methods does not lie in the way they are specified, but in the consequences that they have for the firm. Because once a firm declares to issue a dividend, it must issue the dividend at the agreed upon date. Whereas if a firm announces a share repurchase program, it gives managers the opportunity to buy back share during an agreed upon period, but does not force them to do so. As a result of this difference, the circumstances in which a company is in, might very well determine which payout method is preferred.

So, with the knowledge of the basic difference between the two methods, the next section discusses the implications of uncertainty on these two methods.

2.3 Hypothesis development

This section discusses the literature on dividends and share repurchases in relation to uncertainty. In the first place, the effect of Brexit on dividend policy will be examined. Secondly, the effect of Brexit on share repurchase decisions will be covered. Finally, as share repurchases appear to be the better method for the uncertainty created by Brexit, I discuss the market's reaction to share repurchase announcements both before and after the Brexit.

2.3.1 The effect of Brexit on dividend policy

Historically, many motivations have been given as to why a company would issue dividends. One of the reasons why a firm issues a dividend is to signal information about future performance to the market (Lonkani & Ratchusanti, 2005). The idea behind dividend signaling, is that when a firm announces to increase its dividends, the market would be tempted to think that this increase in dividends were to be financed by a future increase in earnings. Modigliani and Miller (1959) oppose this theory, as they argue that investors should be indifferent about the source of income and only care about the height of their returns. So that identical firms, with different dividend policies, are appreciated equally by investors, which is known as the dividend irrelevance theorem (Modigliani & Miller, 1959).

Where the dividend irrelevance theory should mathematically hold, there are several behavioural reasons why investors do deem dividends relevant (Kania, 2005). Investors are often risk-averse, making the prospect of stable returns through dividends preferred over the more volatile capital gains returns, even if these returns are equal. Another reason why dividends are preferred to capital gains is regret aversion. As Kahneman and Tversky (1982) describe, people prefer to take a loss that was caused by someone else's action than by one's own actions. This is best illustrated by the following example. If

company A returns a dividend of amount X, one needs to sell a part of company B to get the same return, but through capital gains. If company B's stock would appreciate after selling, the investor would regret selling it, whether he would not regret it to a similar extent that firm A returned a dividend.

If investors are to some extent risk-averse and Brexit caused an increase in economic uncertainty, one would be led to believe that managers might have altered their dividend policy in response. Therefore, I am interested in the following question:

SQ$_1$:What is the influence of Brexit-induced uncertainties on dividend policy?

The relationship between cash flow uncertainty and dividend policy has been discussed thoroughly in the literature on payout policy. A limitation of cash flow uncertainty however, is that it is hard to quantify for a great number of firms. A measure that is used to measure economic policy uncertainty in the market is the EPU index by Baker et al. (2016). This measure is based on the reading of 12,000 newspapers and checking for a combination of words such as: 'economic', 'uncertain' and 'regulation'. This index has high levels associations with stock market volatility and is proven to be an important risk factor (Al-Thaqeb, Algharabali, & Alabdulghafour, 2020). In the next paragraphs I discuss the literature on the influence of cash flow uncertainty and several findings regarding the relationship between EPU and dividend policy.

The impact of cash flow uncertainty on dividend policy has been researched from many different angles. Bradley et al. (1998) examine the relationship between cash flow uncertainty and dividend payout from two sides. On the one hand, by looking at the agency-cost hypothesis, which is largely based on Jensen's free cash flow hypothesis and suggests that increasing dividends causes a decrease in agency costs (Jensen, 1986). On the other hand, they argue that the information-content hypothesis should predict a negative relationship between cash flow uncertainty and dividend payout. Because if a firm signals great confidence in future performance, they better make sure that this performance will be attained, otherwise a firm would be heavily penalized. They found the latter relationship to be strongly significant and concluded that the signaling hypothesis is the better explanation.

Kale and Noe (1990) expand on the argument of Bradley et al.(1998) by arguing that dividends are a trustworthy sign of stability, because when these future cash flows turn out to be less than expected, the odds that a firm has to issue equity increase. As issuing equity is often associated with large underwriting costs, this might not be a desirable consequence and firms are probably hesitant to increase dividends when facing uncertainty. In accordance with this argument, Chay and Suh (2009) report that firms with greater stock market volatility had both a smaller chance of paying dividends and paid lower amounts of dividends than firms with smaller stock market volatility. As stock market valuation is largely based on the value of the expected future cash flow, larger cash flow uncertainties result in higher stock market volatility. To further nuance the effects of uncertainty on dividend policy, Bar-Yosef and Huffman (1986) conclude that dividends are positively related to expected future cash flows, but that the higher the expectation is, the smaller the marginal effects of cash flows on dividend payout will be. From which I conclude that in times of greater cash flow uncertainty managers typically choose to payout less in dividends. Therefore, I come to the following hypothesis:

H_1 : Because of the Brexit-induced uncertainties the number of firms that issued dividends decreased.

Like Bar-Yosef and Huffman (1986), other strands of literature also suggest that the relationship between uncertainty and dividend payout might not be so linear as portrayed above. Koussis et al. (2017) conclude that higher cash flow uncertainties will also increase the default risk and that a high default risk should encourage managers to distribute more dividends. As in case of default, having plenty of retained earning might have no value to shareholders, whereas when dividends are paid, at least part of their investment is salvaged. This extreme effect was also found by Tran (2020), who find that banks decrease payout in times of high cash-flow uncertainty, but that they actually increase their dividends during a crisis. Furthermore, Kalay (1981) discover a negative relationship between earnings uncertainty and dividend payout ratios, but only in the cross-section. When testing this relationship in a time-series setting, this relationship was found to be insignificant. This suggests that between firms, levels of uncertainty have an impact of dividend payout, but that when uncertainty of earnings changes for a given firm, this does not seem to affect dividend payout.

Besides acting on the perceived cash flow uncertainty, managers can also cater to the interests of the investors in times of high uncertainty and several papers find that managers actually do so. Attig et al. (2021) report that during times of high EPU, dividends can be of used as they decrease agency problems. For instance, if there is great market-wide uncertainty, the value of a firm is highly volatile. If managers in such cases return cash to the shareholders, the overall volatility of their investment decreases. Moreover, Baker et al. (2020) find that managers generally increase dividends in times of high EPU and that investors appreciate this reaction. Therefore, they conclude that managers react to the investor's desire for information by signalling firm quality through dividend payout.

So, even though the information content hypothesis predicts that an increase in total cash flow uncertainty decreases the number of dividend issuing firms, this is definitely not the whole story. Both the explanation from agency costs and from increased EPU show that in particular cases, managers increase their dividend payout to cater the interests of the investors. Therefore, I argue that if firms are able to pay their dividends, a crisis might motivate them to increase their payout as to please their investors. Hence, my second hypothesis:

H_2 : The firms that continued to issue dividends in face of this increase in uncertainty chose to increase their dividends.

In the next section, I go over the literature on share repurchase decisions and discuss how they are influenced by uncertainty.

2.3.2 The effect of Brexit on share repurchase decisions

Because of the uncertainty generated by the Brexit, managers might be interested in using a payout method that is more flexible than dividends. One of the advantages of the flexibility of a share repurchase program is that managers can choose at what date they want to repurchase shares, if they want to do so at all. Because as D'Mello and Shroff (2000) concluded, managers are to quite some extent capable of buying back shares when they are undervalued. If Brexit would increase the cash flow uncertainty of a firm, this increase in volatility would lead to a decrease in company valuation.

In light of the uncertainties that have been generated by the Brexit and the flexible nature of share repurchase programs, I suspect that managers might have made some changes in their decisions regarding share repurchases. Therefore, I am interested in answering the following question:

SQ$_2$: What was the effect of Brexit-induced uncertainties on share repurchase decisions?

There are two major decisions a manager can make regarding a share repurchase. He can choose to announce a share repurchase and he can choose whether to actually repurchase shares. This is why a share repurchase is usually regarded as a more flexible payout method than issuing dividends (Bhattacharya & E. Jacobsen, 2016). Because of this inherent flexibility, share repurchases might be used at different moments and by different types of firms than dividends. Jagannathan et al. (2000) report that firms with higher constant cash flows often prefer dividends, whereas firms with fluctuating cash flows are more inclined to use a share repurchase. In line with the flexibility hypothesis, Denis (2011) explains that share repurchases are a suitable payout method when a firm experiences an increase in earnings that can not be considered permanent. Adding to this, Iyer and Rao (2017) conclude that in times of crisis, repurchasing firms to a greater extent reduced repurchase payout than that dividend paying firms decreased dividends. Moreover, they conclude that because of this flexibility, these repurchasing firms consistently outperform dividend paying firms both during and after a financial crisis. Furthermore, Stephens and Weisbach (1998) argued that managers mainly announce a share repurchase because of the flexibility gained by being able to time the market rather than trying to increase the stock price by adding a potentially valuable.

Therefore, as the flexibility of a share repurchase announcement is particularly valuable in an uncertain situation like Brexit, I expect the following to be true:

H_3 : British firms announced more share repurchase after the Brexit than before

However, the fact that share repurchases are more flexible than dividends does not directly imply that firm should repurchase shares during uncertain times. Quite to the contrary, Dreyer and Schulz (2021) show that managers, in anticipation of a possible crisis, usually choose to keep cash on the balance sheet instead of paying it out the shareholders. In accordance with this finding, Pirgaip and Dinçergök (2019) report a negative relationship between EPU and the number of share repurchases. Moreover, they found that because of the option like nature of a share repurchase, a share repurchase is a more responsive payout method than dividends. In line with this finding, Walkup (2016) concludes that with increased uncertainty, firms with low cash flows choose to stiffen their dividend policy, whereas the high cash flow firms are inclined to repurchase shares. Moreover, he finds that especially for these high cash flow firms, the probability of announcing a share repurchase increased.

So, because of the flexibility associated with a share repurchase, the Brexit-induced uncertainties should increase the probability that British firms announce a share repurchase. However, because of the uncertainty revolving around the future of British firms, managers most likely announced more share repurchases as to be able to act in case of undervaluation. Thereby, considering a share repurchase announcement as an option rather than an intent to repurchase shares. Therefore, I expect the following to be true:

H_4 : British firms bought back less share after the Brexit than before

In the next section, I will discuss how uncertainties surrounding share repurchase decisions could have an impact on the market's response to share repurchase announcements.

2.3.3 The effect of Brexit on the market's reaction to share repurchase announcements

With many uncertainties revolving the economic future of Britain, it is important to find out what British managers should do in the years to come. Whereas managers might want to promote some of their own goals, Kau et al. (2008) find that on average, managers listen to what the market wants. Moreover, Jörg et al. (2003) report that firms with managers that claim to pursue a strategy that maximizes shareholder value have better stock market performance than firms without. An example of catering to shareholder interest is the relationship between EPU and both dividend policy and share repurchases. Therefore, knowing the market reaction to share repurchase announcements in these uncertain times might be useful in determining in what cases managers should announce a share repurchase. Given this interest, I come to my third and final sub-question:

SQ$_3$: What is the influence of Brexit-induced uncertainties on the market's reaction to share repurchase?

As Ikenberry and Vermaelen (1996) suggest, a share repurchase announcement could be seen as an option to repurchase shares. An option that is only likely to be exercised in the event of under-valuation by the market. When viewing share repurchase announcements as an option, the value of such an announcement can also be calculated like it is an option. Where the present value of the option is determined both by the probability that the option will be exercised and the value that is created in case it is exercised. If firms increasingly used a share repurchase announcement as an option, instead of signaling an actual intent to repurchase, this has negative consequences for the value of such an option, as it decreases the probability of exercising the option. If on aggregate British firms would get undervalued, as deemed by the managers, this would increase the probability of exercising the option. However, if the market is capable of effectively capturing the cash flow uncertainties, I do not expect the market to drastically undervalue British firms. Therefore, if the level of undervaluation does not change after the Brexit, the market reaction to a share repurchase announcement should decline after the Brexit. Hence, I expect the following to be true:

H_5 : The market reaction to a share repurchase announcement decreased after the Brexit.

Even if the option value of these share repurchase announcements did not change on the aggregate, this does not mean that the market treats the announcements of different types of firms equally. My main expectation is that Brexit will have an impact on the total output of British firms, that this will affect their growth opportunities and that this will cause firms to change their payout policy. Therefore, I argue that if this change is true on the aggregate, differences in growth opportunities between firms should also result in differences in payout policy between firms.

When viewing share repurchase announcements as options, creating an extra option should, in theory, create extra value. However, as part of a share repurchase announcement is a signaling of undervaluation, this might dissolve part of the informational asymmetries present. Brockman and Chung (Brockman & Chung, 2001) for example, found a negative relationship between the number of share repurchase announcements and the manager's ability to time the market. In accordance with these findings, Jagannathan and Stephens (2003) found that firms which infrequently announce a share repurchase systematically get a better market reaction than firms which do so frequently.

Moreover, Mishra et al. (2011) report that the market reaction to an announcement is positively related to the level of credibility that a firm has. Firms that have completed share repurchases in the past are more likely to complete share repurchases in the future and therefore the market often rewards these firms when they announce. Furthermore, Billet and Xue (2007) find that the size of a firm is inversely related to share repurchase activity. The explanation for this relationship is the fact that smaller firms typically have larger informational asymmetries than big firms and are therefore more prone to greater levels of undervaluation. Lastly, managers that want to repurchase shares need cash to do so. Therefore, more profitable firms have more cash at their disposable and are probably more likely to do a share repurchase.

So, the likelihood of completion of a share repurchase thus appears to depend on several factors. If these factors do have a significant impact on the likelihood of completion, that should in theory mean that the option value changes with changes in these factors. Therefore, I argue the following:

H_6 : Characteristics that determine the likelihood of a share repurchase should also determine the market's reaction to a share repurchase announcement.

In the next section I discuss the data collection process and how this data will be analysed as to test my six hypotheses.

3 Data and methodology

This section discusses how the data was collected and how meaningful variables were created. Furthermore, it explains how the sample will be analysed using logistic and OLS regression. Finally, I will show descriptive statistics of my variables of interest.

3.1 Sample construction

In order to control for global differences in payout policy, I have to compare the changes in British payout policy with the changes in payout policy of another country. Since I am interested in the effect of the uncertainties created by the Brexit on payout policy, it is important that the levels of uncertainty are different from that of the control country. One would argue that not just Britain, but other countries in Europe, like France, would be affected by the uncertainties caused by the Brexit. Whereas the United States is most likely a great deal less affected by the consequences of the Brexit. When plotting the EPU for these three countries, the following figure is produced:

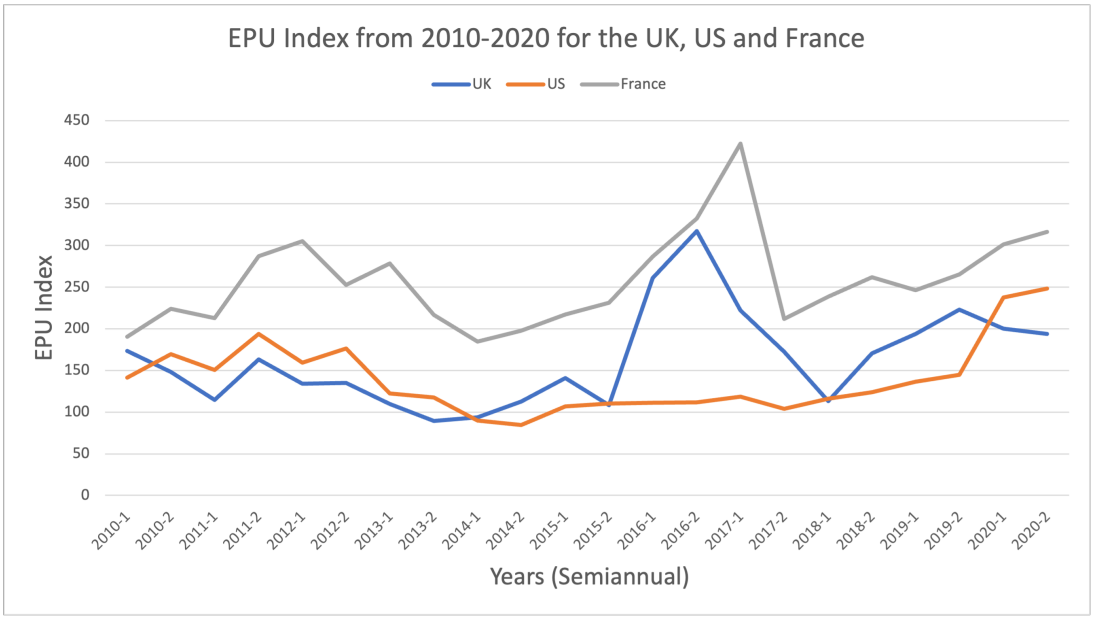

Figure 1: **EPU Index**

This figures shows the EPU index for the United States, France and the United Kingdom. The data is retrieved from `www.policyuncertainty.com` and was generated through the method as suggested by Baker et al. (2016).

When looking at the pattern of the three EPU indices, the French and British indices to a great extent move together, whereas the American index seems to have a life of its own. The biggest spike in EPU is in 2016, when the Brexit vote unexpectedly turned out the way it did. Whereas EPU is not the only type of uncertainty that I am interested in, the results of figure 1 point to the conclusion that the Brexit has little effect on the American market. Therefore, if a relationship between uncertainty and payout policy exists, then comparing the changes in payout policy between France and the UK would not be so telling. Whereas comparing the British changes with American changes in payout policy could be informative about the potential effect of uncertainty on payout policy. So, the US would be the better benchmark to compare changes in British payout policy with.

In order to test the effect of uncertainty on dividend policy, I collect data on dividend payout. Since I am interested in the effects of dividend policy on the British market as a whole, I create a sample that consists of a great number of British firms. From Datastream I obtain Worldscope constituent lists of both the UK (WSCOPEUK:5846 British firms) and the US (WSUS1:999 American firms). For these lists I retrieve data on dividends paid (WC04551) and net income (WC01751)

In order to test the influence of uncertainty on share repurchase decisions, I collect data on share repurchase announcements from SDC. I do so by selecting all announcements that were made between January 2010 and March 2021 by American and British firms. A total of 6886 announcements were returned, of which just 190 were British. For these 190 British share repurchase announcements, I am interested in finding their corresponding market reactions. By collecting share price data around these announcement of the relevant firms I am capable of calculating the market reaction to these announcement.

In the next section I discuss how variables are constructed from this sample and subsequently I explain the methods used to analyse theses variables.

3.2 Methodology and variables

In this section I discuss the variables of interest, how they are created and how they can be used to test my hypotheses.

3.2.1 Market reaction

I calculate the market's reaction to the share repurchase announcement by using event study methodology. To calculate the abnormal returns, one must first calculate the expected returns. One way of calculating the expected returns is through the market model. In case of British firms, this means finding out how they related to the British market. Therefore the returns of the FTSE 100 (main British index) are retrieved. By using these returns in combination with the other British firms, I try to find out how a stock co-varies with the market in the estimation window (110 to 11 days before the announcement). When knowing how a firm typically moves with the market, a possible deviation can be observed in the evaluation period (10 days before to 10 days after the announcement). This deviation from the expected returns is known as the abnormal returns and is described by the following equation:

$$MMAR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt}) \tag{1}$$

Where i indicates the company and t the date. α_i resembles the constant average daily return and βi shows how the company's returns move with the market return, R_{mt}.

Fundamental to the event study is the efficient market hypothesis. If the market is fully efficient, the market would immediately incorporate the information present in the share repurchase. However, as the market might not always be perfectly efficient, it may process some of the information in expectation of the repurchase announcement and some information only several days after the announcement. Therefore, it might be interesting to find out the size of the abnormal returns around the announcement date. One way of doing so is by adding them as to create cumulative abnormal returns, which is done in the following way:

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t=t_2} MMAR_{it} \tag{2}$$

Where t_1 is the start of the interval and t_2 is the end of the interval. In case of a three day interval, one could assume the following values $t_1 = -1$ and $t_2 = 1$. The abnormal returns are then summed over this interval, yielding CAR[-1,1]. In determining my event horizons of choice, I follow Kothari and Warner (2007), who suggest the usage of short and symmetrical event windows as they are the most reliable and trouble free. According to Oler et al. (2007), the most common event window is 5 days [-2,2], which I will use in my baseline model. In order to check how fast the market incorporates the relevant information into the share price I will use an event-day, 7-day and a 21-day CAR interval in my analyses.

In the next section I will discuss the variables that determine the likelihood of completion and therefore the height of the market's response.

3.2.2 Variables of completion

In order to test my final hypothesis, I need to establish whether characteristics that determine share repurchase completion also determine the height of the market's reaction to an announcement. On the aggregate, the expectation is that Brexit will negatively affect the growth opportunities of British firms. However, this decline in growth opportunities is unlikely to be evenly distributed over firms which have unevenly distributed growth opportunities. Firms in innovative industries for example, spend a lot on research and development as to create new products or services. R&D expenditures of the pharmaceutical industry for instance, are ten times the size of those in the oil and gas industry (European Commission, 2013). Since growth opportunities are hard to quantify for a large dataset, it is more convenient to use proxies. As a backward-looking estimate for growth opportunities, I create a variable *R&D* that shows one if a firms spend money on R&D in the past three years. Besides, several papers (Kogan & Papanikolaou, 2014) (Barth & Kasznik, 1999) report a positive relationship between future growth opportunities and the Market-to-Book ratio. Therefore, the *M/B* will also be computed for the firms in this sample as to create a forward-looking estimate of growth opportunities. The alternative interpretation, as Ikenberry et al. (1995) suggest is that the *M/B* is an adequate proxy for undervaluation. Both interpretations will be relevant for later analyses.

The next variable I include is the Economic Policy Uncertainty (EPU) as calculated for Britain. Both Attig et al. (2021) and Baker et al. (2020) conclude that firms payout more dividends during high dividends when *EPU* is high. Moreover, Pirgaip and Dinçergök (2019) find a negative relationship between share repurchase completion and EPU. Since EPU is likely to be related to the mechanisms of a share repurchase, it is important that I include it into egression analysis. I do so by collecting monthly data on British EPU from `www.policyuncertainty.com`, which makes use of the EPU methodology as suggested by Baker et al. (2016). I append the EPU values to my share repurchases dataset by extracting the month and year of every announcement and matching it to the right EPU value.

As suggested by Billet and Xue (2007), I will also consider the possible effect of firm size on share repurchase completion and the market's reaction to the announcement. I will proxy for firm size by running regressions with the natural logarithm of *Total Assets*. Following Jagannathan and Stephens (2003) I create *Multiple*, indicating whether a firm made more than one share repurchase announcement. By using this measure and the work of Mishra et al. (2011), I create *Credible*, which shows whether a firm's previous announcement was completed or not. Lastly, as Christaria and Kurnia (2016) suggest, I proxy for the level of profitability by the return on assets (*ROA*).

The descriptions of all relevant variables are shown in the following table:

Table 1: **Variable description**

This table shows the variables of interest in my analyses. The table consists of the variable's name, what it entails, its source and its unit. The data is mostly retrieved from SDC, Datastream and `www.policyuncertainty.com`. I apply a logarithmic transformation to *Total Assets*.

Name	Definition	Source	Unit
Brexit	One if the announcement date is after 23-6-2016	SDC	Binary
CARs	Cumulative Abnormal Returns over several event windows	Datastream	Unit
Completed	One if the repurchase has been completed and zero otherwise	SDC	Binary
Credible	One if the firm's previous announcements has been completed	SDC	Binary
Deal Value	The value of the repurchased shares in dollars	SDC	Millions
EPU	Economic Policy Uncertainty Index	(S. R. Baker et al., 2016)	Ratio
Industry	The macro industry that a firm is in	SDC	Categorical
M/B	Market capitalisation over the book value of a firm	SDC	Ratio
Month	Month in which an announcement was made	SDC	Date
Multiple	One if the firm announced more than one share repurchase during the sample period (2010-2021)	SDC	Binary
R&D	One if a firms spend money on R&D in the past three years	SDC	Binary
Status	One if a share repurchase has been completed	SDC	Binary
Total Assets	Total assets of a firm (log)	SDC	Millions
Year	Year in which an announcement was made	SDC	Date

3.2.3 Regression analysis

In order to determine what company characteristics determine the likelihood of completion, I make use of a logistic regression. A logistic regression can be used estimate the relationship between a dichotomous variable, in this case, whether share repurchase will get completed or not, and a set of independent variables. The coefficient estimates for the predicting variables are based on the change in odds of completion that follow from a unit change in the predictor variables (Field, 2009).

The basic form for a logistic regression is described by the following equation:

$$Log(\frac{Y}{1-Y}) = \beta_0 + \beta_1 X_1 ... + \beta_n X_n + \epsilon \tag{3}$$

Where $Log(\frac{Y}{1-Y})$ denotes the likelihood of completion. Where $\beta_1 ... \beta_n$ denote the coefficient estimates of variables $X_1 ... X_n$ and ϵ is the model's error term. I will create three types different models. The first

model that I estimate will be a simple logistic regression:

$$Log(\frac{Y_i}{1-Y_i}) = \beta_0 + \beta_1 ROA_i + \beta_2 Multiple_i + \beta_3 M/B_i + \beta_4 log(TotalAssets)_i + \beta_5 Credible_i + \beta_6 R\&D_i + \beta_7 EPU_i + \epsilon_i \tag{4}$$

As share repurchases announcements in the final years of the sample might still get completed in the years to come, I also estimate a logistic regression using year-fixed effects:

$$Log(\frac{Y_i}{1-Y_i}) = \beta_1 ROA_i + \beta_2 Multiple_i + \beta_3 M/B_i + \beta_4 log(TotalAssets)_i + \beta_5 Credible_i + \beta_6 R\&D_i + \beta_7 EPU_i + Year - FixedEffects + \epsilon_i \tag{5}$$

Besides year-fixed effects, there could be industry-fixed effects that determine the likelihood of completion, therefore I also estimate a model with year fixed effects and industry fixed effects:

$$Log(\frac{Y_i}{1-Y_i}) = \beta_1 ROA_i + \beta_2 Multiple_i + \beta_3 M/B_i + \beta_4 log(TotalAssets)_i + \beta_5 Credible_i + \beta_6 R\&D_i + \beta_7 EPU_i + Year - FixedEffects + Industry - FixedEffects + \epsilon \tag{6}$$

For my second type of model, I am interested in finding out what characteristics determine the market's reaction to an announcement. The basic model is that of OLS regression, which produces an equation of the following form:

$$Y_i = \beta_0 + \beta_1 X_1 ... + \beta_n X_n + \epsilon_i \tag{7}$$

Where Y_i denotes the market's reaction in terms of CARs. β_0 is the intercept and $\beta_1 ... \beta_n$ are the slopes for variables $X_1 ... X_n$. I will further specify this equation using a baseline model that uses the 5-day CAR as its dependent variable. In order to correctly specify the model, I will run several tests.

The first test being a Hausman test, which tests a random effects (RE) model against a fixed effects (FE) model and can be used to detect endogeneity, if present in the model. Performing a Hausman test on the two models resulted in $\chi^2 = 2.766$ and $p = 0.8376$, meaning that there is no correlation between individual error terms and the independent variables, therefore a RE model is preferred.

Next, I test a RE model against a pooled OLS regression using the Breusch-Pagan Langrange Multiplier test (Leppert, 2021). The test returns $\chi^2 = 0.78507$ and $p = 0.3756$, meaning that the null hypothesis of no variance across firms can not be rejected. Therefore pooled OLS regression is preferred over a RE model.

One important assumption of OLS regression is that of homoscedacity, meaning that all variables have an equal and finite variance. In case of heteroscedacity, the estimated standard errors will be wrong and OLS regression will not be the best possible model. In order to test for heteroscedacity, I perform a Breusch-Pagan test, the null-hypothesis of which is that of homoscedacity. The test returns $BP = 528.94$ with a $p < 2.2e-16$, meaning that the null hypothesis of homoscedacity can be rejected and that I will have to use robust standard errors.

Finally, I test for serial correlation in the final model using the Breusch-Godfrey/Wooldridge test (Leppert, 2021). This null-hypothesis of this test is no serial-correlation, in case it is violated, the standard errors will be under-estimated. The test returns a $\chi^2 = 2.502$ and $p = 0.1124$, meaning that the null hypothesis can not be rejected and no significant serial correlation is present in the model.

In order for OLS regression to function optimally, it is important to deal with extreme values. Outliers have to be taken care off because even a single outlier can cause a coefficient estimate to change sign or magnitude (Choi et al., 2009). One way in which outliers can be dealt with is through winsorization. With winsorization, a small part of both tails of the distribution can be cut off. One way of doing so is by using the quartile values. A quartile is a fourth of the data and is used to sort a variable based on its value. Where the first quartile consists of the lowest values and the fourth quartile consists of the highest values. One way of using these quartiles is by setting an upper and a lower benchmark. As suggest by Damioli (2018), the upper benchmark is set by $Q3 + 1.5IQR$ and the lower benchmark is set by $Q1 - 1.5IQR$. Where Q1 is the value of the border between the first two quartiles and Q3 is the value of the border between the last two quartiles. IQR stands for inter quartile range and is defined as $Q3 - Q1$. Any value that exceeds the benchmark is replaced by the benchmark. By reducing these outliers to slightly less extreme values, the variables become better suited for OLS regression.

As the results of the regression analysis might be dependent on the length of the CAR interval chosen, I will run models on several different CAR lengths, the model specifications are given by the following equations:

$$\begin{aligned} CAR(Event-Day)_i = \beta_0 + \beta_1 Brexit_i + \beta_2 ROA_i + \beta_3 Multiple_i + \beta_4 M/B_i + \\ \beta_5 log(TotalAssets)_i + \beta_6 Credible_i + \beta_7 R\&D_i + \beta_8 EPU_i + \epsilon_i \end{aligned} \tag{8}$$

$$\begin{aligned} CAR(5-days)_i = \beta_0 + \beta_1 Brexit_i + \beta_2 ROA_i + \beta_3 Multiple_i + \beta_4 M/B_i + \\ \beta_5 log(TotalAssets)_i + \beta_6 Credible_i + \beta_7 R\&D_i + \beta_8 EPU_i + \epsilon_i \end{aligned} \tag{9}$$

$$\begin{aligned} CAR(7-days)_i = \beta_0 + \beta_1 Brexit_i + \beta_2 ROA_i + \beta_3 Multiple_i + \beta_4 M/B_i + \\ \beta_5 log(TotalAssets)_i + \beta_6 Credible_i + \beta_7 R\&D_i + \beta_8 EPU_i + \epsilon_i \end{aligned} \tag{10}$$

$$\begin{aligned} CAR(21-days)_i = \beta_0 + \beta_1 Brexit_i + \beta_2 ROA_i + \beta_3 Multiple_i + \beta_4 M/B_i + \\ \beta_5 log(TotalAssets)_i + \beta_6 Credible_i + \beta_7 R\&D_i + \beta_8 EPU_i + \epsilon_i \end{aligned} \tag{11}$$

Where all CAR intervals are symmetrical around the event date and CAR(Event-Day) represents the abnormal returns on the day of the share repurchase announcement. In the following section I discuss some descriptive statistics of the variables used in these models.

3.3 Descriptive statistics

Table 2 shows the descriptive statistics of the variables used in the regression analyses as shown in section 3.2.3. The final sample consists of 177 British share repurchase announcements between January 2010 and March 2021. The descriptive statistics are shown in the following table:

Table 2: **Descriptive Statistics**

This table shows the descriptive statistics of the variables (after winsorization) used for my analysis of the market reaction to share repurchase announcements. These statistics represent data of 177 British share repurchase announcements between January 2010 and March 2021 as retrieved from SDC.

	1st Quartile	Median	Mean	3rd Quartile	Standard Deviation
Brexit	0	0	0.571	1	0.496
CAR (1-day)	-0.004	0.006	0.01	0.034	0.023
CAR (5-day)	-0.006	0.018	0.021	0.051	0.046
CAR (7-day)	-0.012	0.015	0.021	0.053	0.052
CAR (21-day)	-0.023	0.026	0.027	0.078	0.080
Completed	0	0	0.153	0	0.361
Credible	0	0	0.028	0	0.166
EPU	121.591	149.806	173.321	196.959	82.851
M/B	0.83	1.472	2.346	3.318	2.061
Multiple	0	0	0.472	1	0.473
R&D	0	0	0.294	1	0.443
ROA	1.425	4.076	4.270	7.054	6.250
TotalAssets	172.387	1373.344	8015.989	12701.961	12132.88

More than half of the firms in the sample announced a share repurchase after the Brexit vote. Only 15% of share repurchase announcements were actually completed. Less than a third of the firms that announced a share repurchase invested in *R&D* in the past three years. Whereas nearly half of the firms issued equity before their announcement. A similar number of firms announced a share repurchase more than once in the sample. The value of 0.028 for *Credible* shows that it is very rare for firms to have completed a share repurchase prior to their announcement. The values for *TotalAssets* have a large standard deviation, even after winsorization, which is why a logarithmic transformation will be applied to them in the final analysis.

In general, the market reaction to a share repurchase announcement appears to be positive. Increasing in size and standard deviation when the interval increases. In the following section I will analyse the degree to which the variation in market reaction is determined by company characteristics.

4 Results

In this section the results will be discussed. The results section will be structured along the lines of the three sub-questions. Therefore I will first determine the influence of Brexit on dividend policy by testing H_1 and H_2. Secondly, I will discuss the effect of the Brexit-induced uncertainties through testing H_3

and H_4. Finally, I will use the results from the regression analyses to test the final two hypotheses (H_5 and H_6) and thereby determining the impact of uncertainty on the market reaction to share repurchase announcements.

4.1 The influence of Brexit on dividend policy

In order to find out whether Brexit-induced uncertainties had an effect on dividend policy, the uncertainties first have to be quantified. One way in which these uncertainties can be quantified is through the EPU index. As leaving the European Union would also have an effect on the EPU of its members, as can be seen in figure 1, I choose the United States as baseline country. Until the last quarter of 2015 the EPU index for both nations seem to follow similar trends. From the last quarter of 2015 onward, the British EPU index rapidly increases, whereas the American EPU remained rather stable. The sudden increase from this point in time onward is probably related to the European Union Referendum Act in December 2015, which resulted in the Brexit vote in June 2016. During Donald Trump's presidency the American EPU remained at a rather constant level, only to spike during the presidential election in November 2020. Having established the effects of Brexit on the EPU, the next step is to find out how these uncertainties are related to dividend policy.

By using this knowledge on the difference in EPU, I will test my first hypothesis:

H_1 : Because of the Brexit-induced uncertainties the number of firms that issued dividends decreased.

In order to test this hypothesis, I collect data on dividends paid for constituent lists of British firms (WSCOPEUK) and American firms (WSUS1). When plotting the number of companies that paid dividends between 2012 and 2020, I obtain the following figure:

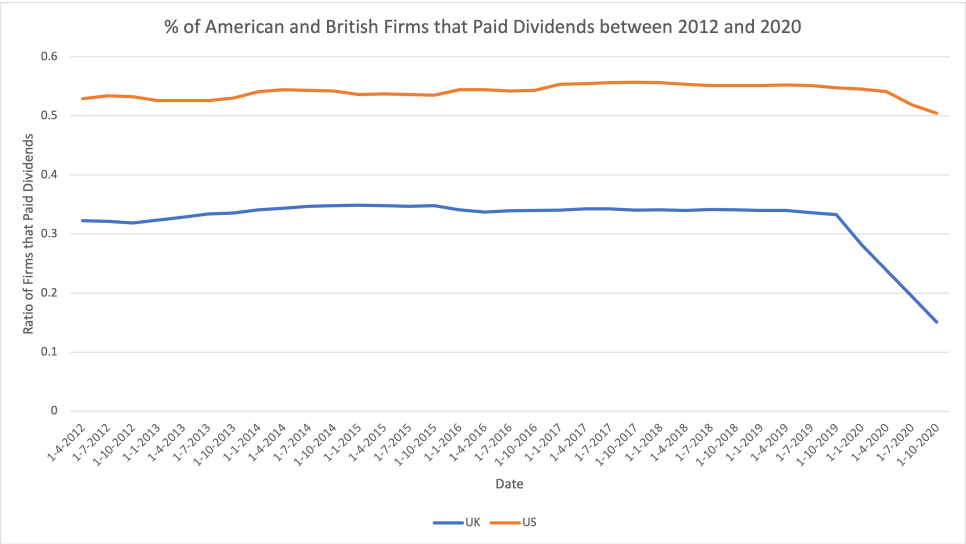

Figure 2: **Percentage of firms that paid dividends over time**
This figure shows the ratio of American and British firms that paid dividends between 2012 and 2020. The data was collected using the WSUS1 and WSCOPEUK constituent lists in Datastream.

This graph shows that firms initially did not alter their dividend policy, even though the EPU for Britain

was very high. For which there are two reasons. Firstly, even though the EPU was very high, it was not clear whether Brexit would actually get done, especially during the period of Theresa May. The percentage of British firms that paid dividends remained incredibly stable from the Brexit vote until 1-10-2019. It was only when the final deal was signed on the 24^{th} of January 2020, that the true ramification became clear. Secondly, as most managers are reluctant to cut dividends, let alone completely stopping to pay them, a little bit of uncertainty should not be able to influence dividend policy that much. As long as no deal was made, managers probably thought that cutting dividends was unnecessary.

When zooming in on this transition from no-deal to deal by taking data from the four quarters of both 2019 and 2020, the following numbers were obtained:

Table 3: **Dividend Paying Firms**

This table shows the number of British and American firms that did and did not pay dividends in 2019 and 2020. This table was produced using the WSUS1 and WSCOPEUK constituent lists from Datastream.

Group	Number of Dividend Paying Firms	Number of Non-Dividend Paying firms
UK:2019	954	1874
UK:2020	612	2216
US:2019	471	385
US:2020	445	411

For both countries, a decrease in 2020 with respect to 2019 can be observed. Part of the reason why this might have happened is due to the COVID-19 pandemic. In order to test whether the differences between these years is statistically significant, I have computed a Chi-Square test for both changes. The results of the first Chi-Square Test are $\chi^2(1, N = 2828) = 103.287, p < 0.00001$, which means that this change in the number of British dividend paying firms is highly significant. The results of the second Chi-Square Test are $\chi^2(1, N = 856) = 1.5872, p = 0.208$, which is not significant at 5%. This shows that even though the COVID-19 pandemic might have caused some firms to stop paying dividends, the Brexit most likely had a far larger impact.

To sum up, British firms as a whole were not affected in their choice to pay out dividends until at least the end of 2019. Only when the deal was signed and the ramifications became clear, a great number of firms stopped paying dividends. Therefore, I argue that H_1 is most likely true.

Next, I want to discuss and test my second hypothesis:

H_2 : The firms that continued to issue dividends in face of this increase in uncertainty choose to increase their dividend payments.

In order to test this hypothesis, I want to see how dividends paid and the dividend payout ratio of British firms developed in the years following the Brexit vote relative to American firms. In the following figure, I will show how the average dividends paid developed from 2014-2020:

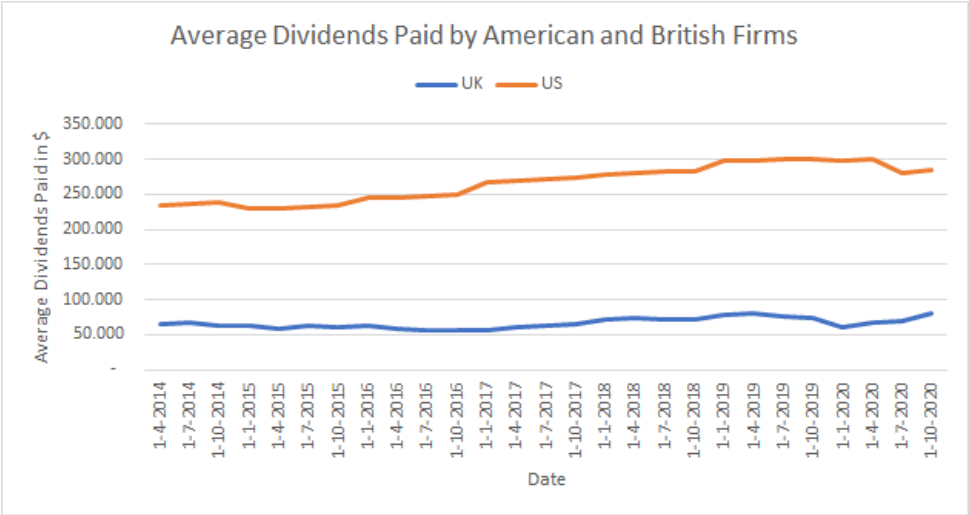

Figure 3: **Average dividends paid**

This figure shows the average dividends paid by the constituents of the Worldscope constituent lists for both the UK and the USA from 2014-2020. The average amounts are denoted in dollars.

Whereas the average American dividends paid increased steadily over time and only saw a small decrease as a result of the pandemic, the British dividends paid had a more volatile path. While the average dividends paid remained rather stable till quite some time after the Brexit, they slightly increased until 2019 and decreased again until the deal was signed. From January 2020 onward an increase in average dividends paid can be observed. However, none of these results seem to point to the conclusion that corporate Britain was shocked.

Perhaps, more interesting answers can be found when looking at the the change in the dividend payout ratio (Dividends / Net Income). The development of the DPR from 2014-2020 is given by the following figure:

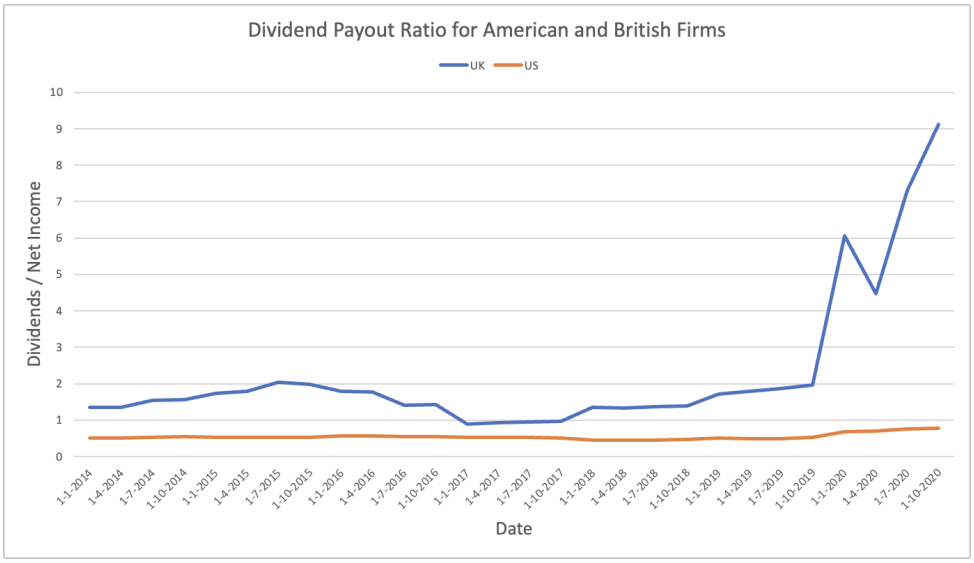

Figure 4: **Dividend payout ratio**

This figure shows the dividend payout ratio as calculated by dividing total dividends paid over total net income for British (WSCOPEUK) and American (WSUS1) firms from 2014-2020.

The results of this figure seem to be rather more convincing than those of the previous figure. For the US, the DPR remained rather constant until 2020, indicating that dividends mostly grew with net income. The British DPR fluctuated between one and two of the period up until the end of 2019. From the start of 2020 onward, a sharp rise from 2 to 9 can be noted, which is a 350% increase. When performing a two sample t-test between the British DPR before and after leaving the EU, a p-value of 0.013 is returned, indicating that the null hypothesis of Brexit having no effect on dividend payout can be rejected at a 5% confidence level. So, the development of average dividends paid does not seem to be determined by the EPU measure, alternatively the signing of the Brexit deal is what seemed to have sparked changes in the dividend policies. When the ramifications of the Brexit became clearer as a result of the deal being signed, British firms that still decided to pay dividends even increased their dividend payout.

When going over the results relating to dividend policy in response to the Brexit, I have come to several conclusions. In the first place, that managers in general aim for a stable dividend policy. Even when EPU went to the roof around the Brexit vote, neither the number of dividend paying firms nor the average amount paid really changed. In the second place, with the deal being signed in early 2020, real change starts to happen. The number of firms paying dividends decreases, whereas the average amount paid and the DPR increased. From which I conclude that managers mostly respond to immediate threats to a firm's business model. In which case they either choose to stop paying dividends as to make sure they will survive, or choose to pay out more dividends to signal to the market that they will survive in the aftermath of the Brexit.

In the next section I will discuss to what extent the Brexit-induced uncertainties affected share repurchases decisions.

4.2 The influence of Brexit on share repurchase decisions

In order to determine the effect of Brexit on share repurchase decisions, I am interested in three things. In the first place, the change in the number of share repurchase announcements before and after the Brexit. Secondly, I am interested in both the number of firms that actually bought back shares. Thirdly, of the size of repurchased volume of those firms that repurchased. By considering these three aspects, I will answer the following question:

SQ$_2$: What was the effect of Brexit-induced on share repurchase decisions?

The starting point is to see whether the number of share repurchase announcements changed over time. My expectation is:

H_3 : British firms announced more share repurchases after the Brexit than before

I will test this hypothesis by using the share repurchase announcements data from SDC. Using data from the US and the UK, the following figure is returned:

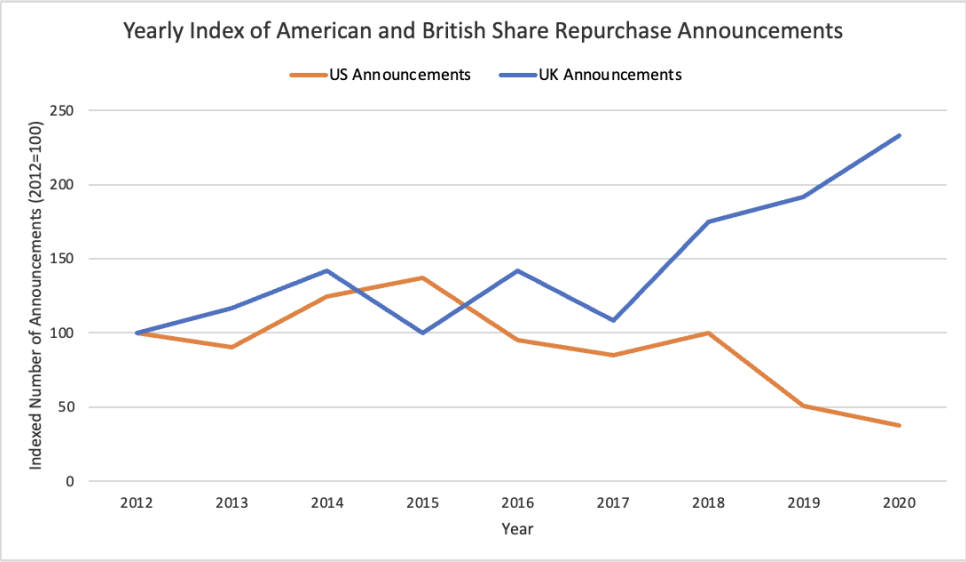

Figure 5: **Number of share repurchase announcements**
This figure shows how the number of share repurchase announcements changed between 2012 and 2020. The values are indexed to 2012 as the number of American announcements is far larger than the number of British announcements. In 2012, there were 12 British announcements and a total of 619 announcements American announcements.

From 2012 to 2018, the change in the number of yearly share repurchase announcements is rather similar for the American and British market. However, from 2018 onward, the two lines diverge. Whereas the number of American share repurchase announcements were less than half of its baseline level in 2012, the British number of share repurchase announcements more than doubled relative to its baseline level. Performing a two-sample t-test of the last two years against the rest of the years returns $p = 0.006$, implying that this increase in share repurchase announcements is statistically significant.

My next expectation is that:

H_4 : British firms bought back less shares after the Brexit than before

Firstly, I will show the yearly change in share repurchase completion ratio, defined as the number of completed share repurchases over the total number of announcements. Secondly, I will over the change in repurchased volume of these years. The share repurchase completion ratio is given by the following figure:

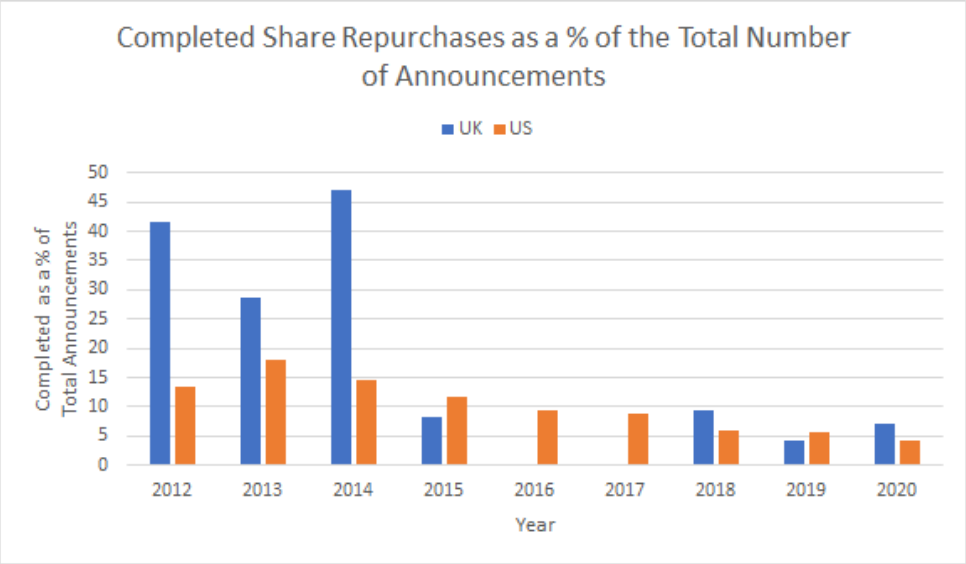

Figure 6: **Completed share repurchases**
This figure shows the completed share repurchases as a % of the total number of announcements made in each year from 2012-2020. This graph makes use of data retrieved from SDC. The number of completed share repurchases in 2012 is 84 for the US and 5 for the UK.

The first thing to be noticed from this figure is that the percentage of completed share repurchases is larger before the Brexit than after the Brexit and moreover, that the completion ratio of British share repurchases is vastly greater than its American counterparts. Part of the reason why this difference exists, is the fact that some share repurchase that are announced after the Brexit might still be completed. However, some part might also have to do with the circumstances created by the Brexit.

In order to put this result into some perspective, I will also show how the repurchased volume changes over this same period. The change of the repurchased amount is shown by the following figure:

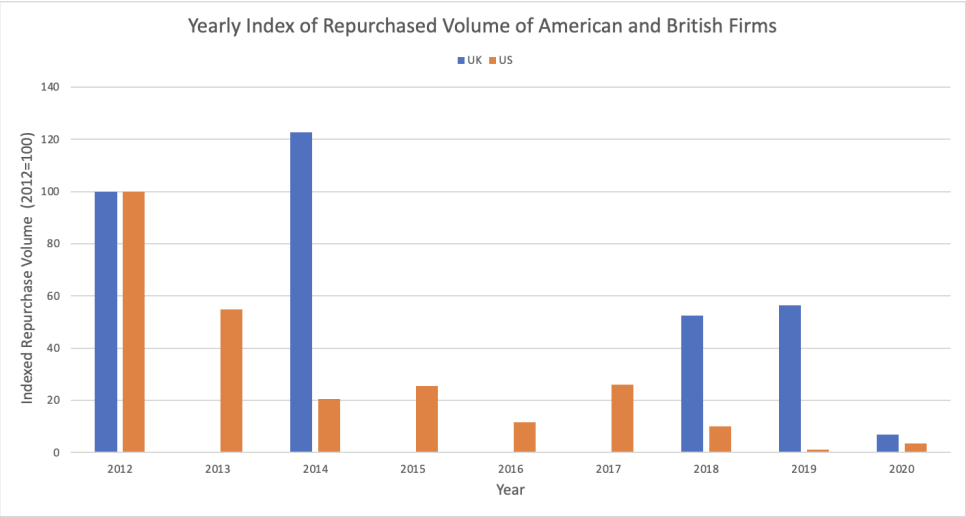

Figure 7: **Indexed volume of share repurchases**

This figure shows the index of the repurchased volume of both American and British firms. The repurchased volume of the base year (2012) is $1.1 billion for British firms and $278 billion for American firms

Whereas the percentage of completed share repurchase announcements was 39% on average for 2012-2014, it was just 7% in 2018-2020. Contrasted to the value of the index that dropped from 74 to 39 between these two period, which is less than halved. Therefore, it seems to be the the case that the number of completed share repurchases dropped sharply, meaning that the volume per share repurchase must have also doubled over the same period. This finding coincides with the hypotheses related to dividend policy, which suggested that less firms would pay dividends, but those that continued to pay dividends increased their payout.

In order to test whether the British change in the number of share repurchase announcements is statistically different from the American change, I will perform a difference-in-difference analysis. In a difference-in-difference analysis, the goal is to find out whether a treatment has an effect (Schwerdt & Woessmann, 2020). In this case, does the Brexit have an effect on the likelihood of a share repurchases getting completed? Setting this up experimentally means finding out the effect of the country, the period and the combination of the two. The results of the difference in difference analysis are shown in the following table:

Table 4: **Difference-in-Difference Analysis**

This table shows the results of the difference-in-difference analysis. British equals one for all completed British share repurchases. Brexit equals one if the announcement was made after the Brexit vote (June 23 2016). The interaction effect equals 1 if an announcement is made by a British firm after the Brexit.

	Dependent variable:
	completed
Britain	1.043^{***}
	(0.280)
Brexit	-0.764^{***}
	(0.102)
Britain:Brexit	-1.192^{**}
	(0.513)
Constant	-1.860^{***}
	(0.052)
Observations	5,461
Log Likelihood	−1,849.359
Akaike Inf. Crit.	3,706.717
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 4 shows the results of the difference-in-difference analysis. The statistically significant (1%) and positive coefficient estimate for *Britain* indicates that British firms are more likely to complete a share repurchase than American firms. Furthermore, the statistically significant (1%) and negative estimate for *Brexit* shows that share repurchases are less likely to be completed after the Brexit than before. This finding mainly captures the effect of the time frame of the sample period, as some recent announcements announcements might get completed in the years to come. The statistically significant (5%) and negative coefficient estimate for the interaction effect indicates that especially British firms are highly unlikely to complete a share repurchase after the Brexit. This evidence supports the notion that British firms mainly announced a share repurchase as to create an option and not as an intent to actually repurchase shares.

To conclude, more share repurchase announcements were made after the Brexit. A smaller share of these repurchases were completed after the Brexit and this difference may in part follow from the sample period. On average, the repurchased volume per share repurchase doubled, but this might be due to the

large variation in firm size. In the next section I analyse the effect of uncertainty on the market's reaction to share repurchase announcements.

4.3 The influence of Brexit on the market's reaction to share repurchase announcements

In this section I try to establish the influence that Brexit-induced uncertainties had on the market reaction to share repurchase announcements. Thereby, I will answer the following question:

SQ_3 : What is the influence of Brexit-induced uncertainties on the market's reaction to share repurchase?

I argue that if the M/B stays stable and the probability of an actual share repurchase decreases, then the option value of a share repurchase announcement must decrease. Therefore, I expect the following to be true :

H_5 : The market reaction to a share repurchase announcement did not change after the Brexit vote.

I first show the changes in the M/B and the probability of a share repurchase announcement. Then I display the market reaction before and after the Brexit. Following the paper by Ikenberry et al. (1995), the M/B is a possible proxy for undervaluation. If undervaluation increased after the Brexit, this should ceteris paribus increase the probability of share repurchase completion as the share repurchase is a greater bargain. In the following figure I show the density plot of the M/B before and after the Brexit:

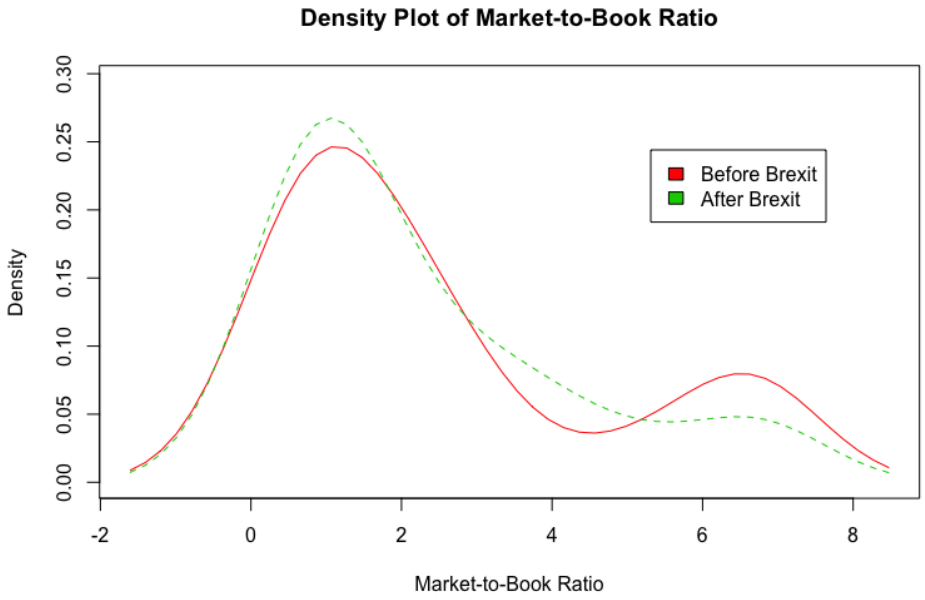

Figure 8: **M/B distribution before and after the Brexit**

This graph shows the M/B distribution before and after the Brexit. This figure uses the values of the M/B for 177 British share repurchase announcements from SDC.

The maximum of both density plots lies around a M/B of 1, whereas the peak is slightly higher after the Brexit than before, there do appear to be large differences between the two distributions. In order to test whether the distribution of the M/B after the Brexit is statistically different from the distribution before the Brexit, I perform a Cramér-von Mises test. This test is like the two-sample t-test, but does not require a normal distribution, which seems to be necessary in this case. The observed statistic is 0.872, resulting in a p-value of 0.411, from which can be concluded that the two distribution are not statistically different. Therefore, it is unlikely that the level of undervaluation increased after the Brexit vote and more likely that it remained stable after the Brexit vote.

As shown by the difference-in-difference analysis (see table 4 and figure 6), firms are less likely to repurchase share after the Brexit. However, this might be the result of how recent this sample is. The statistically significant (at 5%) and negative interaction effect does provide evidence that British firms in particular, were rather unlikely to complete a share repurchase after the Brexit. These findings show that, when viewing share repurchase announcements as options, they should have less value after the Brexit.

In order to see whether these changes in option value had an impact on the market reaction, I am interested in the difference in market reaction to share repurchase announcements before and after the Brexit. To grasp the global differences in market reaction over the years surrounding the Brexit, I plot the distribution of the 5-day CARs over the period 2012-2020:

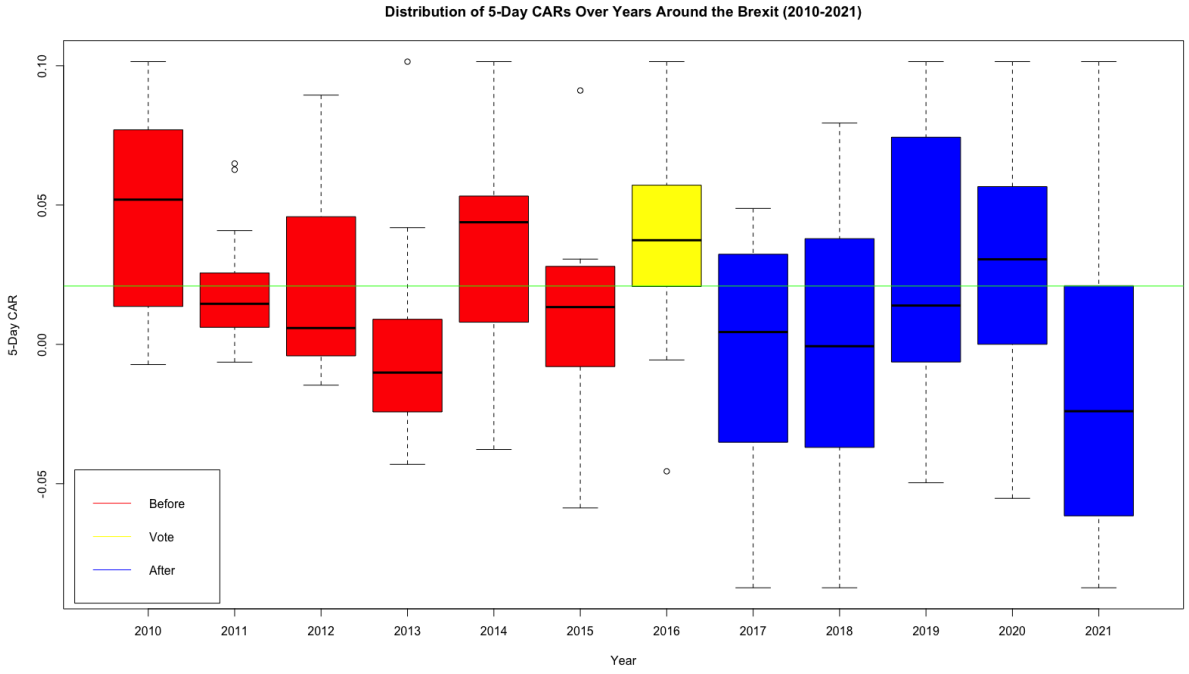

Figure 9: **Distribution of the 5-day CAR from 2010-2021**

This figure shows the distributions of the 5-day CARs for the years surrounding the Brexit. Where the 2010-2015 is the before the vote period, 2016 is the voting year and 2017 to March 2021 is the period after the Brexit vote.

The average 5-day cumulative abnormal returns are around 2.1% and are represented by the horizontal green line. Interpreting the height of the CARs relative to the years might give an indication as to the way in which in the Brexit-process effected the market's reaction. The market reaction to a share repurchase announcement appears to be above average in 2010, 2014, 2016 and 2020 and below average in the other years. When interpreting these results with respect to uncertainty, one could argue that the uncertainties surrounding the Brexit were the highest at the moment of the vote in 2016 and during 2020, when they left the EU. When dividing the data over the period before the Brexit and after the Brexit, the average market reaction before is 2.42%, whereas the average market reaction after is 1.85%. Therefore, the average market reaction is lower after the Brexit, however when performing a Cramér-von Mises test, a p-value of 0.44 is returned. This p-value indicates that the distribution of the market reaction can be assumed to be equal before and after the Brexit. Therefore, it seems plausible that the market reaction to share repurchase announcements decreased after the Brexit, but additional testing may be necessary to confirm this effect.

Following from this and the fact that the average market reaction to a share repurchase announcement of a British firm is positive, one might argue that more Britain firms should announce a share repurchase. However, inspired by the result of Kalay (1981), who find a negative relationship between uncertainty and dividend payout in the cross-section, but do not find the same to hold in a time-series setting, I want to find out what cross-sectional differences might contribute to the height of the market reaction to a share repurchase. As knowing along which lines the market reaction differs across firms can help to decide what firms should announce a share repurchase, if more uncertainty is to come.

From an option's perspective, variables that determine the likelihood of a share repurchase, should also determine the height of the market reaction to its announcement. Hence, I expect the following to be true:

H_6 : Characteristics that determine the likelihood of a share repurchase should also determine the market's reaction to a share repurchase announcement.

As a starting point for testing this idea, I perform several logistic regressions. The following table shows the results for these logistic regressions:

Table 5: **Share repurchase completion**

This table shows the results of three logistic regressions. The dependent variable is *completed*, which is one when a share repurchase has been completed and 0 otherwise. The first model is a simple logistic regression just using the announcement characteristics. The second model uses year-fixed effects and the final model also includes industry-fixed effects. The data used for these logistic regression is the British sample of 177 announcements.

	Models:		
	Simple	Year-Fixed Effects	Industry & Year Fixed Effects
ROA	0.062*	0.082*	0.072
	(0.037)	(0.042)	(0.058)
Multiple	0.515	1.212*	1.355
	(0.606)	(0.697)	(0.890)
M/B	−0.074	0.093	0.167
	(0.123)	(0.151)	(0.260)
log(TotalAssets)	−0.326***	−0.339***	−0.475**
	(0.092)	(0.110)	(0.212)
Credible	−15.079	−13.572	−14.305
	(1,021.273)	(1,281.050)	(1,505.551)
R&D	−0.398	−0.857	−0.248
	(0.573)	(0.672)	(1.230)
EPU	−0.009*	0.005	0.007
	(0.005)	(0.008)	(0.015)
Constant	1.613*		
	(0.893)		
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 5 shows a positive and statistically significant relationship between completion and the return on assets in the first two models. This result indicates that more profitable firms are more likely to complete a share repurchase than less profitable firms. This result was also predicted by theory, as more profitable firms generally have more cash at their disposal to complete a share repurchase. Moreover, a positive relationship was estimated between *Multiple* and the likelihood of completion, but this relationship is only statistically significant at 10% in the Year-Fixed Effects model. Even though this result is not highly statistically significant, this result indicates that it is quite plausible that firms which announce more share repurchases are more likely to repurchase shares.

In all three models, the relationship between *log(TotalAssets)* and the likelihood of completion is negative and statistically significant (at 1%). This result suggests that larger firms are less likely to complete a share repurchase than smaller firms, as predicted by Billet and Xue (2007). Furthermore, the coefficient estimate for *Credible* is very negative and has massive standard errors. When delving into the data, I find that none of the firms which announce a share repurchase after having actually repurchased, will repurchase for a second time. This finding is most likely related to the sample size of 177 announcements and the fact that only 5 announcements are deemed credible by the definition of Mishra et al. (2011).

Finally, in the simple model, the EPU index is negative and statistically significant at 5%. However, the sign is positive in the two other models, which suggest that relatively small levels of confidence can be assigned to this result. Overall, I conclude that profitability and firm size are quite likely to have an impact on the chances of announcement to be completed. However, as only 27 out the 177 share repurchases were completed, the absence of other relationships might just be a result of having a relatively small sample.

Next, I am interested in finding out how these characteristics might influence the market's reaction to a share repurchase announcement. I have captured the market's reaction using four different CAR intervals as the dependent variables of pooled OLS regressions. The results are shown in the following table:

Table 6: **Market reaction to share repurchase announcements**

This table shows the results of pooled OLS regression on four different CAR intervals with robust standard errors. The regression was run on the sample of 177 British share repurchase announcements.

	Models:			
	CAR (Event-day)	CAR (5-days)	CAR (7-days)	CAR (21-days)
Brexit	-0.005^{*}	-0.017^{**}	-0.019^{**}	-0.017^{**}
	(0.003)	(0.008)	(0.008)	(0.007)
ROA	-0.0003	-0.001^{***}	-0.002^{***}	-0.001^{***}
	(0.0003)	(0.0004)	(0.001)	(0.001)
Multiple	-0.004	-0.013	-0.012	-0.013^{*}
	(0.004)	(0.010)	(0.009)	(0.007)
M/B	-0.001	-0.003^{**}	-0.0003	-0.003
	(0.001)	(0.001)	(0.002)	(0.002)
log(TotalAssets)	0.0003	0.0003	-0.001	0.0003
	(0.001)	(0.001)	(0.002)	(0.001)
Credible	-0.013^{***}	-0.006	0.0003	-0.006
	(0.004)	(0.014)	(0.012)	(0.015)
R&D	0.003	-0.004	-0.005	-0.004
	(0.004)	(0.005)	(0.009)	(0.007)
EPU	0.0001^{***}	0.0001^{***}	0.0002^{***}	0.0001^{***}
	(0.00001)	(0.00002)	(0.00002)	(0.00004)
Constant	0.007	0.024^{*}	0.023	0.024^{*}
	(0.005)	(0.013)	(0.018)	(0.014)

Note: *p<0.1; **p<0.05; ***p<0.01

Table 6 shows the results for the four regression models. Whereas figure 9 and the corresponding statistical test showed that the 5-day CARs were not statistically different before and after the Brexit, they are significant in this regression analysis. Meaning that the company characteristics of firms that announced a share repurchase might have changed after the Brexit.

The *ROA*, which is statistically significant and positive in the logistic regression (see table 5), is statistically significant (three out of four models at 1%) and bears a negative coefficient estimate. Meaning that more profitable firms are more likely to complete a share repurchase, but that the market reacts worse to the announcement of a profitable firm than of a less profitable firms. What this suggest is that these types of firms generally have more cash available for completing a share repurchase than less profitable firms. Opportunity costs might be a reason why the market reacts better to firms with lower levels of *ROA*. As firms with higher ROA typically have more profitable projects than firms with lower ROA, therefore a share repurchase of a high ROA firms might implicate more sunk costs.

The coefficient estimate for *Multiple* is negative in all intervals, but only statistically significant at 10% in the CAR (21-days) model. This plausible negative relationship might be because of the fact that the informational content of a single announcement may be a lot higher than the marginal value of the informational content of the second announcement. Related to this result, is the market reaction on the announcement day of the share repurchases of firms that were deemed credible. With a negative coefficient, statistically significant at 5%, indicating that the market recognises whether a firm uses an announcement just as an option and in general does not like firms to perform multiple share repurchases. Performing multiple share repurchases is usually not efficient because of the fact that there are costs associated to setting up a share repurchase program and the fact that the informational content of a second share repurchase is lower. Therefore, I am not surprised to find that the market reacts poorer to these types of announcements.

The *M/B* bears a negative coefficient estimate, which is significant at 5% in the model based on the 5-day CAR. As the M/B can both be seen as proxy for undervaluation and growth opportunities, this result can be interpreted along both lines. Where firms with higher M/B are in general less undervalued than firms with lower M/B, therefore the option value is lower. Alternatively, firms with higher M/B generally have more growth opportunities than low M/B firms and are therefore less well off repurchasing shares than they are when investing in new projects.

The *log(TotalAssets)* is not statistically significant in any models and does not have a consistent sign over the four models. It is surprising to find that firm size appears to be the most important predictor of share repurchase completion, but is deemed irrelevant by investors. This might support the idea that the market is not extremely interested in whether a share repurchase will actually get done, but more in the idea that it is possible if necessary.

Whereas the *R&D* variable is not statistically significant in any of the models, the *EPU* is highly significant (1%) in all of the models. *EPU* appears to be positively related to the market reaction, meaning that in times of greater uncertainty, the market values the announcements better than in more certain times. What this result indicates is that if uncertainty in Britain will increase in the future, for instance when a Scottish referendum is held, that British firms might do their shareholders a favour by

announcing a new share repurchase.

In the next section I summarize my finding and discuss its implications for the future of payout policy.

5 Conclusion

To my knowledge, I am the first to analyse how the uncertainties resulting from Brexit influence the payout policy of British firms. Starting with the effect of these uncertainties on dividend policy, I have several interesting findings. The evidence points towards the notion that managers generally aim for smooth and stable dividend policies and do no let their policies get shaped by uncertainty in the market. The results indicate that only when the Brexit deal was done and its consequences became clear, a significant number of firms stopped paying dividends and thus chose to keep their cash on the balance sheet. However, the firms that continued to pay dividends, chose to increase their dividends and dividend payout ratio. These results agree with the conclusion that in times of uncertainty, managers are to some extent capable of estimating what this uncertainty will mean for their firm. If they feel that their firm will be badly affected, they will act with caution and cut dividends. Alternatively, if a manager feels that the firm will survive the period of uncertainty, has ample cash and little growth opportunities, he might signal this sentiment by increasing a firm's dividends.

As to the effect of these Brexit-induced uncertainties on the share repurchase decisions, I show that the number of share repurchase announcements increased after the Brexit and spiked once Britain officially left the EU. From this fact, I conclude that in times of uncertainty, firms value the flexibility of a share repurchase and therefore announce more of them. Moreover, I report that the number of share repurchase announcements drastically dropped after the Brexit, but that this drop is partly compensated by the increase in deal volume per completed share repurchase. This finding is in agreement with the conclusion of dividend policy, where managers are either cautious or signal strength by repurchasing more. However, since these conclusions depend on just a couple of observations, I am hesitant to assign great levels of confidence to them.

Regarding the effect of uncertainty on the market's reaction to share repurchase announcements, I am able to report several interesting findings. I find evidence that the probability of completion decreased after the Brexit vote, which could partly be the case as a result of the sampling period, and the M/B remained stable. Because of this decrease in the value of the share repurchase option, the value of the share repurchase announcement decreased, but stayed positive. From these findings I conclude that more firms should announce a share repurchase during times of uncertainty, as this share repurchase option remains positive and thus creates value. However, this advise has to be adjusted to the type of company that announces a share repurchase.

I report that profitability and firm size are determinants of share repurchase completion in my sample and find that smaller and more profitable firms are more likely to complete a share repurchase than larger and less profitable firms. Only the level of profitability is also a determinant of the market's reaction, whereas the market prefers announcements of less profitable firms over more profitable firms. Furthermore, undervalued firms with little growth opportunities are the most likely to receive a good

market reaction. If managers want to create shareholder value, they should thus announce a share repurchase when EPU is high, when they are not highly profitable, when they deem themselves to be undervalued and when they do not have lucrative growth opportunities.

These conclusions must be seen in light of several of this paper's limitations. Most of these limitations were related to the sample size, as a sample size of just 177 observations meant that just two dozen of share repurchase announcements were actually completed. Furthermore, when analysing the same sample period several years from now, more certainty can be assigned to the announcements that actually ended up getting completed. Therefore, future research related to the effect of uncertainty on payout policy, might better be done on changes in the American market, as share repurchases are far more common there.

Whereas uncertainties surrounding the Brexit might have decreased with Britain leaving the EU, Brexit trouble is far from over. Only the future will tell what the overall consequences of Brexit on Britain will be. For now, I would advise British managers to constantly evaluate what the Brexit means for their firms and re-adjust their payout policy accordingly.

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