

MASTER THESIS

FINANCIAL ECONOMICS

Does Economic Policy Uncertainty Affect IPOs?

MSC IN BUSINESS ECONOMICS

Department of Financial Economics
Erasmus School of Economics
Erasmus University Rotterdam

Student: Gediminas Gruodis
Student ID number: 502149

Supervisor: Haikun Zhu

Abstract

In this thesis, I investigate economic policy uncertainty effects on IPO performance for 1997 to 2016 in the US market. To measure uncertainty I use Baker, Bloom and Davis (2016) created an economic policy uncertainty index and my own made Factiva index. My investigation of IPO performance is threefold. First, I investigate economic policy uncertainty effects on IPO volume and proceeds. Second, I test whether economic policy uncertainty would affect specific industry sectors differently. Finally, I investigate whether high economic uncertainty would extend the IPO registration period.

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1. Introduction

Initial Public Offerings (IPOs) represent a vital part of capital markets and has been an interesting subject for both policymakers and academic researchers. For individual firms IPOs help to acquire finance, provide growth opportunities and improves competitive advantage (Kenney, Patton and Ritter, 2012). For local or national economy IPOs increase employment levels and facilitate positive spillover effects to non-IPO firms. Although a healthy IPO market is an essential factor in any country, recent various studies show significant variation in IPO performance both in the US (Lowry, 2003; Gao, Ritter and Zhu, 2012) and in Europe (Ritter, Signori, and Vismara, 2013). However, despite the already significant number of studies focused on fluctuations in IPO volume, the reasons for this variation remain unclear.

I investigate possible explanations for fluctuations in the IPO market through the economic policy uncertainty channel. Growing literature asserts that policy uncertainty impacts the global economy and in the context of IPOs, policy uncertainty could be considered as a source of risk as it could lead to increased uncertainty about IPO success. Despite anecdotal evidence suggesting negative effects on IPOs, there is still not enough academic evidence linking economic policy uncertainty with lower numbers of firms going public. that higher uncertainty also can influence companies to stay away from IPO launches. Therefore, in this thesis, I explore a possible relationship between economic policy uncertainty and IPO performance in the US for the period 1997 to 2016.

I structure my investigation in several ways. First, I apply Baker, Bloom and Davis (2016) (hereinafter – BBD index) to investigate if the fluctuations of economic policy uncertainty correlate with IPO performance, namely, aggregate IPO volume and proceeds. For additional robustness check, I develop my own economic policy uncertainty indexes both for aggregate uncertainty in the US and in individual industries by using Factiva. My created algorithm expands on already existing BBD index by adding a larger sample of newspapers for index construction, a larger set of keywords indicating uncertainty and industry-specific uncertainty index for specific industries.

First, I investigate the economic policy uncertainty effects on the aggregate US IPO market for the period of 1997 to 2016. To indicate IPO performance on the aggregate level, I select total IPO volume and total proceeds as my main dependent variables. My findings suggest that policy uncertainty has significant adverse effects on IPO volume and proceeds. An increase of 10% in economic policy uncertainty lowers the aggregate number of IPOs by at least 4.6% when using BBD index and at least 4.7% decrease when Factiva index is applied. For total IPO

proceeds, a 10% increase in economic policy uncertainty shows at least 8.3% decrease when the BBD index is used and at least 5.2% decrease while using Factiva index. I continue investigating the effects of uncertainty on IPO performance over time.

Secondly, I investigate whether IPO performance would differ if industry-specific uncertainty indexes would be used. For this purpose, I filter my previously created Factiva index by specific industries. My findings show that different industries tend to have different fluctuations of uncertainty, in other words, uncertainty surrounding one industry might have low to no effect in another sector. Overall, findings show a negative relation between IPO performance in a specific industry and industry-specific uncertainty index.

Finally, I look for an explanation of how economic policy uncertainty could affect lower IPO performance. I posit that firms might be less willing to go public as high uncertainty would increase the value of the waiting option. To test this, I calculate the time between the first registration date and the first trading date. The results suggest that during times of high economic policy uncertainty firms tend to take more time to go public. A 10 unit increase in BBD economic policy uncertainty index is associated with an extended IPO completion date of at least 7 days.

My thesis contributes to various strands of economic literature in several ways. First, I investigate currently unexplored economic policy uncertainty effects on IPO performance. Secondly, I provide additional economic policy uncertainty index by creating my own Factiva algorithm and offering more flexible ways to measure uncertainty both on an aggregate and industry levels. Finally, I show that economic policy uncertainty extends the time companies need to take in order to complete their registration process.

2. Literature review

2.1. Fluctuations in the IPO market

The fluctuation of the IPO market is a well-established concept in economic literature. The IPO fluctuation literature dates back to Ibbotson and Jaffe (1975) and Ibbotson, Sindelar, and Ritter (1988) who suggest that IPOs tend to form periods of clusters also described as „hot“ and „cold“ markets. During the periods of „hot“ market cycles, the aggregate volume and proceeds of IPOs are high, while in „cold“ markets the number of firms going public decreases. However, the causes of these fluctuations have not been fully investigated. Some possible explanations have been provided by Lowry and Schwert (2002) who suggest that high IPO volume periods

are positively related to the periods of high initial returns and positive information thereafter. In other words, positive information on successful IPOs leads to higher initial returns and more companies filing to go public soon thereafter.

Added puzzle to IPO fluctuation was the overall decline in IPO markets from the year of 2001. Figure 1 shows a more visual representation of varying IPO volume over time. The graph depicts medium IPO volume throughout the period of 1980 to 1990, high volume during the period of 1991 to 2000, and as sudden drop through the period of 2001 to 2018. Several theories tried to explain the drop in IPO volume. Several previous studies link the decreased number of IPOs to more strict regulations for going public. For example, the Sarbanes-Oxley Act of 2002 is sometimes considered as a key factor for lower IPO volume as launching an IPO became more costly. Another often mentioned reason explaining lower IPO volume is the technology company bubble which reduced the attractiveness of going public. Other theories point out that some companies, in particular smaller ones, could be worth more if they are a part of a large company. Thus, they find merging to a large company as a better strategy than launching their own IPO.

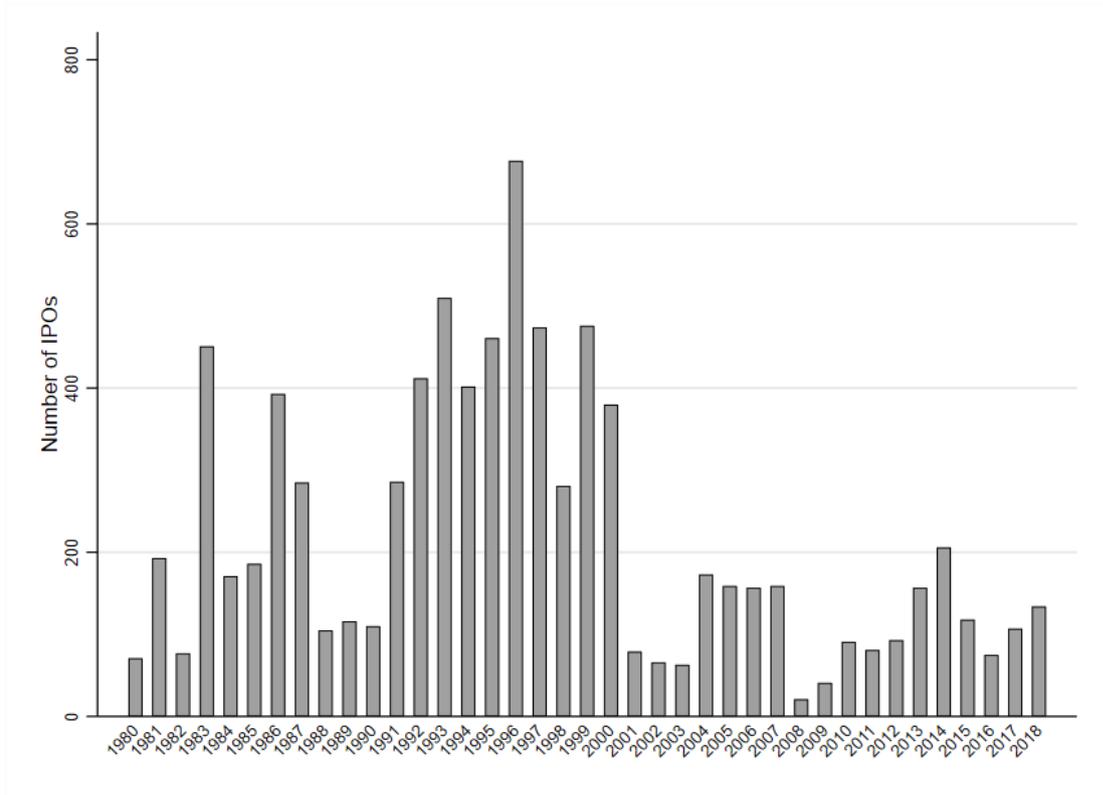


Figure 1. Aggregate volume and proceeds of IPOs by US public firms. This figure depicts the total number of firms going public in the US for the period of 1980 to 2018. Data on the number of IPOs were taken from Jay Ritter’s website (<https://site.warrington.ufl.edu/ritter/ipo-data/>).

Several other studies tried to explain the fluctuations in IPO volume by suggesting different explanations. For example, Lowry (2003) suggests that the capital demands hypothesis, the information asymmetry hypothesis, and the investor sentiment hypothesis could be the three main theories explaining IPO volume fluctuations. The capital demands hypothesis posits that private firms' aggregate demand for capital can cause variations in IPO volume. When economic conditions are good, companies tend to have higher demands for capital. Choe, Masulis, and Nanda (1993) point out that more firms decide to make seasoned equity offerings when the economic conditions are better. Pastor and Veronesi (2005) point out that IPO waves occur as a response to market conditions rather than market misvaluations. In other words, better economic conditions make more companies seek more capital, which can be received in several ways; one of them is going public (Ritter and Welch, 2002).

The information asymmetry hypothesis posits that IPO variation could be explained by varying adverse-selection costs over time. This could then explain why some firms would prefer timing their equity issues as adverse selection costs are one of the main factors why firms choose to not issue equity when they need financing (Myers and Majluf, 1984). When information asymmetry is very high, companies suffer from high adverse selection costs in addition to the direct issue costs. If the total costs exceed the benefits of an IPO, firms will postpone the IPO until the benefits can cover the costs, in order to maximize firm value. Thus, the information asymmetry hypothesis suggests that the IPO cycle is affected by the time-varying costs of adverse selection. They then speculated that the results could be applied to IPOs as well. Choe et al. (1993) showed that adverse selection costs decrease during an economic expansion, leading to an increased proportion of equity issues, given their relatively higher benefits than costs.

The investor sentiment hypothesis posits that the costs of issuing equity depend on the investor optimism of the market and negative sentiment will cause a decrease in firms issuing equity. For example, Lee, Shleifer, and Thaler (1991) conclude that changes in investor sentiment significantly affect IPO volume over time. These three hypotheses can partly be used when explaining the phenomenon of IPO clustering when the market is "hot" and many companies are going public, or when the market is "cold" and fewer companies are willing to go public. When the capital is less costly, and there is a positive sentiment in the market, firms might be more willing to go public. In case of bad economic conditions firms might choose to defer their IPO and choose waiting option until the economic conditions are better (Ritter and Welch, 2002; Yung, Colak and Wang, 2008; Colak and Gunay, 2011).

2.2. Economic policy uncertainty

Uncertainty is a concept in commonly used economic literature as it usually fluctuates with changes in various economic factors such as GDP, unemployment rate, and other non-economic factors such as wars and other conflicts. For example, both macro and micro uncertainty appear to rise sharply in recessions and fall in economic booms (Bloom, 2014) because lower economic growth induces higher micro and macro uncertainty.

Despite a large number of theories explaining IPO fluctuation, there has not been much academic literature investigating the relationship between the movements of IPO market and policy uncertainty, although anecdotal evidence suggests that decision to go public can be affected by various changes in economic policy, making firm investment decisions less likely under high levels of uncertainty. Some companies might defer their IPO launch if the country has high levels of uncertainty or choose to do IPO in a country with less uncertainty. Pastor and Veronesi (2013) suggest that higher levels of uncertainty increase the cost of finance. More recently, Baker et al. (2016) investigated policy uncertainty effects in more detail by creating an economic policy uncertainty index. However, there has not been enough literature investigating economic policy uncertainty effects in more details and how it could affect a firm's decision to go public. Several strands of literature try to investigate economic uncertainty effects on corporate decisions. For example, Rodrick (1991) shows that even moderate policy uncertainty can significantly reduce investments. Julio and Yook (2012) document the negative relation between political uncertainty and company investments. Recent academic literature regarding this issue has provided more insights into how uncertainty could affect IPO markets. For example, in a recent paper on U.S. gubernatorial elections Colak, Durnev, and Qian (2017) found evidence that higher political uncertainty substantially depresses IPO activity originating from the election state due to possibly higher cost of capital. A more recent study by Bonaimé, Gulen, and Ion (2018) found that economic policy uncertainty has adverse effects on aggregate M&A volume and aggregate deal value.

Most of the economic policy uncertainty literature focuses on several explanations on why firms would choose to defer capital decisions when uncertainty is high. The most commonly discussed theory explaining the effects of uncertainty is the real options theory (Bernanke 1983; McDonald and Siegel 1986), which states that firms look at their investment choices as a series of options. For example, if a manufacturing company wants to expand its production but is uncertain about the prospects, it might choose a waiting option to see if the economic conditions are getting better or worse and will base their decision to expand based on that. Therefore, the

option value to delay for the manufacturing company is high when uncertainty is high. As a result, firms might be more reluctant to make investment and hiring decisions during periods of instability. Hence, real option theory could be a logical explanation of why some firms would postpone equity issues because going public is one of the biggest irreversible decisions a firm can make during its lifecycle.

Other theories such as risk aversion and risk premia suggest that investors want to receive compensation for higher risk and because higher uncertainty leads to increasing risk premia, the cost of financing might rise as well. A more behavioral explanation suggests that people, in general, prefer outcomes with high certainty and avoid uncertain outcomes, displaying a behavior known as ambiguity aversion. As the range of possible outcomes (uncertainty) expands, the worst possible outcome gets worse, so agents cut back on investment and hiring.

3. Methodology

3.1. Measuring policy uncertainty

I measure economic policy uncertainty by using two different methods. First, I use the BBD index as a measurement for economic policy uncertainty. The BBD index is a weighted average of three components. The first component quantifies the volume of news discussing policy-related uncertainty. This is done by using an automated search of the archives of ten large newspapers, and counting the number of articles containing at least one of the terms “uncertainty” or “uncertain,” at least one of the terms “economic” or “economy,” and at least one of the words “congress,” “legislation,” “white house,” “regulation,” “federal reserve,” or “deficit” (Baker et al., 2016). The number of policy uncertainty articles in that newspaper is then normalized by the total number of articles in that newspaper. These ten series are then normalized to unit standard deviation and summed within each month. The second component of the BBD index measures the level of uncertainty related to future changes in the tax code. The third and final component of the BBD index captures forecaster disagreement about future monetary and fiscal policies. The overall BBD index has been often used in other research as well, and the methodology proposed by Baker et al. (2016) has already been used when creating uncertainty indexes for the other countries as well. However, a growing literature on economic policy uncertainty has pointed out possible flaws of the BBD index. For example, Hlatshwayo (2016) argues that the BBD index focuses too much on the word “uncertainty” or “uncertain” when deciding on whether the newspaper article indicates uncertainty. Some newspaper articles

might have other synonymous words describing uncertainty, for example, “risk” or “risky”. Therefore, adding more keywords might get a clearer indication of the uncertainty of the newspaper article. Another possible drawback of the BBD index is that it focuses only on a limited number of newspapers which might not provide an accurate representation of uncertainty (Ghirelli, Perez, and Urtasun, 2019). To address possible drawbacks of the BBD index I create my own unique Factiva index to measure economic policy uncertainty and to act as a possible robustness check for BBD index.

The methodology to create specific Factiva algorithms are as follows. First, I follow the methodology used by Baker et al. (2016) and select the most reputable newspapers in US such as the *Los Angeles Times*, *USA Today*, *Chicago Tribune*, *Washington Post*, *Boston Globe*, *Wall Street Journal*, the *Miami Herald*, *The Dallas Morning News*, *Houston Chronicle*, *San Francisco Chronicle* and the *New York Times*. Then, I add an additional set of newspapers covering the period from 1997 to 2015. The list of additional papers includes *American Banker*, *American Banker Magazine*, *Barron's*, *Chicago Sun-Times*, *The Arkansas Democrat Gazette*, *The Atlanta Journal*, *The Baltimore Sun*, *The Charlotte Observer*, *The Columbus Dispatch*, *The Denver Post*, *Detroit Free Press*, *Forbes*, *The Hartford Courant*, *The Kansas City Star*, *New York Daily News*, *Newsweek*.

To account for economic policy uncertainty, I divide my index into three main topics that are the building blocks for economic policy uncertainty. The main topics I need to address are the general state of the economy, uncertainty related to it and policies that might have caused this. For that purpose, I need to check for specific sets of keywords addressing all these factors in order to have a policy uncertainty measurement. I provide one of the examples of my used keyword selection below:

- **Uncertainty (U):** {*uncertainty, uncertain, unstable, instability, instabilities, risk, risks*}
- **Economy (E):** {*economic, economy*}
- **Policy (P):** {*Congress, legislation, White House, regulation, Federal Reserve, deficit*}

The uncertainty factor is measured as a set of the total number of uncertainty keywords in the newspaper article. The general set of keywords consists of words such as “uncertainty”, “uncertain”; however, this factor can be easily extended by adding more synonymous words such as “unstable”, “instability”, “instabilities”, “risk”, “risks”. The economic factor is mostly used as an indicator for an economy-related newspaper article and therefore only uses words such as “economic” and “economy”. The final component of the index is the policy factor which

contains a set of policy keywords. For this economic policy uncertainty, I used keywords such as “Congress”, “legislation”, “White House”, “regulation”, “Federal Reserve”, “deficit”. To make my index more accurate, I exclude the possible keywords signaling confident news about the market by filtering out the keywords such as “without doubt”, “no uncertainty”, “no doubt”. The final version of the Factiva algorithm used to obtain all the information about the economic policy uncertainty can be found in Appendix I: Factiva Algorithms section. The final version of Factiva index can be described as an equation below:

$$Factiva_t^{EPU} = \#\{U \cap E \cap P\}_t \quad (1)$$

Where $Factiva_t^{EPU}$ stands for policy uncertainty index at a time t . The EPU , in this case, stands for economic policy uncertainty. The index elements are described as U , E , and P , indicating a specific set of keywords. The total number of keywords is then aggregated to a specific year t . I test whether my created index shows similar correlations to BBD_t^{EPU} . To test this, I check correlations for simple $Factiva_t^{EPU}$ index, Factiva index weighted by total articles about economy described as $Factiva_t^{EPU} \times Scaled$ and Factiva index with a more detailed search algorithm approach suggested by Hlatschwayo (2016) and described as $Factiva_t^{EPU} \times Detailed$. The controlled index follows a similar approach to Baker et al. (2016) where all uncertainty articles are scaled by the total number of general articles in the press. This approach controls for a possible reduction in all the articles in the press which would possibly result in the fluctuation in index values. Due to the lack of Factiva data, I decided to use the number of all economic articles instead of total articles in the press. This way I can measure how many economic articles contained information about uncertainty. I use a detailed index to check how $Factiva_t^{EPU}$ would change if a more detailed algorithm would be used; therefore, I test this by creating a more detailed version of the current Factiva algorithm. I provide the correlation results in Table 1.

Table 1. BBD and custom Factiva index correlations. The table shows a comparison between custom made Factiva economic policy uncertainty index (rows 3 – 8) and BBD index (rows 1 – 2). The first version of the Factiva index is presented in rows 3 – 4. Factiva index controlled with a total number of articles is presented in rows 5 – 6. Rows 7 – 8 show the Factiva index with the more detailed search algorithm, * shows significance at the .05 level.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) BBD_t^{EPU}	1.000							
(2) $\log(BBD_t^{EPU})$	0.974* 0.000	1.000						
(3) $Factiva_t^{EPU}$	0.343* 0.000	0.368* 0.000	1.000					
(4) $\log(Factiva_t^{EPU})$	0.303* 0.000	0.317* 0.000	0.927* 0.000	1.000				
(5) $Factiva_t^{EPU} \times Scaled$	0.193* 0.003	0.221* 0.001	0.807* 0.000	0.787* 0.000	1.000			
(6) $\log(Factiva_t^{EPU} \times Scaled)$	0.221* 0.001	0.248* 0.000	0.805* 0.000	0.822* 0.000	0.989* 0.000	1.000		
(7) $Factiva_t^{EPU} \times Detailed$	0.339* 0.000	0.353* 0.000	0.926* 0.000	0.929* 0.000	0.604* 0.000	0.628* 0.000	1.000	
(8) $\log(Factiva_t^{EPU} \times Detailed)$	0.276* 0.000	0.281* 0.000	0.810* 0.000	0.954* 0.000	0.626* 0.000	0.686* 0.000	0.914* 0.000	1.000

The correlation Table 1 indicates that BBD_t^{EPU} and $Factiva_t^{EPU}$ indexes are similar and can be used for further research. The $Factiva_t^{EPU}$ index shows a correlation of 0.343 when compared to the BBD_t^{EPU} index. There are several factors that could explain this result. First, The Factiva only allows for yearly article searches while Baker et al. (2016) index use data for every month. Therefore, to make this comparison I had to assume of the same fixed policy uncertainty in each month, while BBD_t^{EPU} index accounted for monthly fluctuations. It is also worth noting that my created index focuses on a larger sample of articles in the US which might have resulted in a larger sample of uncertainty articles and in turn to slight fluctuations from Baker et al. (2016) methodology. It also seems that $Factiva_t^{EPU} \times Detailed$ index lowers the correlations between both BBD_t^{EPU} and $Factiva_t^{EPU}$ indexes. This finding suggests that using more detailed Factiva search algorithm produces slightly larger deviation from the original

BBD_t^{EPU} index. The $Factiva_t^{EPU} \times Scaled$ index which is weighted by the total number of economic articles shows the lowest correlation with the BBD_t^{EPU} index. However, this result might indicate a difference between Factiva search methodology and the process Baker et al. (2016) used to acquire their index. It is also worth mentioning that due to a very large number of an overall number of articles on Factiva and a relatively small number of uncertainty articles, I was unable to scale my original index by the total number of articles.

I then continue to explore whether certain industries would have different types of uncertainties. For example, some news and regulations might be more relevant to certain industry sectors, while other sectors might stay unaffected. For this purpose, I use the same approach as in creating my Factiva algorithm, only this time I filter my index for certain industries. The industry index correlation is shown in Table 2.

Table 2. BBD and Factiva industry uncertainty index correlations. The table shows a comparison between BBD economic policy uncertainty index and custom made Factiva economic policy uncertainty indexes for different industries, * shows significance at the .05 level.

Panel A: Industry-specific indexes compared to BBD index						
Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) BBD_t^{EPU}	1.000					
(2) $Consumer_t^{EPU}$	0.315* 0.000	1.000				
(3) $Energy_t^{EPU}$	0.239* 0.000	0.448* 0.000	1.000			
(4) $Financials_t^{EPU}$	-0.059 0.378	0.510* 0.000	0.165* 0.013	1.000		
(5) $Health_t^{EPU}$	0.023 0.724	0.738* 0.000	0.369* 0.000	0.925* 0.000	1.000	
(6) $Tech_t^{EPU}$	0.051 0.445	0.519* 0.000	0.138* 0.037	0.852* 0.000	0.848* 0.000	1.000

Panel B: Industry-specific indexes compared to Factiva index						
Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) $Factiva_t^{EPU}$	1.000					
(2) $Consumer_t^{EPU}$	0.879* 0.000	1.000				
(3) $Energy_t^{EPU}$	0.652* 0.000	0.448* 0.000	1.000			
(4) $Financials_t^{EPU}$	0.489* 0.000	0.510* 0.000	0.165* 0.013	1.000		
(5) $Health_t^{EPU}$	0.711* 0.000	0.738* 0.000	0.369* 0.000	0.925* 0.000	1.000	
(6) $Tech_t^{EPU}$	0.534* 0.000	0.519* 0.000	0.138* 0.037	0.852* 0.000	0.848* 0.000	1.000

The results indicate that the majority of industry indexes are positively correlated with aggregate Factiva and BBD indexes. However, some indexes show lower correlations and some even negative ones. This might be interpreted that some industries are less susceptible to aggregate economic policy uncertainty.

3.2. IPO Data

I collect public firms that decided to go public in the US for the period 1997 – 2016 from Thompson One database. I take the same approach as suggested in previous IPO literature, and therefore, I exclude closed-end funds, financial sector firms, real estate investment trusts (REITs), equity spin-offs, and carve-outs. I aggregate IPO volume and proceeds for every month following an approach used in other, literature (Lowry 2003; Gao and Ritter 2010) yielding an aggregate dataset for IPOs in the US for the period of 1997 – 2015. I continue this step to get total IPO numbers for my selected industries. Since I also want to see how policy uncertainty affects individual firms, I use a firm-level dataset. My dependent variables are *IPO Volume* which measures how many firms went public each month in the period of 1997 – 2015. To measure proceeds raised from the IPO process I use the *IPO Proceeds* variable which accounts for the total number of proceeds raised by the company's decision to go public.

Since I am also interested in finding how uncertainty would affect the firm's decision to go public, I investigate the time the company takes to launch its IPO. The process of planning and executing an IPO is time-intensive and typically takes 14 to 16 weeks from filing date to first trading date. The registration process involves three stages: the "prefiling period" where the company files the initial registration statement with the SEC followed by the "waiting period" and finally the "post-effective period" when stock is finally listed on a stock exchange. Registration statements for IPOs are subject to review by the SEC's staff to monitor compliance with applicable disclosure requirements. Once any SEC staff comments have been addressed, the issuer may request that the staff declare the registration statement effective, which means the company may proceed to consummate its IPO. In conjunction with an IPO, a company usually applies to list its shares on an established stock exchange, such as the New York Stock Exchange or NASDAQ. The timeline of this process can be described as a registration process and might involve important decisions to postpone an IPO. To measure the length of the IPO process, I create *IPO Duration* measure which can be described as the number of days between first IPO filing and first trading dates.

For aggregate macroeconomic control variables, I use the natural logarithm of yearly GDP in the US, which is obtained from the FRED database. The overall condition of the economy is an important measure when it comes to making corporate decisions. The low GDP can indicate low market performance and decrease the number of IPOs despite the uncertainty. The GDP measure is also and often used control variable in other economic policy uncertainty literature. Other important control variables include yearly GDP growth ration and yearly unemployment rate. For firm-level control variables, I select various size measures that could be attributed to an IPO launch decision.

Table 3. Summary statistics of IPO data. The table describes all aggregate IPO performance and IPO performance on selected economic sectors.

Panel A: Aggregate IPOs					
Variable	Obs	Mean	Std.Dev.	Min	Max
<i>IPO Volume</i>	228	53.886	30.769	2	146
<i>IPO Proceeds</i>	228	4538.958	3320.947	12.966	23764.1

Panel B: Industry IPOs					
Variable	Obs	Mean	Std.Dev.	Min	Max
<i>Consumer_t^{IPO Number}</i>	228	4.965	3.686	0	17
<i>Consumer_t^{IPO Proceeds}</i>	228	355.678	896.547	0	12193.75
<i>Energy_t^{IPO Number}</i>	228	6.482	4.521	0	24
<i>Energy_t^{IPO Proceeds}</i>	228	1029.317	1304.682	0	9339.367
<i>Financials_t^{IPO Number}</i>	228	5.711	3.58	0	19
<i>Financials_t^{IPO Proceeds}</i>	228	1318.104	3682.373	0	39700.58
<i>Health_t^{IPO Number}</i>	228	14.079	9.217	0	43
<i>Health_t^{IPO Proceeds}</i>	228	745.351	852.974	0	5263.43
<i>Tech_t^{IPO Number}</i>	228	14.031	10.85	0	50
<i>Tech_t^{IPO Proceeds}</i>	228	871.011	1074.324	0	6129.561

Panel C: Firm IPOs					
Variable	Obs	Mean	Std.Dev.	Min	Max
<i>BBD_t^{EPU}</i>	2897	72.98	18.982	56.062	134.251
<i>Factiva_t^{EPU}</i>	2897	334.471	232.236	98	1292
<i>IPO Duration</i>	2897	118.856	133.781	0	3394
<i>IPO Proceeds</i>	2897	4.302	1.133	.46	9.886
<i>Revenue</i>	1286	1971.218	6591.523	.6	53182
<i>Sales</i>	521	1204.647	3253.39	.9	22389
<i>Cash</i>	1189	319.957	914.19	.2	6753
<i>Total Assets</i>	1309	4643.113	17237.68	1.9	146130
<i>Total Debt</i>	1970	312.194	936.708	.1	6957.4
<i>Leverage</i>	915	.265	.611	0	4.245

3.3. Hypotheses

The literature described in the first section supports the idea that economic policy uncertainty would reduce economic activity. In times of high economic policy uncertainty firms would be less willing to go public and would exercise real option wait until the market conditions are more favorable (Pastor and Veronesi, 2005; Altı, 2005; Colak and Gunay, 2011). Based on this idea, I propose the following hypothesis:

Hypothesis 1a: *The number of IPOs is lower during periods of high economic policy uncertainty.*

The decreasing number of IPOs is most likely to affect the total proceeds as well. Based on this discussion, I propose the following:

Hypothesis 1b: *The total proceeds from IPOs are lower during periods of high economic policy uncertainty.*

Both hypotheses suggest that the IPOs will be clustered based on the levels of economic policy uncertainty. Previous literature suggests that IPOs fluctuate according to “hot” and “cold” IPO markets (Ibbotson and Jaffe, 1975; Ritter, 1984). Therefore, the periods of high uncertainty could be “cold,” thus, having lower volume and proceeds. It is worth noting that clustering tends to be different based not only on time but industry level as well (Ibbotson and Jaffe, 1975). Therefore, it could be argued that some industries will see different reactions to economic policy uncertainty.

Firms can react to uncertainty shocks differently, but in general, companies might be more hesitant to make irreversible decisions as stated in real options theory. Therefore, I argue that firms might extend the period between the filing date and the first trade date.

Hypothesis 2: *During times of high policy uncertainty firms will extend the period between the filing date and first trade date.*

3.4. Regressions

I begin my empirical analysis by investigating the fluctuations of *IPO Volume* and *IPO Proceeds* in periods of high economic policy uncertainty on an aggregate level. For this purpose, the following regressions are used:

$$\ln(IPO\ Volume_{it}) = f(\ln(EPU_{it})) + \gamma_{it} + \varepsilon_{it} \quad (3)$$

$$\ln(IPO\ Proceeds_{it}) = f(\ln(EPU_{it})) + \gamma_{it} + \varepsilon_{it} \quad (4)$$

- $IPO\ Volume_{it}$ stands for the IPO volume at a time t , for the industry i
- $IPO\ Proceeds_{it}$ stands for the IPO proceeds at a time t , for the industry i
- EPU_{it} stands for the policy uncertainty index provided at a time t , for the industry i
- γ_{it} stands for aggregate macroeconomic control variables
- ε_{it} stands for random error

To investigate economic policy uncertainty effects on the firm decisions to postpone going public, I use dataset indicating each firm and how long did it take to go from filing date to first trade date of an IPO. For this purpose, I regress the *IPO Duration* variable on the economic policy uncertainty index. The regression can be expressed as a formula shown below:

$$IPO\ Duration_{it} = f(EPU_{it}) + \gamma_{it} + \varepsilon_{it} \quad (5)$$

- $IPO\ Duration_{it}$ stands for the IPO volume at a time t , for the industry i
- EPU_{it} stands for the policy uncertainty index provided at a time t , for the industry i
- γ_{it} stands for firm-level control variables
- ε_{it} stands for random error

4. Empirical Results

4.1. Policy uncertainty and aggregate IPO activity

I start my investigation by first determining whether there is a relationship between economic policy uncertainty and IPO performance. For this purpose, I regress natural logarithm of *IPO Volume* and *IPO Proceeds* on the natural logarithm of economic policy uncertainty indexes indicated as BBD_t^{EPU} and $Factiva_t^{EPU}$. Regression results suggest that economic policy uncertainty indeed has negative effects on IPO performance. Panel A of Table 4 shows the economic policy uncertainty effects measured by the BBD index on aggregate IPO performance. The results indicate that a 10% increase in economic policy uncertainty measured by BBD_t^{EPU} decreases the *IPO Volume* by 4.6% - 5.4%. Moreover, a 10% increase in economic policy uncertainty leads to a decrease in aggregate *IPO Proceeds* by 8.3% - 8.4%. Similar results can be seen by using the Factiva index for measuring economic policy uncertainty. A 10% increase in economic policy uncertainty measured by $Factiva_t^{EPU}$ index indicates a 4.7% - 6.7% decrease in *IPO Volume* and a 5.2% - 6.9% decrease in *IPO Proceeds*.

The results are significant and show the same effects when both indexes are used. Therefore, the economic policy uncertainty indeed has a negative effect on aggregate IPO performance, suggesting that firms are less likely to go public when the economic conditions are unclear.

Table 4. Economic policy uncertainty effects on aggregate IPO performance. The table presents regression results from economic uncertainty and total IPO performance for 1997 and 2015. Panel A shows economic policy uncertainty effects on IPO performance when Baker et al. (2016) index is used. Panel B display regression results when custom made Factiva index is used, t -statistics are reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Policy uncertainty effects with BBD index				
	(1)	(2)	(3)	(4)
	<i>IPO Volume</i>	<i>IPO Volume</i>	<i>IPO Proceeds</i>	<i>IPO Proceeds</i>
BBD_t^{EPU}	-0.462*** (0.0945)	-0.536*** (0.114)	-0.837*** (0.121)	-0.831*** (0.150)
<i>GDP</i>		-0.694* (0.275)		-0.259 (0.361)
<i>Real GDP growth</i>		-0.119*** (0.0291)		-0.107** (0.0382)
<i>Unemployment rate</i>		-0.0428 (0.0317)		-0.0788 (0.0416)
Adjusted R-squared	9.2%	15.6%	17%	19.5%
No. of observations	228	228	228	228
Panel B: Policy uncertainty effects with Factiva index				
	(5)	(6)	(7)	(8)
	<i>IPO Volume</i>	<i>IPO Volume</i>	<i>IPO Proceeds</i>	<i>IPO Proceeds</i>
$Factiva_t^{EPU}$	-0.472*** (0.0650)	-0.674*** (0.106)	-0.522*** (0.0905)	-0.695*** (0.147)
<i>GDP</i>		0.818** (0.312)		1.490*** (0.432)
<i>Real GDP growth</i>		-0.0141 (0.0295)		0.0190 (0.0408)
<i>Unemployment rate</i>		0.0128 (0.0335)		-0.0573 (0.0463)
Adjusted R-squared	18.5%	21.4%	12.4%	16.7%
No. of observations	228	228	228	228

The effects of uncertainty on the IPO market can be seen more clearly in Figure 2. Both graphs depict changes in *IPO Volume* and *IPO Proceeds* with the fluctuations of economic policy uncertainty index measured by monthly BBD_t^{EPU} index. The IPO performance is in general lower when the economic policy uncertainty is high. Moreover, when economic policy uncertainty is low, the IPO number increases substantially. Period of 2003 to 2007 shows low economic policy uncertainty similarly showing a high number of IPOs. The period of 2009 to 2014 depicts high economic policy uncertainty spikes and a low number of IPOs.

I continue my investigation by fitting a vector autoregression (VAR) to a current aggregate dataset consisting of monthly US data from January 1997 to December 2015. The top panel of Figure 3 shows a negative response to economic policy uncertainty shock measured as BBD_t^{EPU} index. Specifically, a 10% increase in uncertainty is associated with a 1.8% decrease in *IPO Volume* and a 3.2% decrease in *IPO Proceeds*. The bottom panel indicates IPO performance response to economic policy uncertainty index depicted by yearly $Factiva_t^{EPU}$ index. A 10%

increase in uncertainty is associated with a 2.8% decrease in *IPO Volume* and a 7% decrease in *IPO Proceeds*.

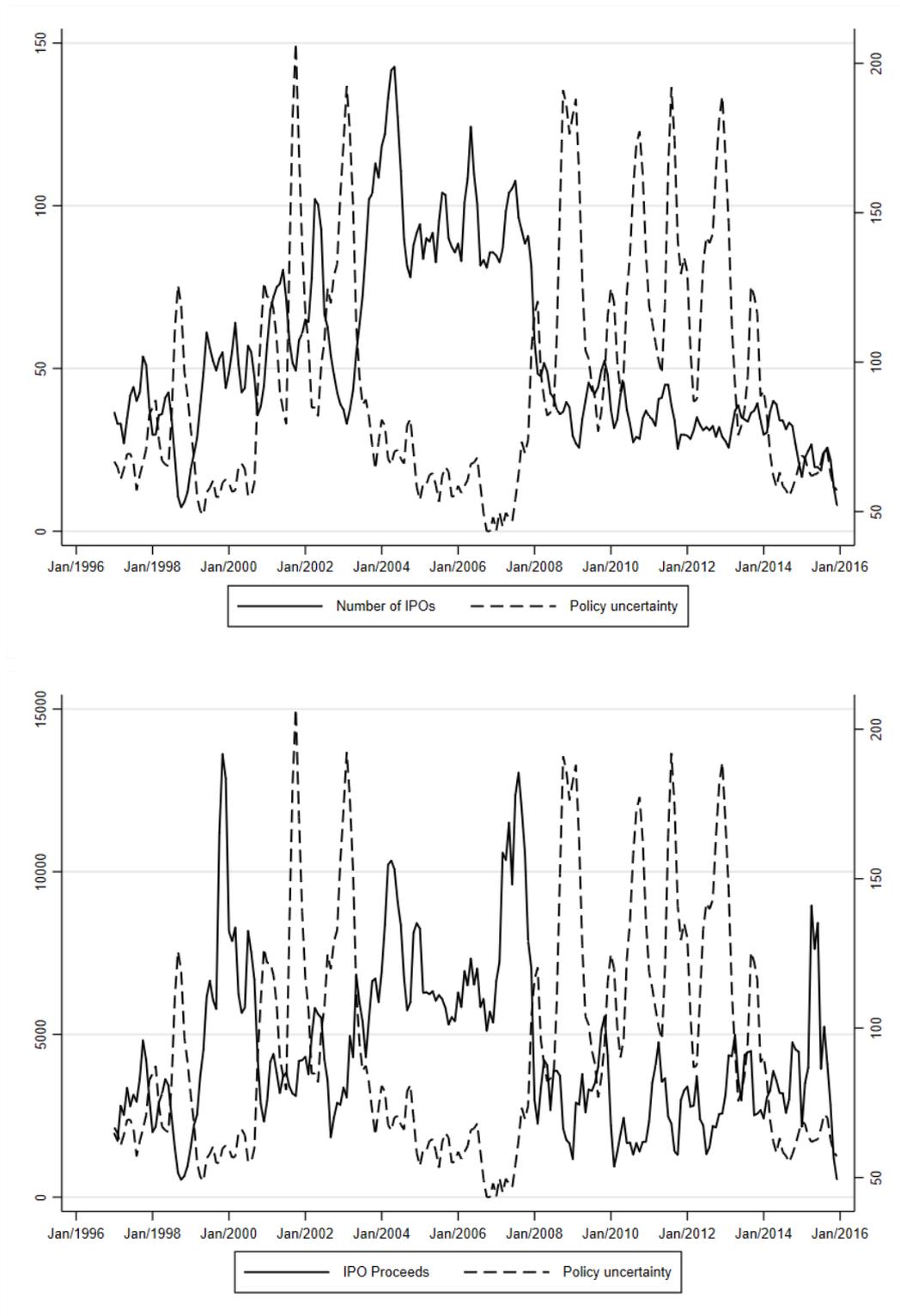


Figure 2. Aggregate volume and proceeds of IPOs by US public firms. This figure depicts the three-month moving averages of total IPO volume (top panel) and proceeds (bottom panel) by US-based, public firms, together with the Baker et al. (2016) policy uncertainty index, from January 1997 to December 2015. Total IPO proceeds and correspond to the solid lines and left axes; policy uncertainty corresponds to the dashed lines and right axes.

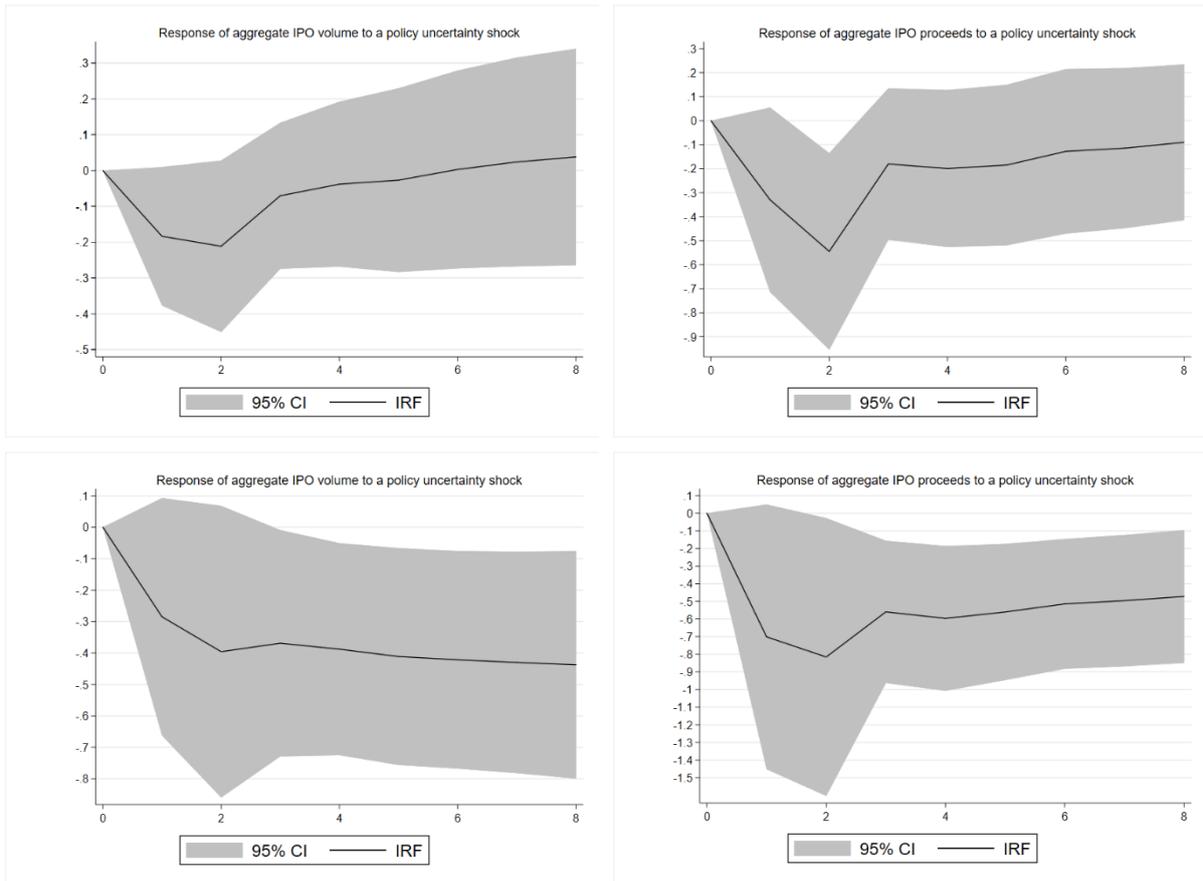


Figure 3. The estimated effect of a policy uncertainty shock on IPOs in the US. The figure top figures depict the impulse response function (IRF) of IPO activity to a shock of BBD index while two bottom figures show the response of IPO activity when the Factiva index is used.

4.2. Policy uncertainty and industry – level IPO activity

I continue my investigation into IPO activity by testing whether the economic policy uncertainty will affect specific industries differently. I posit that IPO performance in some sectors can differ even in the case of a general negative relationship discussed in the previous section. A more visual representation of this can be seen in Figure 4, where total IPO volume and proceeds are plotted with BBD_t^{EPU} index for specific industries. The plot shows that even across industries patterns of reduced IPO activity can be seen. From looking at the given graph it seems that the healthcare sector was least affected throughout the period of 1997 to 2015; however, it still suffered a steep drop in IPO volume as in other sectors. This observation suggests that economic policy uncertainty shocks depress IPO activity regardless of the industry sector.

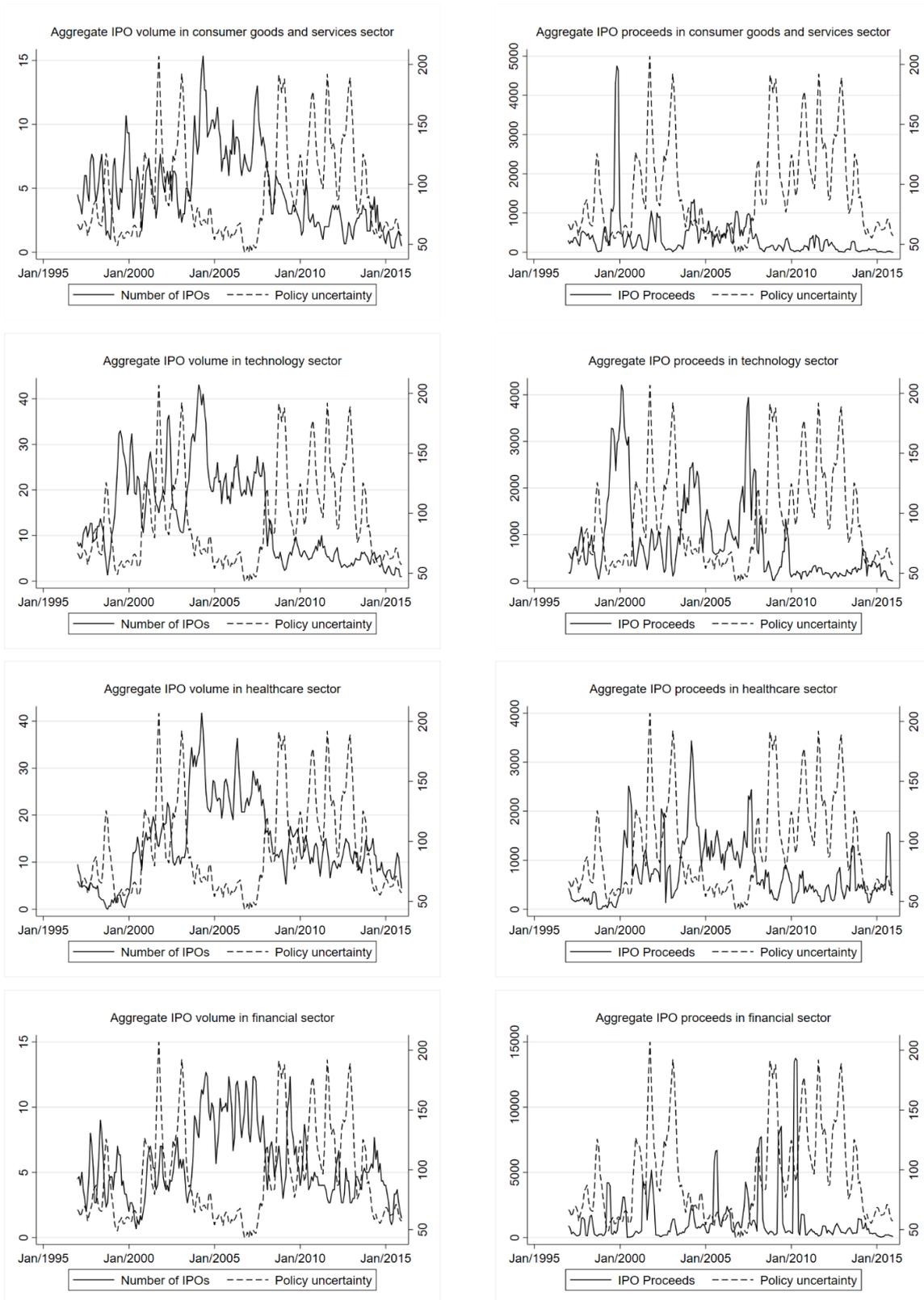


Figure 3. Aggregate volume and proceeds of IPOs by US public firms for different industry sectors. Figures depict the three-month moving averages of total IPO volume (top panel) and proceeds (bottom panel) by US-based, public firms in different industry sectors, together with the Baker et al. (2016) policy uncertainty index, from January 1997 to December 2015. Total IPO proceeds and correspond to the solid lines and left axes; policy uncertainty corresponds to the dashed lines and right axes.

The problem with applying aggregate economic policy uncertainty shock over a specific industry is that it might not show the most accurate picture. The aggregate index tracks the whole economy, which might not be completely related to industry-specific uncertainty; therefore, I create industry-specific Factiva index, which limits uncertainty articles only specific industry sector. My selected sectors include healthcare, technology, financials, and consumer goods sectors. To create industry-specific indexes I use the same approach as when creating aggregate Factiva index, only this time I filter out relevant articles related to each selected industry. Further regression results are shown in Table 5.

Table 5. Industry-specific economic policy uncertainty effects on various sectors. The table presents regression results from specific industry economic uncertainty indexes created by using Factiva and IPO performance in those sectors for 1997 and 2015, t-statistics are reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Policy uncertainty effects to the healthcare sector				
	(1)	(2)	(3)	(4)
	$Health_t^{IPO\ Number}$	$Health_t^{IPO\ Number}$	$Health_t^{IPO\ Proceeds}$	$Health_t^{IPO\ Proceeds}$
$Health_t^{EPU}$	-0.00110	-0.00870***	-0.00241	-0.00866***
	(0.000805)	(0.00114)	(0.00124)	(0.00195)
<i>GDP</i>		3.849***		3.915***
		(0.465)		(0.797)
<i>Real GDP growth</i>		-0.0346		-0.0198
		(0.0338)		(0.0580)
<i>Unemployment rate</i>		-0.0533		-0.185***
		(0.0319)		(0.0547)
Adjusted R-squared	0.4%	29.6%	1.3%	13.3%
No. of observations	221	221	221	221

Panel B: Policy uncertainty effects to the technology sector				
	(5)	(6)	(7)	(8)
	$Tech_t^{IPO\ Number}$	$Tech_t^{IPO\ Number}$	$Tech_t^{IPO\ Proceeds}$	$Tech_t^{IPO\ Proceeds}$
$Tech_t^{EPU}$	-0.0289***	-0.0254***	-0.0388***	-0.0328***
	(0.00251)	(0.00323)	(0.00481)	(0.00621)
<i>GDP</i>		-0.0156		0.0705
		(0.423)		(0.814)
<i>Real GDP growth</i>		0.0380		0.0870
		(0.0357)		(0.0687)
<i>Unemployment rate</i>		-0.149***		-0.274***
		(0.0335)		(0.0643)
Adjusted R-squared	36.9%	46.3%	22.1%	33.3%
No. of observations	227	228	227	227

Panel C: Policy uncertainty effects to consumer products and services sector				
	(9)	(10)	(11)	(12)
	$Consumer_t^{IPO\ Number}$	$Consumer_t^{IPO\ Number}$	$Consumer_t^{IPO\ Proceeds}$	$Consumer_t^{IPO\ Proceeds}$
$Consumer_t^{EPU}$	-0.0119*** (0.00180)	-0.0152*** (0.00428)	-0.0297*** (0.00435)	-0.0414*** (0.0103)
<i>GDP</i>		0.865* (0.439)		0.946 (1.058)
<i>Real GDP growth</i>		0.0157 (0.0407)		0.216* (0.0982)
<i>Unemployment rate</i>		-0.00937 (0.0584)		0.209 (0.141)
Adjusted R-squared	17%	17.7%	17.9%	18.7%
No. of observations	221	221	211	211

Panel D: Policy uncertainty effects to the financial sector				
	(13)	(14)	(15)	(16)
	$Financials_t^{IPO\ Number}$	$Financials_t^{IPO\ Number}$	$Financials_t^{IPO\ Proceeds}$	$Financials_t^{IPO\ Proceeds}$
$Financials_t^{EPU}$	-0.00238** (0.000902)	-0.00482*** (0.00110)	-0.00401 (0.00241)	-0.00868** (0.00301)
<i>GDP</i>		1.376*** (0.371)		2.477* (1.021)
<i>Real GDP growth</i>		-0.0489 (0.0318)		-0.0505 (0.0874)
<i>Unemployment rate</i>		-0.0899** (0.0315)		-0.0924 (0.0867)
Adjusted R-squared	2.6%	10.1%	0.8%	3.1%
No. of observations	224	224	224	224

The results in Table 5 indicate that for the majority of selected industries the negative effects of economic policy uncertainty on IPO persist. However, some industries show more sensitive effects of uncertainty. For example, the IPO performance in the technology sector is the most sensitive to a policy uncertainty shock in the technology sector. An increase of 1 unit in $Tech_t^{EPU}$ is associated with a decrease in $Tech_t^{IPO\ Number}$ by 2.5% - 2.9% and a decrease in $Tech_t^{IPO\ Proceeds}$ by 3.3% - 3.9%. The consumer goods and services sector has also shown a high sensitivity to industry-specific uncertainty shocks. A 1 unit increase in $Consumer_t^{EPU}$ is associated with 1.2% - 1.5% decrease in $Consumer_t^{IPO\ Number}$ and a 2.9% - 4.1% decrease in $Consumer_t^{IPO\ Proceeds}$. The industry-specific uncertainty effect was lower for IPOs in the financial sector. A 1 unit increase in $Financials_t^{EPU}$ is associated with a decrease in $Financials_t^{IPO\ Number}$ by 0.24% - 0.48% and a decrease in $Financials_t^{IPO\ Proceeds}$ by 8.7%, only when macroeconomic control variables are introduced. The IPO performance of the healthcare sector has shown little sensitivity to economic policy uncertainty effects in the healthcare sector. A 1 unit increase in $Health_t^{EPU}$ is associated with a decrease in $Health_t^{IPO\ Number}$ and $Health_t^{IPO\ Proceeds}$ by 8.7% but only when control variables have been introduced.

4.3. Policy uncertainty and firm-level IPO activity

The results from the previous section indicate that policy uncertainty affects aggregate IPO performance by lowering the number of IPOs in the market. However, this reduction in IPO doesn't explain why firms would be less willing to go public. To further investigate this issue, I continue to explore the real options channel through which firms would be less willing to go public when uncertainty is high. In other words, firms will be more hesitant to make any irreversible corporate decisions when uncertainty in the market is high. One of the ways to test anticipation of the firm is to check the time period between the IPO filing date and IPO trading date. The IPO process can be extended if the firm sees uncertain market conditions, in turn lengthening the process of listing the company. It has already been shown that companies might try to time their IPOs when the possibility of initial returns is highest (Lowry and Schwert, 2002); therefore firms would postpone going public as uncertainty has been shown to be negatively correlated with uncertainty (Baker et al. 2016).

To test whether firms extend the time of IPO completion, I use *IPO Duration* as the main dependent variable. The duration variable is described as a number of days between the first filing date and the first trade date of an IPO. For the main independent variables, I use a yearly average of BBD_t^{EPU} index-matched to every firm on the filing date. Similarly, I use the yearly $Factiva_t^{EPU}$ index-matched to each company and add control variables to account for firm size. The final results are shown in Table 6 indicate that there is a significantly positive correlation between *IPO Duration* both economic policy uncertainty indexes. A 10 unit increase in BBD_t^{EPU} is associated with an increase in *IPO Duration* period by approximately 7 days, indicating that firms are more likely to postpone going public when there is high policy uncertainty. The results are significant and constant after the control variables for size and fixed effects have been introduced. In the third and fourth columns, I introduce firm and industry-specific fixed effects with clustered standard errors on the industry level. Both results confirm my hypothesis that firms are more likely to postpone their process of going public.

For the final test, I use the same approach only with $Factiva_t^{EPU}$ index to check if the results persist after using different measures for economic policy uncertainty. The following regressions indicate that a 10 unit increase in $Factiva_t^{EPU}$ is associated with 0.6 day longer *IPO Duration*. The results continue to hold even after all control variables and fixed effects have been introduced, confirming that firms are more likely to extend the period between the IPO filing date and actual going public date. The lower effect of $Factiva_t^{EPU}$ on *IPO Duration* could

be explained by the yearly instead of monthly data used in $Factiva_t^{EPU}$. Hence, this could have lead to results showing less sensitivity to economic policy uncertainty. Nevertheless, both indexes are associated with significant and persistent effects on *IPO Duration*.

Table 6. Policy effects on the duration between the filling and first trading dates

Panel A: Effects on duration using BBD index				
	(1)	(2)	(3)	(4)
	<i>IPO Duration</i>	<i>IPO Duration</i>	<i>IPO Duration</i>	<i>IPO Duration</i>
BBD_t^{EPU}	0.728** (0.201)	0.728* (0.271)	0.721** (0.198)	0.749* (0.264)
<i>Proceeds</i>		-6.385 (7.214)		-9.716 (8.957)
<i>Revenue</i>		-0.606 (3.785)		0.882 (5.513)
<i>Cash</i>		-4.441 (2.839)		-4.027 (3.468)
<i>Total Assets</i>		-9.810 (12.12)		-13.33 (11.55)
<i>Total Debt</i>		18.66 (11.43)		20.13 (11.35)
<i>Leverage</i>		16.96 (11.49)		19.29 (11.43)
Firm FE	N	N	Y	Y
Industry FE	N	N	Y	Y
Adjusted R-squared	1.2%	1.1%	1.6%	2.3%
No. of observations	2444	802	2443	681
Panel B: Effects on duration using Factiva index				
	(5)	(6)	(7)	(8)
	<i>IPO Duration</i>	<i>IPO Duration</i>	<i>IPO Duration</i>	<i>IPO Duration</i>
$Factiva_t^{EPU}$	0.0663*** (0.0106)	0.0929*** (0.0218)	0.0681*** (0.0125)	0.103** (0.0255)
<i>Proceeds</i>		-14.29* (6.291)		-18.66* (8.163)
<i>Revenue</i>		1.757 (4.929)		1.738 (5.631)
<i>Cash</i>		-3.075 (3.702)		-2.563 (3.331)
<i>Total Assets</i>		1.251 (28.90)		0.424 (12.37)
<i>Total Debt</i>		4.930 (28.89)		5.322 (12.99)
<i>Leverage</i>		2.894 (29.22)		3.899 (13.50)
Firm FE	N	N	Y	Y
Industry FE	N	N	Y	Y
Adjusted R-squared	1.5%	2.6%	1.9%	3.8%
No. of observations	2444	681	2443	681

5. Conclusion

In this thesis, I take a closer look into possible IPO explanations for IPO fluctuations in the US market. I posit that changes in economic policy uncertainty influence IPO performance. By quantifying uncertainty in the US with Baker et al. (2016) index, I find negative correlations between IPO characteristics such as volume and proceeds. To check for the robustness of the index, I create my own Factiva algorithm by building on the already existing methodology of BBD index. The results indicate results very similar to BBD index, allowing for the conclusion that IPOs are indeed affected by different levels of uncertainty. Since some economic sectors will be affected differently, I create sector-specific uncertainty index. Results indicate that most of the various sector IPOs are negatively correlated with Factiva index. This also implies that when uncertainty is high, firms will view going public as an irreversible action and will postpone the launch date until the uncertainty is lower. I test this assumption by using firm-level data and by examining how much time firms spend between filing for an IPO and going public. The results indicate a positive relationship between IPO duration period, in other words, if uncertainty is high firms will be willing to take more time to launch their IPO. This result is in line with results tested on an aggregate level and with previous literature of real options.

My thesis mainly contributes to the existing economic literature on IPO activity (see e.g. Lowry and Schwert, 2002; Pastor and Veronesi, 2005; Gao et al., 2013) and a growing literature on uncertainty effects to the economy (see e.g. Gulen and Ion, 2014; Baker et al., 2016; Bonaime et al., 2018). Thesis results could be valuable for market analysts, policymakers, and academics. Future research could use more detailed uncertainty indexes by applying more specific algorithms. This also means that more specific policy or other uncertainty indexes could be created and tested on various economic factors.

6. References

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Appendix I: Factiva Algorithms

Generic: (uncert*) and (economic or economy) and (Congress or deficit or Federal Reserve or legislation or regulation or White House) near8 (United States or United States of America or US or USA) not (“without doubt” or “no uncertainty” or “no doubt” or shares or equit* or stock market)

Normalization: (economic or economy) and (Congress or deficit or Federal Reserve or legislation or regulation or White House) near8 (United States or United States of America or US or USA)

Generic: (safeguard measure* or domestic content or anti-dumping or sanitary measure* or free trade zone or rules of origin or dumping or quota or voluntary export restraint or local content requirement or WTO or World Trade Organization or protectionism or (trade near2 (war or deal or delegation or controversy or bilateral or free or preferential or dispute or polic* or restriction* or quota or commission or sanction or content or embargo or negotiation* or agreement* or anti or deal or barrier* or red tape or subsid* or TRIPS)) or (import near2 (license or fees or duty or barrier* or tariff* or competit* or tax*)) or (export near2 (license or tax* or subsid* or competit*)) or government or (spending near2 (government or public or fiscal)) or austerity or tax* or (fiscal near2 (plan or crisis or emergency or measure* or gap or discipline or consolidation or stimulus)) or (budget near2 (surplus or deficit or plan or revenue or balanced or gap)) or (debt near2 (public or national or sovereign or government)) or government revenue* or budget or deficit reduction or public revenue or entitlements or automatic stabili?er* or monetary policy or yield or interest rate or policy or regulat* or Federal Reserve or Fed or monetary or quantitative easing or money supply or bond purchases or overnight rate or tight money or loose money or discount rate or loose* policy or tight* policy or accomm* policy or monetary accomm* or asset purchases or open market operations) same (uncert* or ambiguous or dubious or precarious or unpredictable or undecided or undetermined or unresolved or unsettled or concern or worr* or anxiet* or doubt* or unclear) near8 (United States or United States of America or US or USA or Americ*) not (“without doubt” or “no uncertainty” or “no doubt” or shares or equit* or stock market) and wc>99