DOCTOR OF PHILOSOPHY

Political Preferences and Financial Stability: The Case of European Countries

Nguyen, Phuc Lam Thy

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By Phuc Lam Thy Nguyen

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Abstracts

The aim of this thesis is to examine the link between political preferences and both financial and social instability. In particular, the thesis investigates: *(i) the impact of sovereign credit ratings on government support (Chapter 4); (ii) the impact of terrorist attacks on government support (Chapter 5);* and *(iii) stock markets' reactions to elections (Chapter 6).* These empirical chapters further the understanding of the effects of credit risk and extreme events on voters' preferences, along with the role of political dynamics in explaining financial instability.

In order to explore these questions, a unique hand-collected dataset of polling results, which measure daily supports for political parties in European countries from 2000 to 2017 for Chapters 4 and 5, and from 2005 to 2019 for Chapter 6, is used. Polling data is then analysed jointly with other datasets, including sovereign credit ratings, terrorist attacks, elections, stock return, and stock volatility. Various econometric techniques are employed, including fixed effects model, propensity score matching, and event study.

The first empirical chapter shows that changes in sovereign credit ratings have an asymmetric impact on voters' preferences, with negative rating events leading to significant decreases in government support, while positive rating events do not have a significant effect. This implies that sovereign ratings have political power by influencing the voters' perceptions of incumbents' quality. The second empirical chapter finds that citizens tend to rally together behind their leaders rather than rail against them in the aftermath of terrorist attacks despite the loss of lives and grave consequences for national economies and financial markets. This sheds light on public attitudes toward terrorism, with citizens providing more support for the government after terrorist attacks in order to fulfil their needs for protection. The last empirical chapter focuses on the sensitivity of stock markets to election uncertainty and election shock measured by polling results. In pre-election periods, stock volatility is affected by the likelihoods of various electoral outcomes. In post-election periods, stock volatility increases indicating that investors might be surprised by the election outcome. The accuracy of election prediction contributes to the magnitude of election shock.

Overall, this thesis contributes to the understanding of the determinants of government support, by offering new evidence of the political consequences of sovereign rating events and terrorist attacks. Additionally, the thesis provides insights into stock markets' behaviour during elections and confirms the effect of political risks on stock markets. The thesis highlights the underlying mechanisms behind political and financial uncertainty, hence informs policy debates surrounding the best way to stabilise politics and financial markets.

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Abbreviations

ATT	Average treatment effect on the treated
CRAs	Credit rating agencies
CSES	Comparative Study of Electoral Systems
DID	Differences-in-differences
EPU	Economic policy uncertainty
EU	European Union
EUH	Election uncertainty hypothesis
FDI	Foreign Direct Investment
FE	Fixed-effects
FEM	Fixed-effects model
GARCH	Generalized autoregressive conditional heteroskedasticity
GIIPS	Greece, Ireland, Italy, Portugal, and Spain
GMM	Generalized method-of-moments
GRS	Global Rating Scale
GTD	Global Terrorism Database
IEM	Iowa Electronic Markets
ITERATE	International Terrorism, Attributes of terrorist events
IV	Instrumental variables
LP	Eventual largest party
LSA	Assessment of life satisfaction
MRS	Municipal Rating Scale
NNM	Nearest Neighbour Matching
NSD	Norwegian Centre for Research Data
OLS	Ordinary least square
PBC	Political Business Cycle
PS	Propensity Score
PSM	Propensity score matching
PUH	Political uncertainty hypothesis
RUP	Eventual runner up party
S&P	Standard and Poor's
SIC	Standard Industry Classification
START	Study of Terrorism and Responses to Terrorism
UIH	Uncertainty Information Hypothesis
UK	United Kingdom
US	United States
VIX	CBOE Volatility index
WGIs	Worldwide Governance Indicators

Chapter 1 Introduction

The thesis aims to investigate what drives changes in political preferences and whether these in turn affect financial stability. This thesis is motivated by a series of economic and political shocks in European countries since 2007, following the global financial crisis and the subsequent European sovereign debt crisis. In that period, many European economies have been damaged and suffered from the rapid increase in fiscal deficits and high levels of debt (Baum et al., 2016). In response, credit rating agencies (CRAs) announced a series of sovereign rating downgrades[1], which negatively affected economic growth and financial stability (See Section 2.3.1). The effect of the sovereign debt crisis is far from over with the slow growth continues to linger, hampering European governments' attempts to reduce their public debt burden (Moody's, 2019b). Within the Eurozone, only Germany, Malta, and Netherlands have a lower debt level than they did in 2008 (Hale, 2019).

Over a prolonged period of poor economic conditions and financial instability, public trust in national governments has fallen drastically, especially in countries with high level of debt such as Greece, Ireland, Italy, Portugal, Spain, and Cyprus (Faiola, 2011; Foster and Frieden, 2017). As a result, mainstream parties are punished for their failure in managing economic shocks, while right-wing extremist and populist parties gain consensus given their political rhetoric with nationalistic or xenophobic tendencies (Funke et al., 2016; Guiso et al., 2019; Margalit, 2019). For example, extreme far-right parties (such as *Golden Dawn* in Greece and *Front National* in France), and populist or openly Eurosceptic parties (such as *Podemos* in Spain, *Five Star Movement* in Italy, *True Finns* in Finland, *The UK Independence Party* in the United Kingdom (UK), and *The Alternative for Germany* in Germany) have had major electoral successes in recent elections.[2] According to Funke et al. (2016), political polarisation strongly increases partisan conflicts and policy uncertainty. This combination makes post-crisis resolution more difficult at a time when decisive political actions may be needed the most.

The financial and sovereign debt crises episode has triggered policy debates and academic research to focus even more on political economy and financial stability. Firstly, as

[1] For example, Standard and Poor's (S&P) downgraded the credit ratings of France from AAA to AA+, and 8 other European countries on January 13, 2012. Additionally, 14 European countries were assigned negative outlooks (Baum et al., 2016). CRA's actions inform investors of the quality of a country's economic fundamentals and its ability to repay sovereign debt (See more details in Section 2.3).

[2] Using a sample of 20 developed countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, UK and the United States (US), from 1870 to 2014, Funke et al. (2016) find that the vote share for far-right parties increases by 30%, on average, after a financial crisis.

many European countries have experienced a high degree of political polarisation (Funke et al., 2016; Foster and Frieden, 2017; Guiso et al., 2019)[3], it is vital to understand the underlying mechanism behind this trend. This thesis therefore focuses on the determinants of government support across time, and not only during elections. Even though polls tend to provide more signalling effects than votes (Nannestad and Paldam, 1994), prior studies mainly focus on the determinants of electoral outcomes (e.g. Healy and Lenz, 2017; Quinlan and Okolikj, 2019; Cunha et al., 2020). These studies, therefore, are unable to capture immediate changes in government support in the aftermath of financial and exogenous events. Changes in government support might increase the likelihood of early elections or lead to changes in political power. This political uncertainty affects fiscal policies and government borrowing (Fic and Saqib, 2006). Furthermore, during the post-crisis period, frequent government and cabinet changes may hamper the ability to provide effective responses to economic shocks. Secondly, news about governments' actions and policies around the world has been dominant in local and international financial markets causing changes in asset prices (Pástor and Veronesi, 2013).[4] This highlights the need for further investigations on the market impact of the uncertainty derived from political events, since investors are influenced by the political costs/benefits associated with the outcomes of these event. Among political events, the thesis exploits national elections. The election day is known in advance, but, depending on the system, the election result may be unclear far beyond election day. The electoral process disseminates the policy-related information to market participants during the potential period of political changes. Prior studies which examine the reactions of stock markets during election mainly investigate the ex-ante and ex-post effects of elections (e.g. Pantzalis et al., 2000; Bialkowski et al, 2008). Other studies examine whether stock markets react to changes in political support measured by betting market data in the US (e.g. Goodell and Vähämaa, 2013; Goodell et al., 2020). This thesis overcomes the use of a single country dataset and provides a new and innovative measure of daily political support at the multi-country level.

There is an extended literature which examines what drives the movement in voters' preferences (e.g. Healy and Lenz, 2017; Quinlan and Okolikj, 2019; Cunha et al., 2020) and how changes in political support affect the financial stability (e.g. Pantzalis et al., 2000;

[3] Section 2.1 provides more discussion about the political polarisation trend in European countries.

[4] For example, during the 2010-2012 European sovereign debt crisis, an announcement by European politicians about a deal cutting Greece's debt in half on October 27, 2011 resulted in an increase in S&P500 index by 3.4%, French and German stock indices by 5%, since investors considered it as an indication of increased likelihood of the eurozone's preservation. A week later, stock markets declined when Greek prime minister announced his intention to hold a referendum on the deal (Pástor and Veronesi, 2013).

Bialkowski et al., 2008; Goodell and Vähämaa, 2013; Goodell et al., 2020). The first line of studies relating to economic voting literature often examines whether the performance of national economies affect electoral outcomes (See Section 2.2). However, these studies suffer from the endogeneity bias caused by reverse causality. Particularly, an incumbent may be penalised for the poor economic performance. Changes in political support may affect political and policy uncertainty, which cause changes in economies and financial markets in election year. Another cause of endogeneity problem is the omitted variables bias which might affect both the economy and the vote shares. To reduce these potential biases, the thesis uses a polling dataset which measures government support across time. Changes in government support measured by frequent polling results are less likely to cause a reverse causality on the country's sovereign credit ratings and terrorism events. Using frequent polling data also reduces bias caused by confounding variables since the analyses in Chapter 4 and 5 can capture immediate changes in government support in the aftermath of adverse rating and terrorism events, respectively. The second line of studies mainly focuses on how stock markets volatile during election campaign periods and react to electoral outcomes. The effect can be hampered by omitted variables. For example, suppose that an election has pro and anti-war parties. External threatening actions from another nation, indicating an increasingly likely war, may lead to an increase in the firm shares' value in defence sector and an increase in the election prospect of the pro-war party (Snowberg et al., 2007). The use of polling results dataset allows the examination of stock markets' reaction to changes in political support in short period regardless of partisan effects, which mitigates the effect of omitted variables.

The thesis answers three main research questions: (i) *What is the impact of sovereign credit ratings on government support?* (ii) *What is the impact of terrorist attacks on government support?* and (iii) *How do stock markets react to election uncertainty and election shock?*

Chapter 4 examines whether sovereign credit ratings have a significant impact on government support. To the best of my knowledge, this thesis is the first to investigate this relationship. Prior studies highlight the importance of economic variables in determining government support either at elections or across time (see Section 2.2.1), yet there is limited empirical evidence on the political impact of sovereign credit ratings (see Section 2.3.2) even though they are considered as indicators of the economic, financial, and political health of the country. Higher sovereign credit ratings reflect improved economic conditions, lower credit risks, easier and cheaper access to financing, and vice versa. The financial and debt crises have attracted public attention to the influence of CRAs on the economy. Many studies reveal that

negative rating events have a significant negative impact on national economies and financial markets (see Section 2.3.1). Hence, it is plausible that voters would respond to changes in sovereign credit ratings by changing their political preferences. The unique polling data facilitates the estimation of immediate changes in government support in response to credit rating events. This enhances the understanding about the signalling effect of CRAs on voters' perceptions with respect to the quality of the incumbent.

Chapter 5 examines whether government support changes in the aftermath of terrorist attacks. Exogenous events such as terrorist attacks or natural disasters, which cause economic loss, also affect the support for the government (See Section 2.2.2). Prior studies examine whether these events change electoral outcomes (e.g. Ramos and Sanz, 2018) or government durations (e.g. Williams et al., 2013b). These studies provide evidence supporting the presence of the political impact of these events, albeit they are beyond the control of the government. However, previous studies are unable to capture immediate changes in government support after exogenous events. Such changes may affect the way the incumbent responds and implements policies. By using polling data, this Chapter brings this concern to the forefront and enhances the understanding about the immediate political effect of terrorist attacks.

Chapter 6 focuses on the effect of political uncertainty on financial markets. Particularly, it examines how stock markets react to election uncertainty and election shock. There is an extended literature that examines market reactions during elections (See Section 2.4.1). Probabilities of electoral outcomes are associated with future policy uncertainty, hence significantly affect market uncertainty (Goodell et al., 2020). Several studies provide evidence supporting this view, but none of them evaluates election uncertainty and election shock measured directly from pre-election polling results at a multi-country level (See Section 2.4.1). As the betting data is not available for all EU countries, polling data is the only indicator of public support for political parties in the absence of election. By using an innovative polling data, this thesis provides a better understanding of the market impact of changes in political support measured by polling results during elections.

This thesis uses a unique dataset of polling results measuring the daily support for political parties in European countries. Opinion polls are carried out by polling firms as requested by newspapers, TV programmes, and the government, in order to capture the support for political parties and the winning likelihood of these parties in forthcoming elections (Smales, 2016). I hand-collected pre-election polling data from online news articles and publicly available polling datasets and built an extensive polling dataset for European countries. While most prior studies use a dataset of government support during elections (vote

shares), this polling dataset provides the percentage support across time for the incumbent party from 2000 to 2017 (with 13,596 daily observations used in Chapters 4 and 5) as well as for all political parties from 2005 to 2019 (with 9,341 daily observations used in Chapter 6).[5] This comprehensive polling dataset allows the examination of immediate changes in government support in the aftermath of sovereign rating news and terrorist attacks throughout the sample period (not only on or around elections) in Chapters 4 and 5, respectively. It also allows the calculation of the election uncertainty and election shock directly from pre-election polling results, which measure voters' expectations about the likelihood of winning for various political parties, used in Chapter 6. Given the rich dataset at a multi-country level, this thesis overcomes the use of a single country sample, which was employed in prior studies (e.g. Li and Born, 2006; Goodell and Vähämaa, 2013; Goodell et al., 2020) and captures the characteristics of different political systems across countries. The dataset of polling results provides an innovative measure of government support across time at the multi-country level, which contributes to the analyses in two strands of literature: First, the determinants of government support; Second, the reactions of stock markets to election uncertainty. In comparison to lower-frequency datasets (e.g. vote shares at elections), the daily polling data is more advantageous in reducing endogeneity bias, hence could provide more robust estimation results. Furthermore, in the absence of elections, opinion polls are the only indicator of the public support for political parties in European countries.[6] The polling dataset is jointly analysed with the rich datasets of sovereign credit ratings, terrorist attacks, elections, and stock indices to answer the research questions. A dataset of daily observations of long-term foreign-currency sovereign credit ratings is obtained from the three biggest CRAs (S&P, Moody's, and Fitch) and used in Chapter 4. A terrorism dataset collected from Global Terrorism Database is used in Chapter 5. A dataset of elections, obtained from European Election Database and government websites, along with a dataset of daily, high, and low stock prices obtained from Thomson Eikon are used in Chapter 6.

In order to address the research questions, the thesis employs various methodologies, namely the fixed-effects model (FEM), the propensity score matching (PSM), and the event study. Chapter 4 employs the FEM and PSM, which are commonly used in the credit rating literature (e.g. Almeida et al., 2017; Cai et al., 2019). These methods are employed to deal with

[5] The characteristics of the polling data sample is discussed in Chapter 3 (for data used in Chapters 4 and 5) and Chapter 6.

[6] Some prior studies use betting markets to measure political support in the US (e.g. Goodell and Vähämaa, 2013; Goodell et al., 2020) (See Section 3.1). There is a limited availability of electoral betting data in European countries. Only five countries have betting data: France, Germany, Ireland, Netherlands, and the UK (See Chapter 3).

possible endogeneity effects caused by confounding variables. Inspired by Dai et al. (2020), the FEM and PSM are also used in Chapter 5. The PSM approach used in Chapters 4 and 5 employs the Nearest Neighbour Matching (NNM) with replacement and caliper matching. Chapter 6 uses the FEM and the event study following Fan et al. (2020b). This Chapter employs two stock market indicators: stock return and stock volatility, in which daily stock volatility is calculated based on intraday high and low stock prices (Parkinson, 1980).

Next, the main results from empirical chapters and their key implications are discussed. Chapter 4 examines the impact of sovereign credit ratings on government support using a panel dataset of 27 European countries (excluding Luxembourg) from September 21, 2000 to July 28, 2017.[7] Chapter 4 shows that sovereign credit ratings significantly influence the electoral prospects of incumbent politicians, albeit in an asymmetric way. Citizens tend to punish their governments in response to negative rating events, but they do not seem to reward their government in the case of positive rating events. Moreover, they are sensitive not only to actual rating changes but also to outlook and watch credit signals. These findings imply that sovereign credit news, which signals the government's quality, plays a crucial role in explaining the mechanism behind voting behaviour. In order to maintain public support, governments must adopt policies to ensure a manageable level of public debt, stable economies, and stable financial markets in order to avoid negative rating actions by CRAs during their time in office.

Chapter 5 investigates the impact of terrorist attacks on government support. I employ the same dataset of polling results of 27 European countries as used in Chapter 4 combined with terrorism data from September 21, 2000 to July 28, 2017. The results of Chapter 5 suggest that terrorist attacks tend to draw citizens to rally behind their leaders despite the loss of lives and the negative impact on the economy. However, differently from the rest of European countries in the sample, the effect of terrorist attacks on government support in Germany and France does not appear to be significant. This could be driven by the variations in economic conditions, trust in government, or media coverage of the terrorist events in France and Germany compared to the remaining countries (Baum, 2002; Chowanietz, 2011; Chatagnier, 2012). Focusing on the sample of remaining countries, the rally effect is robust to various specifications, including different regions, type of attacks, level of fatalities, and repeated attacks. More severe terrorist attacks lead to stronger support for the government. These findings suggest that terrorist attacks, which are usually beyond the control of the government, influence voters' preferences. After terrorist attacks, citizens tend to provide more support for

[7] There is no polling data available for Luxembourg during the sample period.

the government with the hope that their leaders can solve the problem and guarantee their safety, thus implying that improvements in counter terrorism can increase the likelihood of re-election.

Chapter 6 examines how stock markets react to election uncertainty and election shock using various datasets which covers 91 elections in 26 European countries (excluding Luxembourg and Lithuania) from January 01, 2005 to September 03, 2019.[8] The results of Chapter 6 reveal that election-induced uncertainty significantly affects the volatility of stock markets in the pre-election period. Additionally, the stock volatility increases in the post-election period and its magnitude is affected by the accuracy of election prediction. Stock returns appear to be unaffected by election uncertainty and election shock. These results suggest that the uncertainty around elections is more likely to cause the discrepancy in stock valuations rather than the actual change in stock return. During periods of increased stock volatility induced by elections' uncertainty, investors can hold option contracts to hedge against alternative electoral outcomes. Both election uncertainty and election shock are measured directly from polling results (See Section 6.4.2), hence Chapter 6 reveals that information provided by opinion polls impact financial markets. This suggests that polling results can be used as a proxy for the market expectation on the electoral outcome.

Overall, the thesis makes substantial contributions to several strands of literature and policy debates. Firstly, Chapter 4 is connected to the line of studies on economic voting which examines the relationship between voters' preferences and the performance of national economy and financial markets. Chapter 4 also contributes to the credit rating literature by highlighting the role of CRAs in politics beyond credit markets. Secondly, Chapter 5 helps to identify the determinants of government support and enhances the understanding of how citizens react to extreme events that negatively affect national economies. The findings of Chapter 5 contribute to the literature that studies voters' rationality in response to exogenous events beyond the control of the government. Thirdly, the results of Chapter 6 confirm the sensitivity of stock markets to the uncertainty derived by political events. This contributes to the literature about the relationship between financial markets and political uncertainty. Chapter 6 also furthers the knowledge on the importance of opinion polls and markets prediction in gauging voting intentions, so that they could be used to explain election shocks and market uncertainty. Finally, the thesis furthers the debates surrounding the most appropriate way for maintaining political and financial stability in the future by providing a

[8] There is no polling data available for Luxembourg. High and low stock prices data is not available for Lithuania.

better understanding of the mechanisms behind changes in political support and increased market uncertainty, respectively. The findings of the thesis may be of interest to a range of market participants, as well as CRAs, pollsters, regulators, and policymakers.

The remainder of the thesis is organised as follows. Chapter 2 reviews the most relevant literature on government support, sovereign credit ratings, and stock markets' behaviour during political events. Chapter 3 explores the hand-collected polling results for the incumbent party used in Chapters 4 and 5. Chapter 4 examines the impact of sovereign credit ratings by S&P, Moody's, and Fitch on government support. Chapter 5 investigates changes in government support in the aftermath of severe terrorist attacks. Chapter 6 examines how stock markets respond to the election uncertainty before elections and the accuracy of the election prediction after elections. Chapter 7 presents the conclusion of the thesis, including a discussion of the thesis' implications and potential future research directions.

Chapter 2 Literature review

2.1 Introduction

The 2007-09 global financial crisis and the 2010-12 European sovereign debt crisis provide a context in which the stability of both financial markets and politics was shaken up in European countries (see Chapter 1). European governments which are run by mainstream parties have been less supported, especially in countries with high level of debt, while right-wing extremist and populist parties tend to gain more support (Funke et al., 2016; Foster and Frieden, 2017; Guiso et al., 2019). This political polarisation causes partisan conflict and policy uncertainty which in turn affects market uncertainty. Hence, it is important to investigate what drives such movement in political support and how political support interacts with financial stability, which are the focuses of this thesis. This Chapter provides a thorough review of the existing literature which is most closely related to the key themes of this thesis. Prior studies are insightful and provide a theoretical basis for issues examined in empirical chapters. More specific and focused literature reviews are included in Chapters 4, 5, and 6.

Section 2.2 reviews previous research on how voters react to: (i) changes in economic conditions, and (ii) exogenous events that affect the national economy (e.g. terrorist attacks, natural disasters). Firstly, the review of the literature that links the economy and government support at elections ("vote") or across time ("poll") reveals that voters are sensitive to changes in economic conditions. Such changes are perceived by voters to evaluate the political quality of the incumbent. This strand of literature is relevant for Chapter 4 of this thesis. Secondly, prior studies find that exogenous events, which are outside the direct control of the incumbent, could alter voters' preferences via their impact on voters' emotion and perception of the incumbent's quality. This finding is relevant for Chapter 5 of this thesis.

Section 2.3 reviews the literature on the nature of sovereign credit rating, and highlights its market and economic impact, along with its link to politics. The key finding is that sovereign credit ratings, which consider economic, political, and social conditions (Vu et al., 2017), have a widespread impact on the national economy and financial markets of the rated-country, such as bond, equity, CDS, currency, and derivative markets. The effect of sovereign rating events also spreads to other countries' economies and financial markets. Moreover, it has been shown that sovereign ratings have a strong link with politics. This raises the question whether sovereign ratings may influence the level of political stability, via the point of being able to

affect the electoral prospect of the incumbent. This argument is considered in Chapter 4 of this thesis.

Section 2.4 reviews the available research on the response of stock markets to political events. This section is divided into four sub-sections corresponding with four groups of political events: (i) elections and referendums; (ii) wars and political crises; (iii) terrorist attacks; and (iv) political speeches and unanticipated events. While the universe of all political events is immense, political events presented in this section are selected based on practical considerations and literature availability. It has been shown that market participants are sensitive to the political cost/benefit induced by political events, resulting in changes in stock return and stock volatility. This finding is relevant for Chapter 6 of this thesis.

In short, this Chapter is laid out as follows. Section 2.2 reviews the literature on government support, Section 2.3 reviews the literature on sovereign credit ratings, and Section 2.4 reviews the literature on how stock markets react to political events. Section 2.5 concludes with a critical discussion on the gaps in the literature that this thesis will fill, highlighting the contribution of the thesis.

2.2 Government support

Prior studies find that economic variables play an important role in determining government support. Citizens are sensitive to economic conditions in forming their attitudes toward the incumbent party. Given the powerful policy instruments, the government is held responsible for changes in economic conditions. Studies in this field are conducted at micro (e.g. individual surveys) and macro (e.g. analysing macro time series) levels to enhance the understanding of the relationship between the economy and government support. Section 2.2.1 presents the literature that links the economy and government support at elections and during pre-election periods. Section 2.2.2 discusses how citizens react to exogenous events which affect the national economy.

2.2.1 The economy and government support

Nannestad and Paldam (1994) and Lewis-Beck and Stegmaier (2013, 2019) review the literature that examined the relationship between the economy and voters' preferences since the early of 1970s. They conclude that the economy affects government support and electoral outcomes in different ways, across countries, and over time (see Table 2.1). The relationship

between the economy and government support is referred to the term "economic vote" (Lewis-Beck and Stegmaier, 2013). According to the economic voting theory, when the economy improves, the support for the government increases. When the economy declines, the support for the government decreases. Several studies support for this theory, for example Fauvelle-Aymar and Stegmaier (2013), Healy and Malhotra (2013), Lewis-Beck and Stegmaier (2013, 2019), Sen and Donduran (2017), Tilley et al. (2018), and Park (2019).

Statistical models assessing the relationship between the economy and government support are called "Vote and Popularity functions" ("VP-functions") (Lewis-Beck and Stegmaier, 2019). In VP-functions, "V" stands for the vote for the government at elections (in "V-functions"), while "P" stands for government support in the pre-election poll (in "P-functions") (Lewis-Beck and Stegmaier, 2013). In general, the VP-function explains how the economic outcomes are linked to government support as measured by votes and polls.[9] Votes and polls send signals to politicians, however polls seem to have stronger signalling aspect (Nannestad and Paldam, 1994). Votes take place only after the election campaign, while polls are conducted daily, weekly, or monthly prior to elections. In the absence of elections, polls show the public support for the party in office.

The basis for economic voting is the 'responsibility' hypothesis which suggests that voters hold the government accountable for the state of the economy (Lewis-Beck and Stegmaier, 2019). The responsibility hypothesis is framed in terms of economic outcomes, not of economic policies. Therefore, prior studies consider the standard macroeconomic variables, such as economic growth, inflation, and unemployment as the most important predictors in the VP-functions, however their findings are controversial (e.g. Powell and Whitten, 1993; Roberts, 2008; Fauvelle-Aymar and Stegmaier, 2013; Dassonneville and Lewis-Beck, 2014; Kirchgässner, 2016).[10] While Nannestad and Paldam (1994) highlight the importance of unemployment and inflation, Lewis-Beck and Stegmaier (2013, 2019) argue that unemployment and growth are more important in determining government support.

With respect to the effect of inflation, prior studies reveal that inflation has a mixed and inconsistent effect on government support (e.g. Powell and Whitten, 1993; Chappell and Veiga, 2000; Singer, 2013; Fauvelle-Aymar and Stegmaier, 2013). Chappell and Veiga (2000) analyse 136 elections in 13 Western European countries from 1960 to 1997 and indicate that

[9] Instead of using traditional pre-election polls, some US studies (e.g. Goodell et al., 2020) use the prediction data from the presidential election markets (e.g. Iowa Electronic Markets (IEM)) to proxy for the probabilities of success of the presidential candidates.

[10] Macroeconomic time series data typically have a lag structure of $t - 1$ as voters are myopic with a typical memory of one year (Lewis-Beck and Stegmaier, 2013) (see Table 2.1).

voters punish incumbents when inflation increases. Focusing on US presidential approval from 1960 to 2011, Fauvelle-Aymar and Stegmaier (2013) also find that inflation is negatively associated with the presidential approval. However, Powell and Whitten (1993) argue that inflation may have partisan effects on government support because voters expect a right-wing government to deal better with inflation compared to a left-wing government. Using a sample of 100 elections in 19 countries from 1969 to 1988, they find that right-wing governments seem to be punished (rewarded) for higher (lower) inflation rate. In addition, left and centre governments appear to be unaffected by inflation rate. More importantly, Powell and Whitten (1993) find that unemployment and growth are key variables for government supports. They argue that higher GDP growth should help all governments. However, unemployment should have a partisan effect, whereby left-wing governments should be punished (rewarded) for higher (lower) unemployment. This partisan effect is also discussed by Potrafke (2017), who argues that the incumbents tend to provide policies that reflect their party's preferences. Particularly, a left-wing party is more concerned with their labour base, while a right-wing party attracts capital owners, and hence is more focused on reducing inflation. The significant effects of unemployment and growth on government support are emphasised in other studies (e.g. Fidrmuc, 2000; Benton, 2005; Roberts, 2008; Dassonneville and Lewis-Beck, 2014; Healy and Lenz, 2017). The effect of other measures of national economy, such as wages, military expenditures, disposable income, consumer confidence, and tax burden, on government support are also examined (e.g. Douglas, 1975; Monroe, 1978; MacKuen et al., 1992; Geys and Vermeir, 2008; Healy and Lenz, 2017). These economic measures have predictive power in most election forecasting models, for example Abramowitz (2008), Lewis-Beck and Stegmaier (2014); Lewis-Beck and Dassonneville (2015).

Within this VP-function literature, some studies consider stock market performance as a predictor of voters' intentions (e.g. Nadeau et al., 2010; Chong et al., 2011; Fauvelle-Aymar and Stegmaier, 2013; Sen and Donduran, 2016). Fauvelle-Aymar and Stegmaier (2013) reveal that the performance of stock markets is positively associated with the presidential approval in US. They argue that stock markets capture both national economic health and the personal wealth of individuals who own stocks, hence significantly affect voters' preferences. They also find that a deceleration in the stock market index reduces presidential approval, whereas a sharp rise in the index boosts the support. Nadeau et al. (2010) introduce the "patrimonial economic voting" theory indicating that voters who own high-risk assets, of which one component is stock, tend to favour economic policies that are pro-business and against state regulation. Hence, voters with more patrimony tend to prefer right-wing parties. Consistently, Quinlan and

Okolikj (2019) find a significant effect of asset ownership on voting. The more assets owned, the stronger the support for the right-wing party. Their sample includes 34 elections in 34 countries obtained from a survey in 2018 provided by Comparative Study of Electoral Systems (CSES).

Inspired by the 2007-09 global financial crisis, there are various studies that investigated how the personal experience of economic shocks (e.g. job loss or sharp drop in income) affects political preferences and vote choices in recent years. Margalit (2019) reviews the relevant studies in this strand of literature and concludes that economic shocks tend to cause a decline in the incumbent's support. Particularly, using the British Household Panel Survey from 1991 to 2008, Tilley et al. (2018) show that a drop in personal earnings is associated with less support for the incumbent regardless of partisan effects. In the same vein, Ahlquist et al. (2018) investigate the political impact of an income shock in Poland, which was induced by a surprise revaluation of the Swiss franc in early 2015. Their findings indicate that supporters for the incumbent party who experienced the income shock were more likely to vote against the incumbent in the subsequent election. Healy and Lenz (2017) examine the impact of changes in wages and employment around the 2008 financial crisis on the US presidential election outcomes at zip code and county levels. They find that the incumbent is less supported in the aftermath of negative economic shocks.

The economic vote may be asymmetric (Mueller, 1973). Particularly, the government might be punished if the economy turns bad, but not rewarded if the economy remains good. Many studies have been done on this asymmetric question, however their findings are mixed (e.g. Dassonneville and Lewis-Beck, 2014; Park, 2019; Marinova and Anduiza, 2020). Using a sample of 359 elections in 31 European countries, Dassonneville and Lewis-Beck (2014) find that government support at elections are more affected in bad economic times rather than good economic times. Soroka (2006) argues that voters will pay more attention to bad news if they are averse to risk. When the economy declines, information on the state of the economy is abundant as the result of media effects (Marinova and Anduiza, 2020). They argue that citizens have incentives to acquire such information in order to punish incumbents for their failure in managing the economy. However, Park (2019) does not find a robust support for the asymmetric hypothesis using CSES surveys from 122 elections in 42 countries from 1996 to 2016.

Another strand of micro-studies focuses on economic voting along two dimensions: "target" and "time" (Lewis-Beck and Stegmaier, 2019). "Target" refers to whether voters are more focused on the national economy (sociotropic) or their personal financial situation

(egocentric). "Time" refers to whether voters are more likely to look backward (retrospective) than forward (prospective) when evaluating the economic conditions. Many studies have consistent findings indicating that sociotropic economic voting has a stronger impact than egocentric economic voting (e.g. Anderson, 2000; Lockerbie, 2006; Duch and Stevenson, 2008; Nadeau et al., 2013). However, Healy et al. (2017) show that egocentric voting is at least as important as sociotropic voting in the 2010 Swedish election. With respect to the "time" dimension, the findings are inconclusive. The effect of retrospective economic voting seems clear, with voters tending to look backward to the performance of the economy (e.g. Kiewiet, 1983; Anderson, 2000; Duch and Stevenson, 2008; Avdeenko, 2018). However, the impact of prospective economic voting remains controversial (e.g. Lockerbie, 1992; Nadeau and Lewis-Beck, 2001; Campbell et al., 2010; Elinder et al., 2015).

In short, government support, measured by voting intention in pre-election periods or actual votes at elections, is significantly influenced by the performance of the national economy and stock markets. The economic vote is influenced by the clarity of government responsibility for the economy (Dassonneville and Lewis-Beck, 2017).

2.2.2 Exogenous events and government support

There is substantial literature focusing on how economic conditions affect government support (see Section 2.2.1). However, the reason why economic outcomes affect voting behaviour is not yet well understood because it is challenging to identify variations in economic conditions that are not under direct control of incumbents (Bagues and Esteve-Volart, 2016). In addition, it is difficult for voters to determine when the macroeconomic factors begin to contract and affect them (Healy and Malhotra, 2010). To overcome these issues, some studies investigate how citizens react to exogenous events which affect national economies.

A summary of literature on how citizens react to exogenous events is presented in Table 2.2. The typical exogenous events are terrorist attacks and natural disasters (e.g. Healy and Malhotra, 2010; Gassebner et al., 2011; Montalvo, 2011; Cole et al., 2012; Carlin et al., 2014; Park and Bali, 2017; Ashworth et al., 2018; Nowak, 2018). Ashworth et al. (2018) propose a model of voter learning and indicate that any shocks beyond the control of policy makers (e.g. natural disasters) can affect incumbent electoral outcomes. They argue that this is not evidence of voter irrationality. Instead, it supports the rational voter hypothesis, in which voters are rational and these events provide opportunities for voters to learn new information about incumbents in terms of level of preparedness or response to the loss. Their model suggests that

changes in voters' perception suffice to change voters' behaviour, hence affect incumbent electoral fortunes.

Extreme events, such as terrorist attacks and natural disasters, cause a significant loss of lives and personal injuries, as well as economic loss. Despite the negative effects of these events, the evidence on their political consequences remains mixed. While some studies find an increase in government support (e.g. Chowanietz, 2011; Chatagnier, 2012; Feinstein, 2016; Nowak, 2018), others show a decreasing trend in the aftermath of these events (e.g. Healy and Malhotra, 2010; Gassebner et al., 2011; Montalvo, 2011; Cole et al., 2012; Williams et al., 2013b; Park and Bali, 2017). On the positive side, people tend to increase their support for their leaders in the hope that they will solve the problem. For example, in the aftermath of the 9/11 terrorist attacks in US, Hetherington and Nelson (2003) report an increase in the presidential approval for George W. Bush (from 51% on 10/9/2011 to 86% on 15/9/2011). Consistently, during the first Gulf War, government support increased in Britain (Lai and Reiter, 2005) and in Israel (Arian and Olzaeker, 1999). Using a sample from 2014 to 2017 and the logit model, Nowak (2018) also finds that Islamist terrorist attacks have a positive impact on citizens' evaluations of the government in Germany. Similarly when considering natural disasters such as wildfire, Ramos and Sanz (2018) find that the vote share of the incumbent party tends to increase when there is a large wildfire up to nine months prior to local election. Their study covers large wildfires in Spain during 1983 – 2011 and uses the Differences-in-differences (DID) approach.

On the negative side, Montalvo (2011) find that bombings in Madrid in 2004 (three days before the election) affect the choice of voters in the 2004 congressional election, with the incumbent party losing the election although polls were quite favourable for this party prior to the election. Citizens blame the government when terrorism increases as they hold the incumbent accountable for the lack of national security. Rather than focusing on electoral outcomes, Park and Bali (2017) find evidence supporting the presence of the terrorism's impact on the likelihood that the autocrat leaders lose power by analysing a sample of 163 countries from 1968 to 2004. Additionally, using a dataset of 150 countries from 1970 to 2002, Gassebner et al. (2011) reveal that terrorism significantly causes the failure of the cabinet, hence shortens cabinet duration. Regarding natural disasters (e.g. tornadoes, wildfires, or catastrophic rainfalls), Healy and Malhotra (2010), Gasper and Reeves (2011), and Cole et al. (2012) consistently show that voters punish the incumbent party in the aftermath of these events, especially when no declaration takes place. The declarations often provide information about the damage and funds delivered to disaster-stricken areas demonstrating the response of

the government to disasters. Gasper and Reeves (2011) argue that although natural disasters are beyond human control, incumbents must handle the consequences of these events.

Other studies focus on the response of voters to exogenous changes in economic conditions. Bagues and Esteve-Volart (2016), for example, study the effect of good economic conditions generated by the Spanish Christmas Lottery on voters' behaviour. They employ the FEM to exploit how the income shocks generated by the Christmas Lottery affect macroeconomic variables and voting behaviour. Using a dataset of national elections from 1986 to 2008, they find that incumbents receive more support from voters residing in provinces that won lottery. This is consistent with the evidence provided by Healy et al. (2010), who indicate that the electoral outcome is affected by the outcome of US local college football games just before an election. They argue that game outcomes significantly affect people's well-being, either directly or via mood contagion in social networks. Hence, when the well-being of voters increases, voters reward the government even though such changes are due to events beyond the government's control.

In short, voters' preferences are affected by exogenous events outside the control of the government. Although the government do not plan for them, these events can influence its support, either via voters' feeling or via new information from which voters learn about the government's quality.

2.3 Sovereign credit ratings

Sovereign credit ratings are risk assessments assigned by CRAs, which evaluate the relative likelihood that the country will default on its obligations (Almeida et al., 2017). It indicates the ability and willingness of a country to service its debt in full and on time. Sovereign ratings help governments to demonstrate financial transparency, hence enhance the capability of the private sectors in the rated country to access global capital and attract foreign direct investment (FDI) (Alsakka and ap Gwilym, 2009). Given this importance, sovereign ratings started to flourish during the 1990s with the increasing number of emerging countries get rated.[11]

S&P, Moody's, and Fitch are three main CRAs. Sovereign credit ratings are assigned by CRAs using an alphabetical rating scale (such as AAA/Aaa, BBB+/Baa1) which represents the level of sovereign credit risk.[12] These ratings are divided into two categories: investment

[11] Fitch rated 117, Moody's 142, and S&P 135 sovereigns (Fitch, 2020a; Moody's, 2019a; S&P, 2020).
[12] More details on the rating scale is presented in Section 4.4.1.

grade (from AAA/Aaa to BBB/Baa2) and speculative grade (from BBB-/Baa3 to C/D) (Fitch, 2017; Moody's, 2017; S&P, 2017a). The "Investment grade" group signals countries with low to moderate credit risk, while the "Speculative grade" group indicates that countries either have a higher level of credit risk or that a default has already occurred in the rated country. Additionally, CRAs assign the outlook/watch status together with the actual ratings to show the direction of potential rating change.[13]

CRAs build their own models to evaluate the credit risk and assign sovereign credit ratings. Although there might be differences in CRAs' rating criteria and the relative weight to each criterion, they may include some economic and political factors in common. Particularly, S&P assigns ratings based on five factors: institutional, economic, external, fiscal, and monetary assessment (S&P, 2017b). Moody's considers four aspects: economic strength, institutional and governance strength, fiscal strength, and susceptibility to event risks (Moody's, 2019c). Fitch employs a relatively similar set of criteria including: structural features of the economy and political stability; macroeconomic performance, policies, and prospects; public finances; and external finances (Fitch, 2020b).

Many studies have examined the determinants of sovereign credit ratings. According to Cantor and Packer (1996) and Mellios and Paget-Blanc (2006), sovereign ratings can be largely explained by the key determinants such as per capita income, government income, GDP growth, inflation, external debt, level of economic development, exchange rate, and default history. Other factors, such as current account balance, foreign reserves, exports, corruption level, and social indexes, also play an important role in determining sovereign credit ratings (Monfort and Mulder, 2000). In the same vein, Afonso et al. (2011) evaluate short-run and long-run effects of macroeconomic and fiscal variables on sovereign credit ratings. They find that changes in GDP per capita, GDP growth, government balance, and government debt have short-run effect on sovereign ratings. Other variables, such as government effectiveness, foreign reserves, external debt, and default history, are more likely to have a long-run effect on sovereign ratings.

In summary, rating a sovereign's creditworthiness with respect to its capacity and willingness to fulfil its debt encompasses qualitative and quantitative information contained in economic and political factors. Hence, sovereign ratings can be used as a measure of national economic and political health. To understand the importance of sovereign ratings, Section 2.3.1

[13] If CRAs anticipate that a credit rating may change in the coming 6 to 24 months (in near term, usually within 90 days), they may issue an outlook (watch) signal indicating whether the possible change is likely to be "positive," "negative," "stable," or "developing" (meaning it's uncertain whether a rating might go up or down).

discusses their impact on financial markets and national economies. In addition, Section 2.3.2 reviews the link between politics and sovereign ratings.

2.3.1 Market and economic impact of sovereign ratings

The 2007-09 global financial crisis and the 2010-12 European sovereign debt crisis have triggered increased interest in the impact of sovereign credit ratings. Prior studies show that sovereign ratings, outlook and watch signals affect the performance of financial markets and the national economy (e.g. Gande and Parsley, 2005; Ferreira and Gama, 2007; Hill and Faff, 2010; Afonso et al., 2012; Chen et al., 2016c). Sovereign rating events not only affect the own-country markets but also cause significant spillover effects to other countries' markets, particularly in emerging countries, neighbouring countries, and during crisis periods (e.g. Gande and Parsley, 2005; Ferreira and Gama, 2007; Alsakka and ap Gwilym, 2012). Furthermore, Arezki et al. (2011) find that sovereign rating downgrades not only have regional contagion effects across European countries but also across financial markets, for example, CDS, banking, insurance and stock markets during the period of European sovereign debt crisis.

Table 2.3 reports a summary of key studies on the market and economic impact of sovereign credit ratings. Regarding bond markets, changes in sovereign ratings move sovereign bond yield spreads (e.g. Gande and Parsley, 2005; Afonso et al., 2012; Böninghausen and Zabel, 2015; Baum et al., 2016). Using a sample of 4 European countries (France, Germany, Italy, and Spain) during 2010-2012 European debt crisis and the event study approach, Baum et al. (2016) find that sovereign bond yields increase in response to negative rating events. Afonso et al. (2012) explore the relationship between sovereign yield spreads and rating news using a dataset of ratings and outlooks of 24 European countries from 1995 to 2010. They find that bond yield spreads respond to changes in both actual ratings and outlooks, particularly important for the case of negative rating events. The impact of positive events is limited. In terms of methodology, they employ the event study method to investigate whether sovereign bond yield spreads around rating events are different to those without rating events. They also use country fixed-effects (FE) to capture the unobserved countries' characteristics (see more details about the FEM in Section 4.5.1). In addition, Afonso et al. (2012) find evidence of rating announcement spillover effects, particularly from lower rated countries to higher rated countries. This finding is consistent with the finding of Böninghausen and Zabel (2015), who indicate that negative rating events have significant spillover effects to other countries' bond markets, and the effects are more pronounced for countries in the same region. However,

positive rating events have insignificant spillover effects. Their study covers 73 developed and emerging countries during 1994-2011.

Sovereign rating events also have significant effects on options and CDs markets (e.g. Ismailescu and Kazemi, 2010; Arezki et al., 2011; Afonso et al., 2012; Tran et al. 2014; Drago and Gallo, 2016). Regarding option markets, Tran et al. (2014) examine the response of the equity index option market to sovereign credit ratings events using a sample of 24 countries from January 2000 to April 2012. They employ the event study method and find that S&P and Moody's signals have a stronger impact on option-implied volatility than Fitch's signals do. Regarding CDS markets, Ismailescu and Kazemi (2010) examine the effect of rating events on CDS spreads of 22 emerging countries, and their spillover effect on other countries' CDS premiums. They find that positive rating events have a significant impact on CDS markets within the two-day window around the event and are more likely to have spillover effects to other emerging countries. In contrast, Afonso et al. (2012) find that CDS markets significantly respond to negative rating news, while the reaction to positive rating news is insignificant. Drago and Gallo (2016) use the event study approach and show that both rating downgrades and upgrades significantly affect CDS markets in 15 European countries from 2004 to 2015.[14] However, CDS markets do not seem to react to outlook and watch signals. Additionally, they find that only rating downgrades have spillover effects to other European countries' CDS markets.

Prior studies find that the influence of sovereign rating news on equity markets is asymmetric (e.g. Brooks et al., 2004; Ferreira and Gama, 2007; Hill and Faff, 2010; Afonso et al., 2014). Particularly, Brooks et al. (2004) examine the impact of sovereign rating changes on abnormal stock returns using the dataset of all rating actions by 4 CRAs, namely Moody's, S&P, Fitch and Thomson from 1973 to 2001. They use the event study method and find that rating downgrades have a negative impact on stock returns, while rating upgrades have an insignificant effect. Ferreira and Gama (2007) find the evidence of spillover effects indicating that changes in sovereign ratings have an asymmetric impact on other countries' stock markets, whereby negative sovereign rating events cause significant market reactions, while the impact of positive events is insignificant. Their study is based on the data of S&P's rating announcements in 29 countries from 1989 to 2003. Using a sample of 21 European countries

[14] The sample includes 15 European countries: Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Slovakia, Slovenia, and Spain.

from1995 to 2011[15], Afonso et al. (2014) find that rating downgrades increase stock market volatility, while rating upgrades have an insignificant impact. They also find that actual rating changes have spillover effects to other countries' market volatility. Tran et al. (2019) propose a model to capture the effect of multiple CRAs' sovereign credit rating actions within a specific time window and then empirically examine the effect of rating actions on stock and currency markets. Using a sample of 41 countries from 2007 to 2013, they find that sovereign rating news from one CRA and additional confirmation news by other CRAs could coordinate investors' heterogeneous beliefs, hence significantly affect both stock and currency markets.

In addition to Tran et al. (2019), many studies examine how currency markets react to sovereign credit rating news (e.g. Hooper et al., 2008; Alsakka and ap Gwilym, 2012, 2013; Baum et al., 2016). Alsakka and ap Gwilym (2012, 2013) investigate how foreign exchange markets respond to rating announcements from the three main CRAs (S&P, Moody's, and Fitch). While Alsakka and ap Gwilym's (2012) study covers 112 countries worldwide from 1994 to 2010, Alsakka and ap Gwilym's (2013) study covers 42 European and Central Asian countries from 2000 to 2010. Both studies indicate that positive and negative rating events affect both the rated country exchange rate and other countries' exchange rates. In addition, Alsakka and ap Gwilym (2013) find that market reactions and spillover effects seem to be stronger during the financial crisis (from 2006-2010) than the pre-crisis period (from 2000-2006) given the increasing public debt and higher risk of sovereign default during the crisis period. In terms of methodology, both studies employ the event study approach with a set of country and year dummies. Baum et al. (2016) examine how Euro exchange rates react to sovereign rating events announced by Moody's, S&P and Fitch during the European debt crisis from 2010 to 2012. They use the event study approach combined with the GARCH model and find that negative rating events have an insignificant impact on the value of the Euro currency, however these events cause higher exchange rate volatility.

Other studies find that changes in sovereign credit ratings significantly affect economic growth (e.g. Chen et al., 2016b; Chen et al., 2016c), FDI (Kim and Wu, 2008; Cai et al., 2019), and international portfolio flows (Gande and Parsley, 2014). Chen et al. (2016c) examine how S&P sovereign rating news affects the rated-country's economic growth using a sample of 103 countries during the period from 1982 to 2012. Using the system generalised method of moments (GMM) and the DID approach, they find that rating upgrades (downgrades) cause increases (decreases) in the rated-country's five-year average annual growth rate. Changes in

[15] The sample covers 21 European countries: Austria, Belgium, Bulgaria, Czech, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Spain, Sweden, and UK.

sovereign ratings affect economic growth via their impact on the interest-rate and capital-flow channels. Chen et al. (2016b) extend the study of Chen et al. (2016c) indicating that sovereign rating changes have significant spillover effects on other countries' economic growth. Kim and Wu (2008) examine whether S&P ratings help in attracting international capital inflows, using the dataset of 51 emerging markets from 1995 to 2003.[16] They use the FEM and find that sovereign ratings affect financial intermediary sector developments and capital flows. Cai et al. (2019) investigate whether sovereign rating events affect FDI flows from 17 emerging countries to 71 recipient countries during 2001-2012 using the FEM. They show that investors in emerging countries are more likely to engage in FDI activities when their own country ratings increase and that they tend to invest more in developed countries with high rating levels and emerging countries with low rating levels. Sovereign ratings also represent a ceiling for ratings assigned to non-sovereign issuers within the country (Alsakka and ap Gwilym, 2013). Therefore sovereign rating events should affect bank credit ratings (e.g. Williams et al., 2013a; Adelino and Ferreira, 2016) and corporate credit ratings (e.g. Almeida et al., 2017; Hill et al., 2018).

In short, sovereign credit ratings consider the information contained in economic, social, and political factors, and hence they have a widespread impact on financial markets and national economies.

2.3.2 Links between politics and sovereign ratings

The number of studies on the interaction between politics and sovereign credit ratings has increased. This might be attributed to the fact that political uncertainty has featured prominently in the actions of CRAs in recent years. For example, in the US, S&P downgraded the nation's rating for the first time in 2011, stating that political brinkmanship in the debate over the debt had made the US government's ability to manage its finances less stable, less effective and less predictable (Goldfarb, 2011). Political uncertainty is named as the key reason for this downgrade. Another example is the surprise rating cut from A- to BBB+ by S&P in Poland in January 2016, albeit the country's economic condition was still positive. It happened after the country's new right-wing government installed the new Law and Justice Administration which interfered legal and economic governance (Moore and Blitz, 2016). This rating action was driven by political not economic considerations. Similarly, in the UK, the sovereign rating was downgraded very soon after the Brexit vote in June 2016. This resulted

[16] There are three kinds of international capital flows: international banking, FDI and portfolio flows (Kim and Wu, 2008).

in downgrades of many non-sovereign UK ratings. More interestingly, using a dataset of 19 developing countries from 1987 to 1998, Block and Vaaler (2004) find that the sovereign ratings are downgraded more frequently in election years as predicted by the Political Business Cycle (PBC) theory. The PBC theory suggests that incumbents have incentives to pursue economic policies calculated to increase voters' support in an election year even if such policies are contrary to concurrent economic reform programs and potentially affect economic growth and development in the post-election period.

Butler and Fauver (2006) examine whether the quality of a country's legal and political institutions (named by "legal environment") affects its sovereign credit ratings. Using a sample of 86 countries from 1975 to 2004, they find that the legal environment, which is quantified by several factors such as the public voice, government effectiveness, political stability, regulatory quality, rule of law, and corruption, plays an important role in determining sovereign ratings. Among these variables, government effectiveness, rule of law and corruption have the strongest impact. Boumparis et al. (2017) examine how the economic policy uncertainty affects sovereign ratings using a sample of 19 countries in Eurozone from 2002 to 2015. They find that sovereign ratings are negatively affected by economic policy uncertainty and that this effect is more pronounced for countries with lower rating levels.

Using the dataset of 64 countries from 1997 to 2011, Vu et al. (2017) show that political risk plays a highly significant role in explaining the differences of CRAs' opinions in sovereign ratings and dominates economic and financial indicators. This is due to the lack of consistently observable and unbiased measures of political risk. In their study, political risk is proxied by the six Worldwide Governance Indicators (WGIs) estimated by the World Bank including: corruption, political stability and absence of violence, government effectiveness, voice and accountability, regulatory quality, and rule of law indicator.

It is possible that CRAs' actions have a reverse causality on politics. For example, Cunha et al. (2019) find that CRAs' rating actions have a significant impact on electoral outcomes at the county and congressional district level. They investigate the effects by exploiting an exogenous variation in municipal bond ratings due to Moody's recalibration of its scale in 2010. Using the DID approach, they find that the incumbent in upgraded municipalities gains higher vote share and is more likely to get re-elected. Positive rating actions affect elections by improving voters' perception of the quality of incumbents, and by producing personal wealth effects through voters who are municipal bondholders. In fact, some politicians use credit ratings as a proxy for economic conditions in their political speeches to impress audiences. For example, in the interview on CBS television on July 17, 2016 Donald

Trump mentioned the AAA bond credit rating of the State of Indiana, where Mike Pence was governor, as a way to prove the excellent performance of the vice president candidate (Cunha et al., 2019). Another example of political power of CRAs is the case of the resignation of Silvio Berlusconi – former Italian Prime Minister on November 16, 2011 amid the Italian debt crisis (Faiola, 2011). He left the office shortly after the Italian government was downgraded by S&P, Moody's, Fitch, and DBRS in the space of 40 days.

In conclusion, this section provides evidence on the link between politics and sovereign ratings. It is apparent that sovereign rating actions have a significant impact on government support. Therefore, future research in this field should strive to enhance the understandings about this relationship.

2.4 Stock markets' reactions to political events

Asset volatility is caused by changes in asset prices (Goodell et al., 2020). The questions of what drives those changes and why volatility increases in certain periods, especially around political events have been examined in many studies. Pástor and Veronesi (2013) argue that changes in stock prices are driven by three factors: economic shocks, firm-specific shocks, and shocks to political uncertainty. The political cost/benefit induced by political events may drive political uncertainty, hence in turn affects markets uncertainty. This Section reviews the literature on how stock markets respond to specific political events. A summary of literature is reported in Table 2.4. Political events are divided into four groups: (i) Elections and referendums; (ii) Wars and political crises; (iii) Terrorist attacks; and (iv) Political speeches and unanticipated events.

This Section is organised as follows. Section 2.4.1. presents the reactions of stock markets to elections and referendums. Section 2.4.2 discusses the effect of events related to military and political crises on stock markets. Section 2.4.3 provides a discussion on how terrorist attacks affect stock markets. Section 2.4.4 explains how political speeches and unanticipated events (e.g. sudden death of political officer) are interpreted by investors and reflected in stock prices.

2.4.1 Elections and referendums

The impact of political events on stock markets has attracted the attention of many scholars. Among political events, election is the interest of most studies in this field. The election day is known in advance which makes it different from other unpredictable political

events, for example, terrorist attacks. However, the outcome of the election is uncertain, and this might affect stock markets via its impact on policy uncertainty (Goodell et al., 2020).

Prior studies, for example, Li and Born (2006), Snowberg et al. (2007), Goodell and Vähämaa (2013), and Goodell et al. (2020), reveal that the uncertainty of the US electoral outcome is reflected in stock prices during the pre-election period. Using a polling dataset from Gallup Organisation for US presidential elections from 1964 to 2000, Li and Born (2006) construct a standardised measure of election uncertainty by taking the difference between the support for the party out of power and the party in power then divided by the poll's sampling error. They find that stock volatility and stock return tend to increase if the election does not show significant preference to either political party.[17] They argue that such uncertainty raises the unpredictability of the prospect of political changes. Instead of using traditional daily pre-election polls, Snowberg et al. (2007) use ten-minute frequency data from Tradesports political prediction markets to measure the election uncertainty during election day following the release of the exit poll and the vote count of the 2004 US Presidential election. They find that the increase in the re-election probability of the incumbent leads to the increase in stock prices as market participants expect stronger output growth and favourable policy changes if the incumbent remains in office.

Goodell and Vähämaa (2013) and Goodell et al. (2020) examine the effect of election uncertainty on stock markets using the dataset of IEM winner-take-all presidential-election contracts.[18] The prices of contracts indicate the relative probabilities of the respective candidates winning. Focusing on five US elections from 1992 to 2008, Goodell and Vähämaa (2013) find that changes in the support for the eventual winner significantly affect stock volatility. Regardless of the partisan effect, which assumes that markets prefer one political party (e.g. the incumbent party) to another, they argue that the information regarding the likelihood of a particular party winning reflect both the election uncertainty and the future policy uncertainty. Such uncertainty should be reflected by changes in stock volatility. Goodell et al. (2020) examine how the election uncertainty influences financial markets uncertainty using a sample from seven US elections during 1992 - 2016. They reveal that changes in the

[17] In terms of methodology, they employ the GARCH model to impose an autoregressive structure on conditional variance which allows shocks to persist over time.

[18] The IEM presidential contracts are future contracts with the payoff based on the election outcome (Democratic/Republican future). The market prices of these contracts reflect the market consensus of the probability of payoff (Goodell and Vähämaa, 2013; Goodell et al., 2020). The prices are bounded to sum to $1 as buying both a Republican and a Democratic ticket. For example, if the Republican ticket costs 70 cents, the Democratic ticket must cost 30 cents.

probability of the incumbent party in being re-elected drive the variance of market returns during the final stage of election campaigns.

Pantzalis et al.'s (2000) study is the first to examine stock markets' behaviour around elections at a multi-country level. They use the event study approach on a broad sample of 33 countries during the period from 1974 to 1995[19] and find evidence of the increase in asset valuations during two weeks prior to the election day. Bialkowski et al. (2008) examine stock market uncertainty around parliamentary and presidential elections of 27 OECD countries from 1982 to 2004. They find that stock volatility tends to rise around election days.

In addition to elections, the Brexit referendum is a political event that is known in advance, however its result is uncertain. Hill et al. (2019) examine the reaction of stock markets to the Brexit Referendum. They argue that the Brexit Referendum might influence the UK's future legal and regulatory framework, hence it might affect the expectations of market participants. Prior to the referendum, they find that the increase in the probability of a vote in favour of Brexit negatively affected stock returns. In addition, when the referendum result was announced with the result that over half of British citizens voted to leave the European Union (EU), the average firm lost 13% of its value during the day of the referendum result (Friday, 24 June, 2016) and the following trading day. In addition, the FTSE 100, which rallied on bets to remain, fell more than 8% within the first few minutes of trading on the day of the referendum result (Allen and Davies, 2016). On the same day, US stock markets dropped sharply at the opening, with the Dow Jones industrial average shedding more than 500 points decreasing by about 3%. Similarly, using a sample of 43 major developed and emerging countries, Aristeidis and Elias (2018) find that the shock from the result of Brexit referendum had spillover effects to other countries' stock markets. Particularly, UK and other countries' stock markets reacted negatively in the immediate aftermath of the Brexit result.

In summary, stock markets are sensitive to the information disseminated during political events such as elections and referendums. The uncertainty about the outcome of these events affects market uncertainty via its impact on future policy.

2.4.2 Wars and political crises

Wars and cross-border military conflicts are one type of political events that have grave consequences. Nordhaus (2002) considers wars as the "ultimate negative sum games" due to the enormous loss of lives and negative effects on the economy. Additionally, the burden of

[19] The sample includes 20 major OECD countries and 13 developing countries.

military expenditure might retard economic growth and investment. Therefore, wars and armed conflicts negatively affect the national economy and investors' sentiment. The impact of such political events on stock markets is potentially immense, hence enhances the interest of many scholars. The Iraq war, which started on March 20, 2003, is the subject of several studies that evaluate the effect of conflicts on US stock markets (e.g. Amihud and Wohl, 2004; Rigobon and Sack, 2005; Wolfers and Zitzewitz, 2009). Particularly, Amihud and Wohl (2004) examine how US stock markets react to the probability of Saddam Hussein's fall from power over the period from September 2002 to November 2003.[20] They find that during the war period from March 17, 2003 to April 11, 2003, a rise in the probability of Saddam's fall indicating a speedy end to the war, was positively associated with stock prices. Similarly, Wolfers and Zitzewitz (2009) find that before the military engagement, the increase in war risk, as measured by the lower probability of Saddam ousted, caused equity prices to decline. By using war-related news in newspapers and various financial markets commentaries from January 6, 2003 to April 7, 2003, Rigobon and Sack (2005) find that the higher level of war risk leads to the decline in equity prices and accounts for a large proportion of stock market fluctuations.

Instead of focusing on a single conflict, Omar et al. (2017) examine how the international conflicts affect global stock markets from 1987 to 2007. The dataset of international conflicts is obtained from International Crisis Behaviour project. Their study focuses on international conflicts, such as internal challenge to the regime, demonstration of force, movement of the army, mobilisation, and indirect and direct violent acts. They exclude any non-violent acts of a lesser gravity, such as protests, diplomatic sanctions, or withholding economic aid. They find that wars and political crises depress stock market indices worldwide using the event study approach. In the same vein, Berkman et al. (2011) construct a crisis index based on a database of 447 international political crises from 1918 to 2006. This crisis index proxies for the perceived disaster probability. They reveal that changes in the crisis index have a significant impact on both the mean and volatility of international stock market returns. This finding is consistent with the finding of Charles and Darné (2014), who show that particular events, such as financial crashes, elections, wars, terrorist attacks, and monetary policies, tend to cause large shocks in volatility of the Dow Jones Industrial Average index during the period from 1928 to 2013.

Although protests are considered as non-violent acts (Omar et al., 2017), they may have a significant impact on the performance of stock markets. For example, Acemoglu et al.'s (2014) study focuses on the impact of protests on stock markets in Egypt from January 2005

[20] Saddam Hussein was President of Iraq from 16 July 1979 until 9 April 2003.

to July 2013. During this time, people poured into the streets to protest against the economic and political arrangements that benefit connected individuals and firms. Acemoglu et al. (2014) use the event study approach and find that the daily number of protesters negatively affected the returns of companies connected to the incumbents but had an insignificant impact on the non-connected companies.

In short, wars and political crises, regardless of whether they are violent or non-violent acts, appear to have a negative impact on stock markets. This evidence is consistent over time and across countries.

2.4.3 Terrorist attacks

Prior studies reveal that terrorist attacks, which result in the broad destruction of human and physical capital, negatively affect stock markets (e.g. Chen and Siems, 2004; Brounen and Derwall, 2010; Chesney et al., 2011; Papakyriakou et al., 2019). Such effect could be driven by negative investor sentiment caused by depression and anxiety in the aftermath of extreme events, which affects investment decision and asset pricing (Kaplanski and Levy, 2010).

Chen and Siems (2004) employ the event study method to study how US stock markets respond to 14 terrorist attacks from 1915 to 2001. They find negative abnormal returns on the event date ranging from -0.49% around the Air India Bombing in 1985 to -7.14% around the 9/11 attacks in 2001. In addition, Arin et al. (2008) find that terrorist attacks not only affect stock return, but also influence stock volatility in six countries (Indonesia, Israel, Spain, Thailand, Turkey, and UK) from 2002 to 2006. In the same vein, Kollias et al. (2011) examine the market behaviour in UK and Greece around 36 terrorist attacks and compare the effect between the stock exchanges in London and Athens. They find that terrorist attacks significantly affect stock volatility and that the smaller capitalisation market (Athens stock market) is more sensitive to terrorism than the larger market (London stock market).

Terrorist attacks not only affect the attacked country's markets but also drive international stock markets. For example, Brounen and Derwall (2010) examine the behaviour of stock markets of 8 major countries (Canada, France, Germany, Italy, Japan, the Netherlands, UK, and US) following 31 terrorist attacks that took place in 16 countries from 1990 to 2005.[21] Their findings imply that terrorist attacks produce mildly negative price effects and prices tend to rebound within the first week after the attacks. Wisniewski (2009) argues that stock markets

[21] The dataset of terrorist attacks includes 16 countries: Spain, US, Japan, UK, Saudi Arabia, Egypt, Kenya, Tanzania, Yemen, China, Pakistan, Peru, Indonesia, Tunisia, Morocco, and Italy.

may quickly revive as investors think that the terrorist attack is a one-off unrepeatable event. Chesney et al. (2011) examine the impact of 77 terrorist events which took place in 25 countries from 1994 to 2005 on stock markets. They focus on how global, European, American, and Swiss stock markets as well as industrial stock indices respond to these attacks. They find that approximately two-thirds of terrorist events have a negative impact on at least one stock market under their consideration. Regarding the industrial effect, the insurance sector and the airline industry are more sensitive to terrorist events compared to banking industry.[22] In the same vein, Papakyriakou et al. (2019) examine how terrorist attacks affect international stock markets. They employ a sample of major terrorism events in G7 countries[23] from 1998 to 2017 and evaluate the impact of such events on an international sample of stock market indices from 66 countries. They use the event study approach and find that global stock markets decline on the attack days and this decline lasts until 10 trading days after the attacks albeit at a slow rate.

Zussman and Zussman's (2006) study is different from other studies in this field as they examine how stock prices change around the Israeli assassinations of senior members in Palestinian terrorist organisations such as Hamas, Fatah, and Islamic Jihad. These assassination attempts are a major element in Israel's counterterrorism effort during the Palestinian uprising in 2000. They argue that the response of stock markets to these assassinations attempts can reflect the effectiveness of this counterterrorism policy. They find that an assassination of a senior Palestinian political leader causes stock indices to decrease, while an assassination attempt on a senior military leader causes both Israeli and Palestinian stock indices to increase. These findings imply that the former type of assassinations is viewed as counterproductive in combating terrorism, while the latter type is considered as an effective measure.

To conclude, similarly to wars and armed conflicts, terrorist attacks negatively affect national economies and stock markets. However, stock markets may quickly rebound during the days after the attack as market participants could consider the terrorist attack as a one-off unrepeatable event.

2.4.4 Political speeches and unanticipated events

This sub-section focuses on the strand of literature about the effect of political speeches and unanticipated political events, such as the sudden death of the political officer, on stock

[22] The high sensitivity of the insurance sector to terrorist risks is due to terrorist attacks often cause fatalities and significant property damage (Chesney et al., 2011).
[23] The Group of Seven (G7) is seven countries with the world's largest developed economies: France, Germany, Italy, Japan, US, UK, and Canada

markets. Market participants could possibly react to these events as they provide new information to markets, albeit their effects are less grave than those of wars or terrorist attacks.

Wisniewski and Moro (2014) examine how stock markets respond to political speeches and proclamations from European Council meetings during 1993 – 2012. They find that markets positively react when the conclusions and declarations convey a positive sentiment and a stance of moral rectitude. In contrast, markets react negatively when the communications are obfuscated. These findings provide evidence that investors react to the content of political speeches and proclamations as it provides new information to the market. Similarly, by analysing the 'state of the state' speeches, which usually delivered annually by US Governors, Durnev et al. (2013) show that the level of optimism in the speech is positively related to abnormal returns of firms headquartered in the Governor's state. They also argue that the tone of the speeches can affect investment and employment decision of the local firms.

Other studies examine the impact of unanticipated events, such as the sudden death of the political officer on stock markets (e.g. Roberts, 1990; Fisman, 2001; Faccio and Parsley, 2009). For example, Fisman (2001) estimates the market impact of Suharto's sudden death while he was in office as the President of Indonesia. The author finds that in the event of Suharto's sudden death, the return of politically unconnected firms would strongly exceed the connected ones by 23% points. In the same vein, Faccio and Parsley (2009) examine the market impact of sudden deaths of politicians in 35 countries. They find that sudden deaths of politicians tend to decrease the value of companies headquartered in their hometown. They argue that politicians systematically favour local enterprise due to their need to get re-elected or concerns for local jobs, hence their sudden deaths significantly affect local companies.

In short, prior studies provide evidence that stock markets significantly respond to political speeches and unanticipated political events such as the sudden death of politicians.

2.5 Conclusion

The purpose of this Chapter is to explore the previous literature which is related to the key themes of this thesis. This includes (i) economic voting, along with how voters respond to exogenous events that affect the national economy, (ii) the nature of sovereign credit ratings and their impact, and (iii) stock markets' behaviour during political events.

The literature on the economic vote has focused on the questions of whether and how economic conditions affect government support. It is a well-established fact that voters react to changes in economic conditions regardless of whether they are sociotropic or egocentric.

Most of the studies evaluate the effect of economic variables on government support at elections measured by vote share for the incumbent (e.g. Quinlan and Okolikj, 2019). Although polls provide more signalling effect compared to votes (Nannestad and Paldam, 1994), there is a limited number of studies, which mostly focus on the US presidential approval (e.g. Li and Born, 2006), and examine how the economy affects government support measured by pre-election polls. Polls signal the support for political parties, hence shifting in polling results may alter the policy choices of the government and affect the probability of the removal of the incumbent in the subsequent election. Given the importance of polls and limitations encountered by previous studies using polling data of a single country, a dataset of polling results of European countries is hand-built for the purpose of this thesis (see Chapter 3). This polling dataset is used to investigate the impact of sovereign credit rating and terrorist attacks on government supports over time (not only on or around elections) and across countries (see Chapter 4 and 5).

Sovereign rating events of European countries during the 2007-09 global financial crisis and the 2010-12 European sovereign debt crisis provide a context in which CRAs gained considerable influence in both national economies and financial markets, and hence may affect the way voters expect the government to respond. As voters are sensitive to economic conditions, they may also be sensitive to the sovereign rating signals provided by CRAs. It is important to examine the political power of CRAs beyond their market and economic impact. If it exists, CRAs' actions may alter the policy choice of the government, resulting in higher level of political instability. For those reasons, Chapter 4 aims to examine the impact of sovereign credit ratings on government support measured by polling results in EU countries. To the best of my knowledge, there is no prior studies examining the link between sovereign ratings and government support across time (see Section 2.3.2). The most relevant study is the study of Cunha et al. (2019). However, they focus on the effect of changes in municipal bond ratings on US electoral outcomes at the county and congressional district level (not pre-election polls).

Using the same polling dataset, Chapter 5 aims to examine how voters react to terrorist attacks. Prior studies have shown that extreme events (e.g. terrorist attacks or natural disasters) outside the control of the government could affect voters' preferences either upward or downward. Changing direction depends on voters' emotion and new information from which voters learn about the government's quality in terms of the level of preparedness and response to the loss of the events. Among extreme events, Chapter 5 focuses on the impact of terrorist attacks. Many European countries have been targeted in recent years, resulting in not only the

destruction of human and physical capital but also instability in economic and market conditions (see Section 2.2.2 and Section 2.4.3). Many studies have examined the political effect of terrorist attacks on electoral outcomes (e.g. Montalvo, 2011) and the stability of the government measured by cabinet durations (e.g. Gassebner et al., 2011). However, these studies have not examined the direction of government support in the immediate aftermath of terrorist attacks. Chapter 5 therefore provides a better understanding of the circumstances under which the government tend to gain or lose its support following terrorist attacks.

Considering the link between politics and stock markets, this Chapter reviews the response of stock markets to political events, such as elections, referendums, wars, political crises, terrorist attacks, political speeches, and unanticipated events (e.g. sudden death of politicians). Among political events, elections are of interest of many studies, however prior studies (e.g. Pantzalis et al., 2000; Bialkowski et al., 2008; Goodell et al., 2020) have not examined the effect of election uncertainty measured directly from opinion polls on stock markets at multi-country level. Given the rich dataset of polling results for all political parties prior to elections, Chapter 6 fills this void and enhances the understanding about the market impact of opinion polls.

To summarise, this thesis furthers the literature on the determinants of government support, the political impact of sovereign credit ratings, the political impact of terrorism, and stock markets' behaviour during political events. The issues examined in empirical chapters enhance the understanding of government support across countries and time, as most previous studies have focused on government support at elections in a single country (e.g. US). Additionally, this thesis provides insights on the importance of sovereign ratings and opinion polls, along with the consequences of terrorist attacks.

Tables

Table 2.1 Key literature on the link between the economy and government support

Topic	Studies	Empirical status
The economy has a significant effect on government support	Nannestad and Paldam (1994); Paldam, (2004); Lewis-Beck and Stegmaier (2000, 2007, 2008, 2013, 2019); Schwartz et al. (2008); Chong et al. (2011); Fauvelle-Aymar and Stegmaier (2013); Sen and Donduran (2016); Cunha et al. (2019); Margalit (2019); Quinlan and Okolikj (2019)	Uncontroversial
The big-three: Voters react to three main macroeconomic variables (unemployment, inflation, and growth).	Kramer (1971); Fair (1978); Remmer (1991); Powell and Whitten (1993); Pacek (1994); Pacek and Radcliff (1995); Wilkin et al. (1997); Chappell and Veiga (2000); Fidrmuc (2000); Benton (2005); Roberts (2008); Singer (2013); Dassonneville and Lewis-Beck (2014); Healy and Lenz (2017)	Controversial
Sociotropic and egotropic voting: sociotropic (national) economic voting has a stronger impact than egotropic (personal) economic voting.	Kiewiet (1983); Alvarez and Nagler (1995); Borre (1997); Nannestad and Paldam (1997); Anderson (2000); Lockerbie (2006); Duch and Stevenson (2008); Lewis-Beck et al. (2013); Nadeau et al. (2013); Healy et al. (2017)	Controversial
Retrospective and prospective voting: voters look backward (retrospective) more than forward (prospective) when evaluating economic performance.	Lockerbie (1992); MacKuen et al. (1992); Price and Sanders (1995); Nadeau and Lewis-Beck (2001); Campbell et al. (2010); Elinder et al. (2015); Avdeenko (2018); Cruz et al. (2018); Arbatli and Gomtsyan (2019)	Controversial
Asymmetry: the economic vote is asymmetric, whereby voters are more sensitive to negative changes in economic conditions than to positive ones.	Kiewiet (1983); Lewis-Beck (1988); Haller and Norpoth (1997); Nannestad and Paldam (1997); Lau (1985); Soroka (2006); Dassonneville and Lewis-Beck (2014); Park (2019); Marinova and Anduiza (2020)	Controversial
Myopia: Voters are myopic, with a typical memory of one year.	Nannestad and Paldam (1994); Lewis-Beck and Stegmaier (2000); Hellwig and Marinova (2015); Healy et al. (2017)	Controversial
Interactions with political agents: the economic vote is influenced by the clarity of government responsibility for the economy	Lewis-Beck (1986); Powell and Whitten, (1993); Anderson (2000); Nadeau et al. (2002); Van der Brug et al. (2007); Duch and Stevenson (2008); Hobolt et al. (2013); Dassonneville and Lewis-Beck (2017)	Uncontroversial

This table provides a summary of key studies which are categorised into different topics in the economic voting literature, based on the key propositions provided by Nannestad and Paldam (1994), a summary of literature reviewed by Lewis-Beck and Stegmaier (2013, 2019), and recent studies**.** Empirical status presents the assessment of the propositions: *Uncontroversial* status shows the support in the literature, while *Controversial* status shows the mixed-support in the literature.

Table 2.2 Key literature on the effect of exogenous events on government support

Paper	Events	Sample	Model type	Findings
Ashworth et al. (2018)	Natural disasters, economic shocks		Theoretical model	Exogenous events outside the control of politicians can affect electoral outcomes.
Bagues et al. (2016)	Christmas lottery	Spain	FEM	Incumbents significantly gain more votes in provinces that win lottery.
Carlin et al. (2014)	Natural disasters	Chile	Matching	Victims of 2010 earthquake and tsunami gave less support for municipal governments.
Chowanietz (2011)	Terrorist attacks	Multi-country	Logit	Political elites tend not to criticise their government in the aftermath of terrorist attacks. The level of criticism increases when terror attacks occur repeatedly.
Cole et al. (2012)	Natural disasters	India	FEM	Voters punish the incumbent after catastrophic rainfalls.
Gasper and Reeves (2011)	Natural disasters	US	FEM	The incumbent is punished for severe weather damage.
Gassebner (2011)	Terrorist attacks	Multi-country	Logit	Terrorism significantly shortens cabinet duration.
Gassebner et al. (2008)	Terrorist attacks	Multi-country	Logit	Terrorist attacks positively affect the probability of the incumbent being replaced.
Getmansky and Zeitzoff (2014)	Terrorist attacks	Israel	FEM	Vote share for right-wing party is higher in localities that are within the rockets' range.
Healy and Malhotra (2010)	Natural disasters	US	FEM	The incumbent is punished for the economic damage (not fatalities) resulting from tornadoes.
Langer and Cohen (2005)	Terrorist attacks	US	Survey	Terrorism ranked third among the issues that mattered most in voters' choice in the 2004 US presidential election.
Montalvo (2011)	Terrorist attacks	Spain	DID	Bombings in Madrid in 2004 had a significant impact on the outcome of the 2004 congressional election.
Nowak (2018)	Terrorist attacks	Germany	Logit	Islamist terrorist attacks have a positive effect on citizens' evaluations of the government.
Park and Bali (2017)	Terrorist attacks	Multi-country	Logit	Transnational terrorism increases the likelihood of the removal of political leaders from office, but mainly for autocrats.
Ramos and Sanz (2018)	Natural disasters	Spain	DID	A large wildfire up to nine months prior to local election increases the vote share of the incumbent party.
Williams et al. (2013b)	Terrorist attacks	Multi-country	FEM	Terrorist attacks have partisan effects on government duration.

This Table presents a summary of key literature on the significant impact of exogenous events, outside the control of the government, on government support.

Table 2.3 A summary of key literature on the impact of sovereign credit ratings

Paper	Impact	Sample	Model type	Findings
Adelino and Ferreira (2016)	Bank ratings and lending supply	Multi-country	FEM, DID	Sovereign downgrades have an asymmetric impact on the ratings of banks at the sovereign rating bound relative to banks that are not at the sovereign rating bound. Such asymmetric effect leads to greater reductions in ratings-sensitive funding and lending of banks at the bound relative to other banks.
Afonso et al. (2012)	Bond markets, CDS markets	EU countries	Event study	Bond yield spreads and CDS spreads respond to negative changes in both the actual ratings and the outlook signals
Afonso et al. (2014)	Bond markets, Equity markets	EU countries	FEM	Sovereign downgrades increase stock and bond market volatility. Upgrades do not have significant effects on volatility.
Almeida et al. (2017)	Firms' cost of capital, investment, and financing decisions	Multi-country	Matching	Firms reduce their investment and reliance on credit markets due to a rising cost of debt capital as a result of sovereign downgrades.
Alsakka and ap Gwilym (2012)	Currency markets	Multi-country	Event study	Positive and negative rating events affect both the own-country exchange rate and other countries' exchange rates.
Alsakka and ap Gwilym (2013)	Currency markets	EU and Central Asian countries	Event study	Rating events affect the own-country exchange rate. Spillover effects to other countries' exchange rates in the region. Market reactions and spillovers are stronger during the financial crisis period than pre-crisis.
Arezki et al. (2011)	CDS markets, Equity markets	EU countries	VAR	Sovereign rating downgrades have significant spillover effects across countries and across financial markets.

Table 2.3 (continued)

Paper	Impact	Sample	Model type	Findings
Baum et al. (2016)	Bond markets, Currency markets	EU countries	Event study, GARCH	Negative rating events have an insignificant impact on the value of the Euro currency, but positively affect exchange rate volatility. Such events result in the higher yields of French, German, Italian, and Spanish bonds.
Böninghausen and Zabel (2015)	Bond markets	Multi-country	OLS	Rating downgrades have a negative spillover effect to other countries' bond markets. The effects are more pronounced for countries in the same region.
Brooks et al. (2004)	Equity markets	Multi-country	Event study	Rating downgrades have a negative impact on stock returns
Cai et al. (2019)	Foreign direct investment	Multi-country	FEM	Sovereign credit ratings play an important role in FDI activities from emerging market.
Chen et al. (2016b)	Economic growth	Multi-country	FEM	A sovereign rating revision of one country influences the economic growth rates of other countries.
Chen et al. (2016c)	Economic growth	Multi-country	GMM, DID	Changes in country rating positively affect economic growth.
Drago and Gallo (2016)	CDS markets	EU countries	Event study	CDS markets significantly react to changes in actual ratings, but do not react to rating warning (outlook and review) announcements. A spillover effect occurs only after a downgrade event.
Ferreira and Gama (2007)	Equity markets	Multi-country	FEM	Rating events of one country impose asymmetric impact on stock markets in other countries, whereby rating downgrades cause negative impact, while rating upgrades have no significant impact.

Table 2.3 (continued)

Paper	Impact	Sample	Model type	Findings
Gande and Parsley (2005)	Bond markets	Multi-country	FEM	Significant spillover effects of negative sovereign rating signals to sovereign bond spreads of other countries. Positive rating events abroad have no discernible impact.
Gande and Parsley (2014)	International portfolio flows	Multi-country	Event study	Sovereign rating downgrades strongly affect outflows of capital from the event country.
Hill and Faff (2010)	Equity markets	Multi-country	Event study	Negative rating events induce negative abnormal returns in both crisis and non-crisis periods.
Hill et al. (2018)	Corporate ratings	Multi-country	Logit	Corporate rating changes within an hour of the sovereign rating change.
Ismailescu and Kazemi (2010)	CDS markets	Multi-country	Event study	Positive rating events have a greater impact on CDS markets in the two-day period surrounding the event. Spillover effects to other countries.
Kaminsky and Schmukler (2002)	Bond markets, Equity markets	Emerging countries	Event study	Changes in actual ratings and outlook signals affect bond yield spreads and stock market prices. Spillover effects to other emerging countries.
Kim and Wu (2008)	Foreign direct investment	Emerging countries	FEM	Sovereign credit ratings affect the development of financial intermediary sector and capital flows.
Tran et al. (2014)	Option markets	Multi-country	Event study	S&P/Moody's credit signals have stronger impact on implied volatility than Fitch does.
Tran et al. (2019)	Currency markets, Equity markets	Multi-country	FEM	Sovereign credit rating news has a significant impact on exchange rate and stock indices.
Williams et al. (2013a)	Bank credit ratings	Emerging countries	Ordered probit	Sovereign rating changes have a significant impact on bank rating changes.

This Table summarises the key literature on the impact of sovereign credit ratings on national economy and financial markets.

Table 2.4 A summary of key literature on stock markets' reactions to political events

Paper	Events	Sample	Model type	Findings
Panel A. Elections and Referendums				
Aristeidis and Elias (2018)	Brexit referendum	Multi-country	Copulas – GARCH	The shock and increased uncertainty from the Brexit referendum results cause financial contagion to other countries.
Bialkowski et al. (2008)	Elections	OECD countries	Event study, OLS	Stocks are more volatile around national elections. Such volatility is determined by a narrow margin of victory, lack of compulsory voting laws, changes in the political orientation of the government, or the failure to form a government with parliamentary majority.
Fan et al. (2020a)	Election, Trump's Inauguration	US	FEM	The disagreement among tweets mentioning both a firm from the S&P 500 composite and 'Trump' is associated with heightened stock price volatility and trading volume before the US Presidential Inauguration in January 2017.
Goodell and Vähämaa (2013)	Elections	US	FEM, REM	Positive changes in the probability of the eventual winner's success result in higher stock volatility.
Goodell et al. (2020)	Elections	US	Granger causality	Changes in the probability of the incumbent party getting re-elected affect the variance of market returns.
Hill et al. (2019)	Brexit referendum	UK	FEM, Event study	The increase in the probability of a vote in favour of Brexit has a negative impact on stock returns. The value of average firm decreases when the referendum result was announced.
Li and Born (2006)	Elections	US	GARCH	Stock market volatility and stock returns increase when the election does not have a candidate with a dominant lead.
Pantzalis et al. (2000)	Elections	Multi-country	Event study	Positive abnormal return during the two-week period prior to the election week, and the abnormal return is the strongest for elections with the highest degrees of uncertainty.
Snowberg et al. (2007)	Elections	US	OLS	The increase in the re-election probability of the incumbent is associated with the increase in stock prices.

Table 2.4 (continued)

Paper	Events	Sample	Model type	Findings
Panel B. Wars and Political Crises				
Acemoglu et al. (2014)	Protests	Egypt	Event study	The daily number of protesters negatively affected the returns of companies connected to the incumbent but had no impact on the non-connected companies.
Amihud and Wohl, (2004)	Iraq war	US	OLS	During the war, a rise in the probability of Saddam's fall was positively associated with stock prices.
Berkman et al.(2011)	Political crises	Multi-country	OLS	Changes in crisis index significantly affect the mean and volatility of world stock market returns.
Omar et al. (2017)	Political crises and Wars	US, World-wide	Event study	Stock market indices fall around political crises and wars.
Rigobon and Sack (2005)	Iraq war	US	IV, GMM	The increase in war risk causes the decrease in equity prices.
Wisniewski (2009)	Military conflicts	US	OLS	The market value of stocks is significantly influenced by the military conflicts.
Wolfers and Zitzewitz (2009)	Iraq war	US	OLS, IV	Before the military engagement, the increase in the probability of war led to a decline in equity prices.
Panel C. Terrorist attacks				
Arin et al. (2008)	Terrorist attacks	Multi-country	GARCH	Terrorist attacks significantly affect both stock return and stock volatility.
Brounen and Derwall (2010)	Terrorist attacks	Multi-country	Event study	Terrorist attacks have negative price effects.
Chen and Siems (2004)	Terrorist attacks	US	Event study	Negative abnormal returns on the attacks' dates.
Chesney et al. (2011)	Terrorist attacks	Multi-country	Event study, Non-parametric, GARCH-EVT	Terrorist attacks negatively affect stock markets on the event-day with the strength of the impact decreasing in the post-event period.
Kollias et al. (2011)	Terrorist attacks	UK, Greece	Event study, GARCH	Terrorist attacks significantly affect stock volatility.
Papakyriakou et al. (2019)	Terrorist attacks	Multi-country	Event study	Terrorist attacks in G7 countries cause the decline of international stock markets on the event day and on the following trading day.
Zussman and Zussman (2006)	Assassinating members of terrorist organisations	Palestine, Israel	OLS	Israeli and Palestinian stock markets significantly react to assassinations of senior members in Palestinian terrorist organisations.

Table 2.4 (continued)

Paper	Events	Sample	Model type	Findings
Panel D. Political Speeches and Unanticipated Events				
Durnev et al. (2013)	Political speeches	US	Event study	The higher level of optimism expressed in a State of the State speech results in higher average abnormal returns across firms headquartered in this State.
Faccio and Parsley (2009)	Sudden death of political officer	Multi-country	Event study	Sudden deaths of politicians cause decreases in the value of companies headquartered in the politician's hometown.
Fisman (2001)	Sudden death of political officer	Indonesia	OLS	In the event of Suharto's sudden death, politically unconnected firms would outperform connected ones.
Wisniewski and Moro (2014)	Political speeches and proclamations from European Council meetings	EU, World-wide	Event study, OLS	Stock market investors positively react to the political speech when its conclusions and declarations convey a positive sentiment and a stance of moral rectitude. In contrast, the returns tend to be negative when the communications are obfuscated.

This Table presents a summary of key literature on the impact of political events on the performance of stock markets.

Chapter 3 Polling data

3.1 Introduction

The main aim of this Chapter is to discuss the dataset of polling results, which measure daily support for the incumbent party in European countries. This polling dataset is used in Chapters 4 and 5 to examine the effect of sovereign credit ratings and terrorist attacks on government support across time, respectively.

An opinion poll is a kind of survey or inquiry designed to measure the public's opinions regarding a particular topic (The Gallup Organization, 2007). In the run up to elections, opinion polls are carried out by various organisations and polling firms to gauge voting intentions. Despite the differences in the wording of survey questions between pollsters, most pre-election opinion polls ask how citizens would vote "if the election were held today" (Jennings and Wlezien, 2018). Polls therefore infer current voters' preferences which determine the political support and the likely winner of forthcoming elections (Smales, 2016). In addition to pre-election polls, previous studies use the prediction data from the US presidential election markets (e.g. Iowa Electronic Markets) as a proxy for the probabilities of success of the presidential candidates (e.g. Goodell et al., 2020). Prediction markets are designed and conducted for the primary purpose of aggregating information (e.g. past elections, polls, traders' incentives) so that market prices forecast future events (Berg et al., 2008). Although prediction markets might incorporate more information than polls[24], there is a limited availability of the prediction data in EU countries.[25] Hence, in this thesis, I employ opinion polls as a measure of voters' preferences.

In the wake of the 2016 US presidential election and Brexit referendum, the performance of the polling industry has come under scrutiny. Indeed, polling firms failed to predict these recent political events and prompted widespread debate on the performance of polls. However, Jennings and Wlezien (2018) find no evidence to support the claims of a crisis in the accuracy of polling using a sample of 351 general elections in 45 countries from 1942 to

[24] Prediction markets outperform polls in five US Presidential elections since 1988 when comparing with the eventual outcomes (Berg et al., 2008).

[25] Among European countries, prediction data is only available for France (e.g. Predictit), Germany (e.g. Predictit), Ireland (e.g. Oddschecker, Electoral Calculus), Netherlands (Voorspellingsmarkt), and UK (e.g. Electoral Calculus, Betfair). Furthermore, prediction markets do not provide data across time (often starting months before Election Day) (Snowberg et al., 2007), hence this data is not of interest of the thesis which aims to examine the determinants of government support across time.

2017. Analysing polls from 200 days before election day, they show that poll errors measured by the absolute difference between polls and actual votes decline over the election timeline. This suggests that polls become more reflective of the eventual electoral outcome. Jennings and Wlezien (2018) argue that polls have been conducted more often with a larger sample size. However, the survey mode could give a rise to the sampling error (Pasek, 2015). Hence, most pollsters have incorporated weightings and other techniques that are designed to increase the representativeness compared to other measures of political support. Notably, the use of weighting protocols based on relevant population parameters is the most pervasive technique. The role of polls in the market expectation of electoral outcomes cannot be neglected (Goodell et al., 2020). Shifts in political support measured by changes in polling results might cause partisan conflict and policy uncertainty, hence affecting market stability. For example, in the 2020 US Presidential Election, when polling results in July 2020 pointed to the potential victory of Joe Biden over Donald Trump, CBOE Volatility index (VIX) reached a record high (28%) as investors were worried about the prospect of higher taxes under the Joe Biden presidency (Hodgson, 2020).

Nannestad and Paldam (1994) argue that signals sent via votes and polls are likely to be received even though polls cover much fewer people than elections. A vote is the deliberate choice that may determine the party in office, while a poll is a riskless simulated election. Hence, it is easier and less risky to send a signal about voting intention to politicians via polls than votes. Polls, therefore, are more volatile reflecting changes in political support and seem to provide a stronger signalling effect than votes. Yet, prior studies on the determinants of government support mostly focus on vote shares instead of polling results (see Section 2.2). Meanwhile, previous studies which have examined voters' preferences mostly use single-country data (e.g. Fauvelle-Aymar and Stegmaier, 2013). Given the importance of pre-election polls and the limitations encountered by previous studies, I hand-built a comprehensive polling dataset for European countries from 2000 to 2017. As prior studies use a dataset of electoral outcomes, they are unable to capture immediate changes in public support for governments in the aftermath of financial events and exogenous events. This limits the understanding on the issues related to partisan conflicts and policy changes. The use of polling results increases the sample size available to measure the electoral prospect about the incumbent across time. However, it should be acknowledged that the new polling data has some limitations. Different pollsters might employ different methodologies (systematic error) and the sample of each poll

might differ from the population (random error) (see Section 3.3). These limitations can be minimised by aggregating polls across all polling firms (Pasek, 2015).

This polling dataset unifies the support for political parties outside the elections at the multi-country level, not only on or around elections. This allows the examination of government support over time and across countries in Chapters 4 and 5. By using frequent polling data, the empirical analyses in Chapters 4 and 5 reduce endogeneity problem caused by confounding variables and reverse causality. Previous studies in economic voting literature mainly focus on how the performance of the national economy affects electoral outcomes. In these studies, there might be confounding variables that can affect both government support at elections and economic conditions. These unobservable factors bias affects the estimated parameters and precludes causal inference (Gormley and Matsa, 2014). This issue is largely reduced when using daily pre-election polling data to measure government support since it closely tracks changes in voters' preferences in response to rating events and exogenous events. This ensures precise and unbiased inference. Regarding reverse-causality bias, Snowberg et al. (2007) argue that previous studies examining the effects of election outcomes on the economy have been hampered by the issue that economic conditions also influence elections. Changes in polling results in short period cannot induce sovereign credit rating events (in Chapter 4) given the through-the-cycle philosophy of CRAs, nor terrorism events (in Chapter 5) which are considered as exogenous events.

Chapters 4 and 5 investigate only the support for the incumbents as the governments are held responsible for the instability of national economies and financial markets.[26] Changes in the economic and market conditions, driven by sovereign credit rating events (in Chapter 4) or exogenous terrorist events (in Chapter 5), are expected to affect the support for the government. Particularly, in Chapter 4, rating events can directly affect the government support through changing voters' perceptions of the quality of the government, with ratings serving as a certification mechanism of the incumbent's fiscal responsibility (Cunha et al., 2020). In Chapter 5, although terrorist attacks are outside the control of the government, they provide citizens with opportunities to learn new information about the incumbent regarding its terrorism prevention and investigation, and emergency preparedness (Ashworth et al., 2018).

[26] The impact of sovereign credit ratings and exogenous terrorist events on changes in the support for opposition parties could be investigated in future research. In this thesis, robustness tests are conducted to control for the number of opposition parties in Section 4.6.1 and Section 5.6.1.5.

Polls are often requested by newspapers, TV programmes and the government. Hence, polling data is hand-collected from online articles and publicly available polling datasets whenever available for each country as long as they report the date that the survey's fieldwork had taken place or the published date.[27] As most polls are conducted over multiple days, I date each poll by the survey end-date. The fieldwork date is not always available and in those cases a careful procedure is taken to calibrate the date following Jennings and Wlezien (2013). Particularly, if only the date of publication of the poll in the online articles is available, that date is used as the survey end-date. There are various polling firms in each country, but there is a lack of clear benchmarks to determine which firm is the most accurate and reliable one. Hence, this thesis uses polling data from different firms instead of cherry picking (Jennings and Wlezien, 2013; Kelly et al., 2016; Acker et al., 2018).

As opinion polls are not always conducted daily and are obtained from different pollsters, this Chapter develops a method to combine polling data to measure government support by calculating the average of polling results for the incumbent party within different time windows (1 day, 3 days, 7 days, 14 days, and 30 days) (See Section 3.3). This method incorporates polls across time and pollsters to provide a larger sample with less sampling error and less uncommon bias, reducing two types of error: random variations and systematic errors (see Section 3.3). Jennings and Wlezien (2018) argue that combining polls from different pollsters provides a fairly reasonable portrait of electoral preferences, where errors may to a large extent cancel out. It is attributed to the increase in the number of polls with a larger sample size and advanced techniques in sampling and weighting to increase the representativeness.

The remainder of this Chapter is structured as follows. Section 3.2 presents summary statistic for polling results, Section 3.3 discusses how to aggregate polling data for the use in Chapters 4 and 5, and Section 3.4 concludes.

3.2 Summary statistics

This Section provides summary statistics on polling data used in Chapters 4 and 5. Section 3.2.1 and Section 3.2.2 present the descriptions for full sample and country sub-samples respectively.

[27] For example, Austrian polling data is obtained from different online newspapers, while UK polling data is mainly collected from YouGov data series. See Appendix 3.1 for the list of pollsters.

3.2.1 Full sample

Pollsters often measure the support for all political parties. However, only polling results for the party in office are used in Chapters 4 and 5 since these chapters focus on changes in government supports. The leading party is defined as the party of the president in presidential democracies (e.g. Cyprus) and that of the prime minister or the chancellor for parliamentary democracies (e.g. UK, Germany). Other countries use a semi-presidential system combining both parliamentary and presidential democracy, whereby a prime minister and a president coexist (e.g. France). In such cases, the party of the leader who exerts more power over executives is considered (Julio and Yook, 2012). Exit polls are excluded from the data sample as Chapters 4 and 5 do not examine electoral outcomes. The dataset covers unbalanced polling results of 27 EU countries for the period from 2000 to 2017. There are no data available for Luxembourg in the sample period. The dataset includes 16094 daily observations.[28]

Descriptive statistics of the polling data are presented in Table 3.1. Columns B and C provide the start and end dates of the dataset for each country. The starting dates are not the same for all countries due to the availability of polling data. All countries have data available until 2017 except for Cyprus and Lithuania. Column D reports the number of observations for each country, whereby Germany, Netherlands, Italy, Spain, and UK have the highest number of observations. There are three countries with less than 20 observations: Cyprus, Latvia, and Lithuania.

Column E of Table 3.1 presents the mean of polling results for the entire sample period of each country. This indicates the average support for the government of each country during the sample period. None of the European countries has more than 50.0% support for the party in office. The mean varies from 14.5% (Lithuania) to 49.7% (Malta). There are 8 countries with more than 30.0% support for the government: Cyprus, Germany, Hungary, Malta, Portugal, Romania, Spain, and UK. There are 6 countries with less than 20.0% support for the government: Czech Republic (Czech), France, Latvia, Lithuania, Netherlands, and Slovenia. The average of government support ranges between 20.0% to 30.0% for the remaining 13 countries.

Out of 6 countries that have the lowest average of government support, Latvia and Lithuania have limited observations during the sample period, hence it is difficult to explain

[28] The initial sample includes 16102 observations. I dropped 8 observations below 0.5th percentile that have a sudden change lasting for one day only since these extreme values cannot be explained by any political or financial events.

the trend of voters' preferences. Meanwhile, there are several explanations for the low support for the government in Czech, France, Netherlands, and Slovenia. Figure 3.1 plots the support for the incumbent for selected countries. It indicates that the support for the Prime Minister of Czech is mostly below 20% for the period from 2001 to 2017, reporting less than 10% in 2014. It can be explained by the political instability in Czech Republic at that time with a series of political events, including the Prime Minister's resignation in 2004, 2005 and 2013 and hung parliament in 2007 and 2013 (BBC News, 2018a). Also, the support for the French President (Hollande) is especially low (less than 20.0%) for the period from April 2014 to April 2017. Chrisafis (2016) writes about Hollande as a president with a lack of preparation, zigzagging on policy, failing to address economic issues and unable to protect citizens from devastating terrorist attacks. Thus, the support rating for the French government dropped significantly. Furthermore, the support for the government in Netherlands is consistently below 25.0%. This figure falls significantly to approximately 10.0% in 2010, since the coalition government collapsed in February 2010 because of the dispute over troops in Afghanistan (BBC News, 2018b). The Slovenian government also experienced unstable support with a series of political and financial events from 2011 to 2014, leading to a decrease in support for the party in office, slumping to below 5.0% in 2012 and 2014. The Slovenian Prime Minister coalition collapsed in 2011 and 2013 after the loss of a confidence vote and a corruption scandal respectively (BBC News, 2018d). In April 2013, there was a major financial problem when the government has to save the country's banking system. Following this event, Moody's cut Slovenia's sovereign rating to Ba1 from Baa2 (Moody's, 2013).

Column F of Table 3.1 reports the standard deviation for the polling data. There are 3 countries with more than 10.0% standard deviation, 12 countries with less than 5.0%, and the remaining 12 countries ranging from 5.0% to 10.0%. Data is widely spread indicating that there might be certain eventful times throughout the sample period. Minimum and Maximum values are reported respectively in Columns G and H of Table 3.1. For the whole data sample, the highest polling result is 62.0% (Romania) while the lowest is 1.6% (Slovenia). It indicates a large fluctuation within the data set. Columns I and J present Skewness and Kurtosis respectively. There are 10 (17) countries with positive (negative) Skewness indicating that the majority of the dataset has a left-skewed distribution, with the mean is to the left of the peak. Kurtosis column presents positive value for all the countries. There are 15 countries with kurtosis values of less than three. This indicates that most countries in the dataset do not have many extreme values.

3.2.2 Country sub-samples

In empirical analyses, it is important to consider country sub-samples to capture the potential heterogeneity of reactions across different groups of countries. The full sample is divided into two groups in Panels A and B in Table 3.1: GIIPS and the remaining countries ("REM"). GIIPS countries represents distressed peripheral economies, including Greece, Ireland, Italy, Portugal, and Spain. GIIPS countries are differentiated from other European countries, since GIIPS countries have been most affected by the 2009-12 European sovereign debt crisis and characterised by a high level of debt and government deficits (Alsakka et al. 2017). During the debt crisis, GIIPS countries experienced a series of rating actions by CRAs and suffered from high borrowing cost. Slow economic growth continues to hamper recovery prospects of GIIPS countries in the aftermath of the debt crisis (Moody's, 2019b). Given the poor economic conditions and financial instability, there is a significant decrease in the public trust in GIIPS governments (Faiola, 2011; Foster and Frieden, 2017). This may cause the differences in public attitudes between GIIPS and REM.

The number of observations of GIIPS and REM countries represents 34.71% with 4147 observations and 65.29% with 11947 observations of the full sample respectively. The government support for GIIPS countries (29.7%) is higher than REM countries (26.3%) on average. While all GIIPS countries have more than 20.0% government support, there are six countries, including Czech, France, Latvia, Lithuania, Netherlands, and Slovenia, in REM group having less than 20.0% government support because of the financial and political instability during the sample period (see Section 3.2.1). Within GIIPS countries, Portugal has the highest support for the government with 36.5%. Figure 3.1 shows that the government support in Portugal is above 30.0% for almost all of the time, except for the period from 2012 to 2014 when Portugal experienced a series of rating downgrades to junk status and the grave consequences of the debt crisis (BBC News, 2018c).

During the 2007-09 global financial crisis and the 2010-12 European sovereign debt crisis, the government support in GIIPS countries has a downward trend (except for Ireland) (see Figure 3.2). This suggests a switch away from the government during these crises, which might be driven by poor economic conditions and lower public trust in the government. Greece seems to have the hardest drop in the government support by 23.7%, consistently decreasing from 38.7% in 2009 to 15.0% in 2012. The support for the government in Italy also shows similar downward trend, falling by 20.8% from 40.1% in 2008 to 19.3% in 2012. Despite the overall decreasing trend for the period from 2007 to 2012, Portugal and Spain still have more

than 30.0% support for the party in office in 2012. Ireland shows a different picture from other countries in GIIPS group, with the public support for the Irish government declines from 30.8% in 2008 to 21.8% in 2011, then recovers in 2012 with 32.0% support for the government. This can be attributed to the fact that the economy of Ireland began to grow again in 2012 (Fitzgerald, 2014). Citizens usually reward the government for such improvements in economic conditions.

In comparison, there is no clear trend of government supports in REM group during these crises (see Figure 3.1). For example, while the government support in Germany remains the same, at approximately 36.0%, the government support in Finland decreases in the period of crises. In contrast, the support for the government in Netherlands has increased from 15.8% in 2010 to 20.8% in 2012. The low support for Netherlands government in 2010 is due to the collapse of the coalition government because of the dispute over troops in Afghanistan (see Section 3.1). However, Netherlands withdrew 1,900 soldiers from Afghanistan later in August 2010 and then formed a new coalition in October 2010 which in turn led to a higher support for the government (BBC News, 2018b).

3.3 Aggregating polling data

This Section discusses how to combine polling data for the measurement of government support (*Govsup*) used in Chapters 4 and 5. Polling results of each country are collected from various pollsters over time, but there is no theory to guide on the most appropriate way to combine the raw polling data. Hence, inspired by Acker et al. (2018) [29], $Govsup_{it+s}$, which is the government support in country i over the time window $(t + s)$, is calculated by taking a simple average of polling results for the incumbent party within different time windows s: 1 day, 3 days, 7 days, 14 days, and 30 days where events (rating events in Chapter 4 or terrorist events in Chapter 5) are observed on date t = 0.[30] For days when more than one poll were recorded, polling results are pooled together to a single poll of polls by taking the average polls estimate (Jennings and Wlezien, 2018).

Measuring the average of polling results over short time windows controls for any information contamination problem, which is the potential impact of temporal clustering of

[29] Acker et al. (2018) combine polling results from different sources by taking a simple average of all three daily-updated polls.
[30] For robustness check, another method is employed by aggregating polling data every three days (see Chapter 4).

events (Gande and Parsley, 2005). The use of a narrow window of two days compared to longer time windows (e.g. 10 days, 30 days) allows reducing information contamination problem (Afonso et al., 2012).[31] Failing to account for such clustering could seriously bias the estimated effects of rating changes (in Chapter 4) or terrorist attacks (in Chapter 5). However, opinion polls are not always conducted daily, hence polling data is aggregated within different time windows to increase the sample size. This method of aggregating data involves a trade-off between precision and robustness. A smaller time window gives more precise information but reduces the sample size, thus reducing robustness. A longer time window increases robustness by increasing the sample size but reduces precision.

In comparison with the use of an individual survey, averaging estimates across multiple concurrent surveys by different pollsters helps in reducing two types of error: random variations and systematic sources of errors (Pasek, 2015). First, random variations, such as sampling error, are incurred in when the sample is different from the population of interest. Walsh et al. (2009) argue that a random sample of people might not accurately reflect the views of the public, which reflects scepticism about the central limit theorem as well as issues such as non–response. Second, systematic sources of errors consist of coverage errors, method biases and response biases, causing the misestimation of a parameter of interest. Both type of errors can produce misleading survey results, causing the differences between survey results and election outcomes (Groves and Lyberg, 2010). This may affect the estimation results in Chapters 4 and 5 which examine changes in polling results for the incumbent party. If individual surveys vary in the form of sampling error and systematic error, then incorporating across polls tends to limit random errors by reducing the uncertainty of the estimates and discount any single uncommon bias.[32] Combining data across polls from multiple pollsters provides a larger sample. Bartels (1996) indicates that larger samples are associated with less sampling error. Hence, prior studies in election analysis find that aggregating data across surveys can produce more accurate estimates (Berinsky et al., 2011). Furthermore, different countries have different polling firms; hence, instead of cherry-picking, aggregating polls across pollsters provides an advantage when survey consumers are not aware of which polls can be trusted. Therefore, polling results in Chapters 4 and 5 are aggregated across pollsters to provide a larger sample with less sampling error and less uncommon bias, mitigating random and systematic errors in individual surveys. This produces more accurate estimations.

[31] For example, Gande and Parsley (2005) and Ferreira and Gama (2007) use 2-day window only.
[32] For example, interactive voice response surveys, which miss the cell-phone-only population, are unlikely to correspond with opt-in web surveys, which exclude offline individuals (Pasek, 2015).

According to Pasek (2015), polling results can be aggregated based on a variety of strategies. Taking the mean of polls is the simplest way. Even though, the estimates could possibly be improved by considering the sample size, precisions of similarly conducted polls, scope of the surveys and region level (e.g. Bernhard and Leblang, 2006), this thesis does not attempt to take into account of these differences from poll to poll due to two main reasons. First, it is attributed to a lack of both systematic examination of aggregation strategies and clear benchmarks to determine which polling firms can be compared (Pasek, 2015). It is impossible to know which polls are the most reliable and the most accurate predictions of voter preferences in the specific time period. Second, it is difficult to obtain sufficient information because most available sources only publish the final polling results. Details about the survey, such as sample size or respondents' characteristics, are not included. For these reasons, polling results across polling agencies should be given equal weight when it comes to calculating the average.

Table 3.2 presents the summary statistics for *Govsup* after aggregating polling data by calculating the average of polling results within different time window. Table 3.2 shows that the longer the time window is, the higher the number of observations is, ranging from 13,596 in the [0; 1] time window to 71,810 in the [0; 30] time window.[33] The average support for the government across time windows is about 28.5%, with standard deviation of approximately 9.5%.

3.4 Conclusion

This Chapter describes a unique dataset of polling results measuring the daily support for the incumbent party in European countries, which are collected manually from several available sources. Polling dataset covers 27 European countries (excluding Luxembourg) from 2000 to 2017, with 16094 observations. Polls appear to be more popular in Germany, Netherlands, Italy, Spain, and UK compared to the remaining countries in the sample. There are some eventful times during the sample period with a strong switch in government supports, which is due to financial and political issues (See Section 3.2).

Pre-election polls are becoming more popular these days to measure voters' preferences towards political parties in the run up to elections. Indeed, Jennings and Wlezien (2018) provide evidence that the number of elections, for which polling data is available, has increased

[33] The number of observations of *Govsup* in [0; 1] time window is smaller than the number of polling results for the incumbent party (see Section 3.2.1) due to more than one poll in one day. In this case, polling results are aggregated by calculating the average of polls on the same day.

overtime. As elections are infrequent, polling results are the only indicator of government support across time. Changes in government support, as proxied by opinion poll changes, might reflect the uncertainty in electoral prospects of the incumbents and possibly cause policy changes.

This thesis employs polling data over time and across countries to explore the determinants of government support. Chapter 4 combines the polling data with sovereign credit ratings data to investigate the impact of sovereign credit ratings on government support. Then, Chapter 5 jointly analyses the polling dataset with the terrorism dataset to examine the effect of terrorist attacks on voters' preferences. A limitation of these chapters may arise from the availability of polling data since polling surveys are not always conducted with daily frequency in most of countries and some polling data are no longer available. Furthermore, some countries ban the publication of polling results for periods prior to elections, hence resulting in the lack of polling data over the final days of electoral campaign (Jennings and Wlezien, 2018).[34] This reduces the potential sample sizes after matching polling data with rating data in Chapter 4 or with terrorism data in Chapter 5. To exploit the data in the most efficient way, Section 3.3 discusses how to combine polling data over time and across pollsters. Accordingly, polling results for the incumbent party are aggregated by calculating the average of polling data within different time windows: [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where events (credit rating events in Chapter 4 or terrorist events in Chapter 5) are observed on date t = 0. By incorporating polling data across surveys and over different time windows, this aggregating method helps in increasing sample size and reducing random variations and systematic sources of errors, which produce more accurate estimations.

In comparison with prior studies that focused on government support at elections (vote shares), the thesis is less likely to suffer from the endogeneity bias caused by unobservable variables and reverse causality given that frequent polling results are used in this thesis. This substantially contributes to the literature on voters' preferences. Furthermore, given the rich polling dataset at multi-country level, the thesis overcomes the use of a single country in prior studies and provides insights on voters' preferences across countries with different political systems. To the best of my knowledge, this thesis is the first to examine the determinants of government support measured by polling results at a multi-country level.

[34] In 2009, Greece enacted a law banning all political polling and the media's dissemination of poll results to the public within 15 days prior to elections.

Tables

Table 3.1 Descriptive statistics of polling results for the incumbent party

A	B	C	D	E	F	G	H	I	J	K
Country	**Start date**	**End date**	**No. of obs**	**Mean**	**Std Dev**	**Min**	**Max**	**Skew-ness**	**Kurto-sis**	**No. of poll-sters**
Panel A. GIIPS countries										
Greece	21/11/2009	05/07/2017	450	0.211	0.059	0.070	0.427	0.22	3.80	21
Ireland	31/03/2008	21/07/2017	169	0.253	0.049	0.120	0.440	-0.15	4.33	6
Italy	25/06/2008	28/07/2017	1987	0.294	0.067	0.119	0.450	-0.23	2.52	33
Portugal	31/10/2001	11/06/2017	341	0.365	0.056	0.202	0.520	-0.34	2.60	11
Spain	21/10/2000	18/07/2017	1200	0.361	0.063	0.186	0.470	-0.27	1.85	42
Panel B. REM countries										
Austria	12/07/2006	27/07/2017	320	0.262	0.033	0.190	0.410	2.01	9.28	20
Belgium	28/03/2010	27/06/2017	34	0.211	0.050	0.100	0.310	-0.89	3.25	11
Bulgaria	15/02/2013	22/03/2017	52	0.242	0.055	0.135	0.340	-0.04	1.88	14
Croatia	04/07/2008	25/07/2017	133	0.264	0.049	0.080	0.353	-0.39	3.39	7
Cyprus	17/07/2015	13/05/2016	14	0.326	0.035	0.220	0.370	-1.94	7.21	6
Czech	17/02/2001	26/07/2017	265	0.180	0.043	0.052	0.350	-0.15	4.00	14
Denmark	20/01/2010	06/07/2017	789	0.213	0.029	0.151	0.288	0.12	1.93	12
Estonia	31/07/2006	28/07/2017	143	0.288	0.060	0.180	0.450	0.50	2.86	2
Finland	31/01/2006	18/07/2017	147	0.205	0.021	0.143	0.247	-0.20	2.61	4
France	22/03/2007	21/04/2017	537	0.174	0.103	0.040	0.550	1.83	6.57	15
Germany	21/09/2000	28/07/2017	3390	0.354	0.045	0.230	0.450	-0.47	2.64	12
Hungary	17/11/2009	25/07/2017	209	0.452	0.074	0.170	0.600	-1.72	7.47	11
Latvia	03/03/2015	24/04/2017	11	0.153	0.058	0.054	0.230	-0.46	1.80	2
Lithuania	01/03/2012	10/09/2016	17	0.145	0.064	0.072	0.243	0.20	1.54	2
Malta	01/01/2015	25/05/2017	20	0.497	0.041	0.401	0.561	-0.97	3.33	4
Netherlands	10/06/2010	14/03/2017	2469	0.178	0.032	0.100	0.267	0.29	2.80	6
Poland	15/10/2000	28/07/2017	796	0.271	0.103	0.020	0.500	-0.68	2.84	27
Romania	27/06/2008	14/03/2017	50	0.351	0.108	0.144	0.620	-0.17	2.81	14
Slovakia	16/01/2011	19/06/2017	47	0.264	0.075	0.060	0.407	-1.34	4.84	4
Slovenia	30/09/2000	21/07/2017	328	0.147	0.089	0.016	0.417	0.72	2.68	17
Sweden	06/10/2010	19/07/2017	377	0.272	0.036	0.185	0.368	0.33	2.65	12
UK	30/01/2003	19/07/2017	1799	0.347	0.045	0.210	0.500	0.54	3.42	19

This table presents descriptive statistics of polling results for the incumbent party of 27 EU countries (excluding Luxembourg) from 2000 to 2017. The full sample is divided into two sub-groups: GIIPS countries in Panel A and REM countries in Panel B. GIIPS group represents the peripheral Eurozone economies, including Greece, Ireland, Italy, Portugal, and Spain. REM group represents the 22 remaining countries.

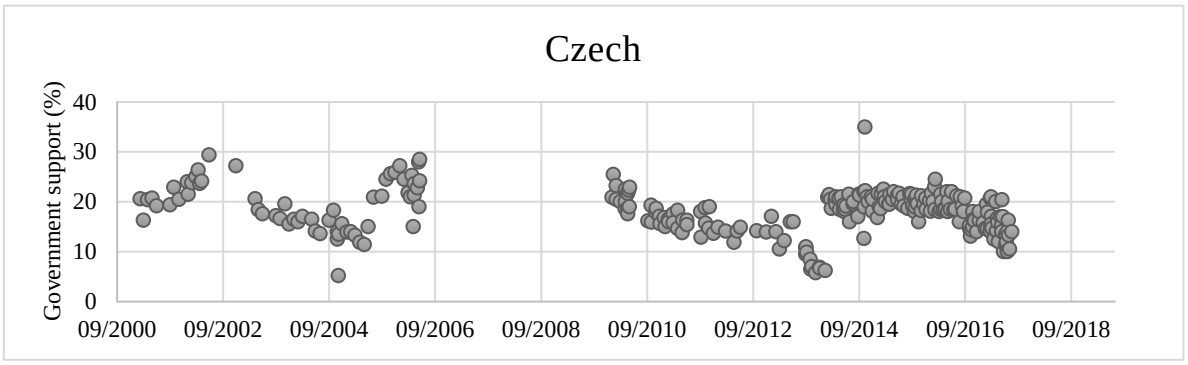
Table 3.2 Summary statistic of government support. Aggregating polling data

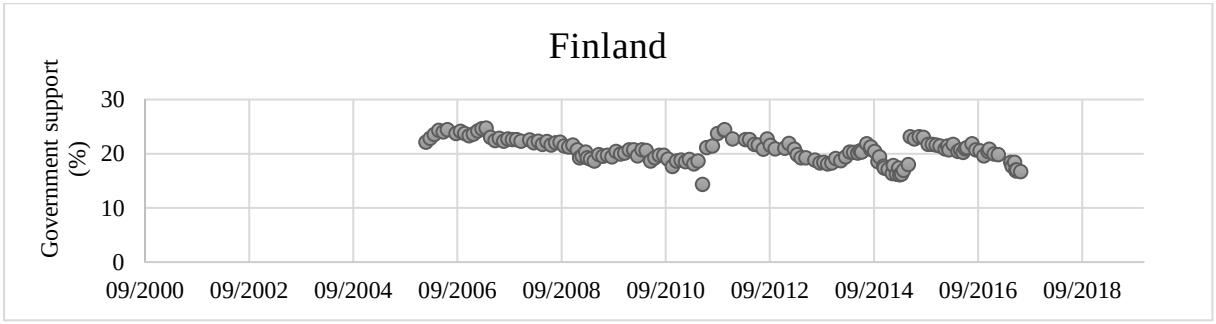
	No. of obs.	Mean	Std. Dev.
Govsup [0; 1]	13,596	0.283	0.094
Govsup [0; 3]	26,752	0.291	0.093
Govsup [0; 7]	40,589	0.288	0.095
Govsup [0; 14]	54,911	0.285	0.097
Govsup [0; 30]	71,810	0.280	0.097

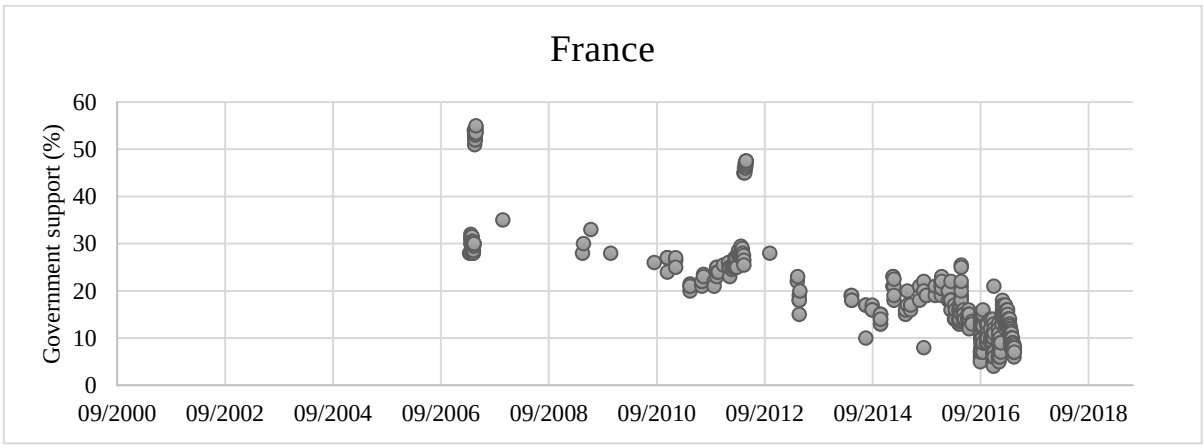
This Table presents the summary statistic of *Govsup*, which represents the level of support for the party in office. *Govsup* is calculated by taking average of polling results for the incumbent party within different time window: [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where events (sovereign rating events in Chapter 4 and terrorist events in Chapter 5) are observed on date t = 0.

Figures

Figure 3.1 Government supports in European countries







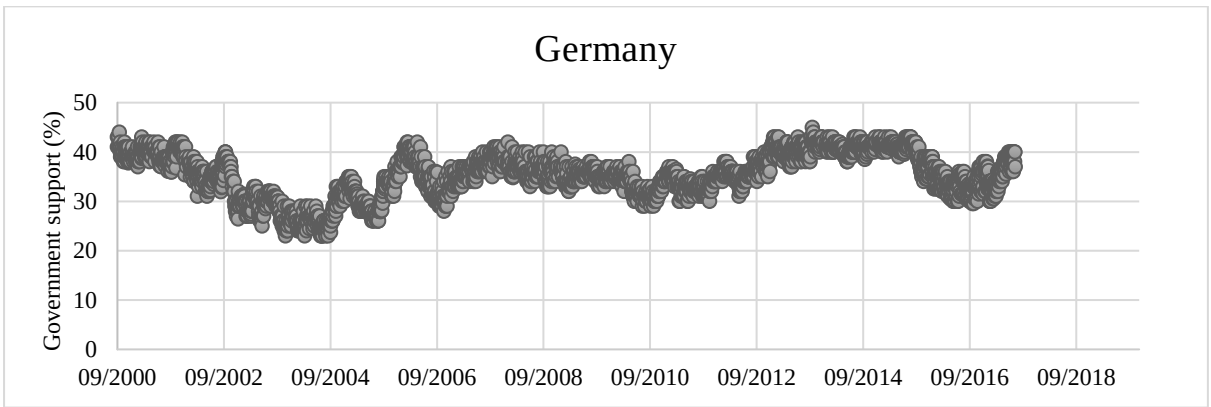
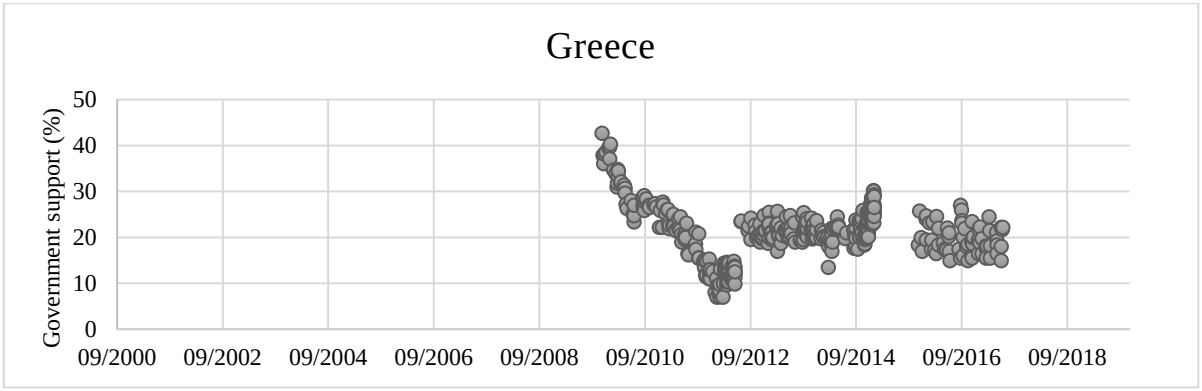
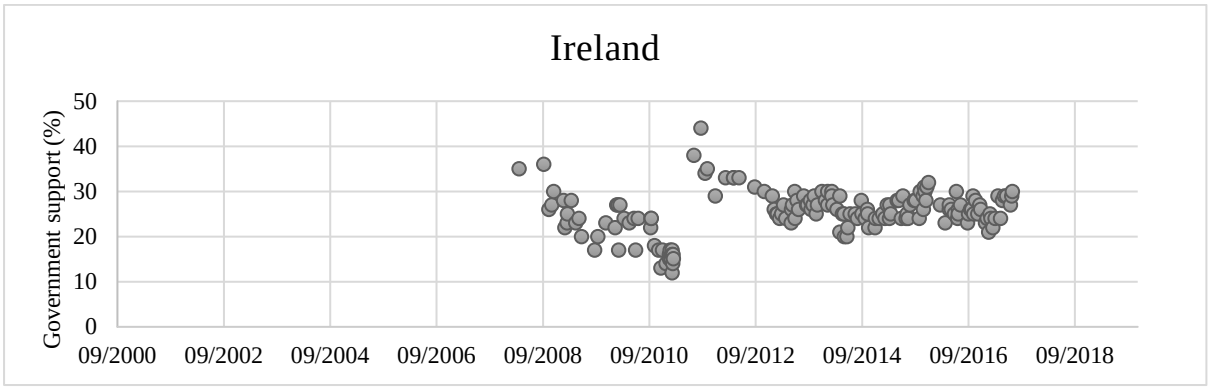
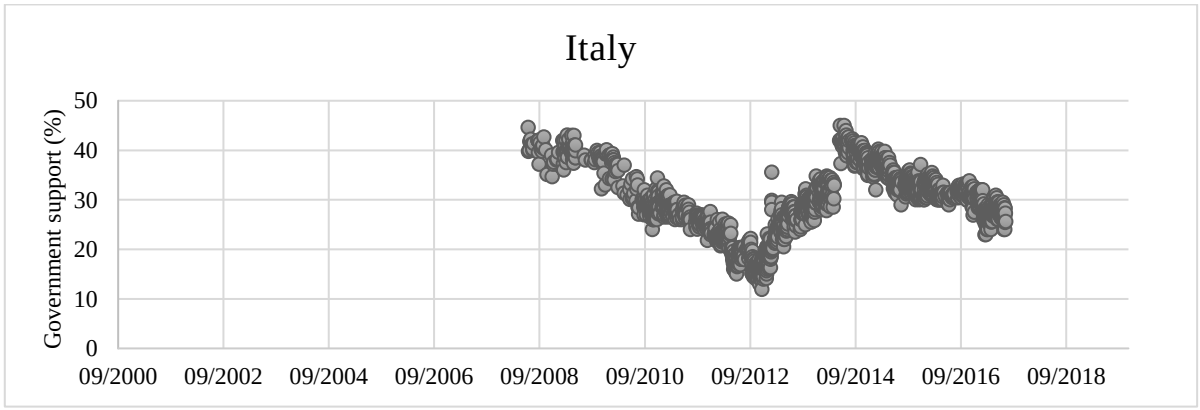


Figure 3.1 (Continued)







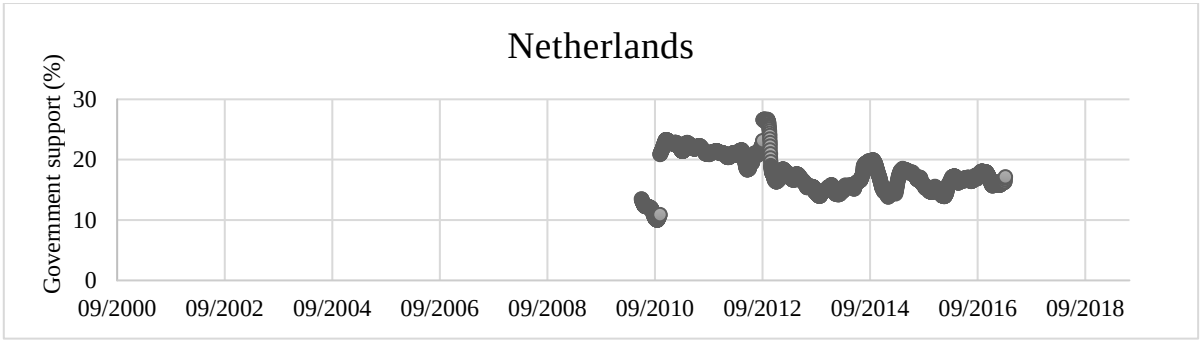
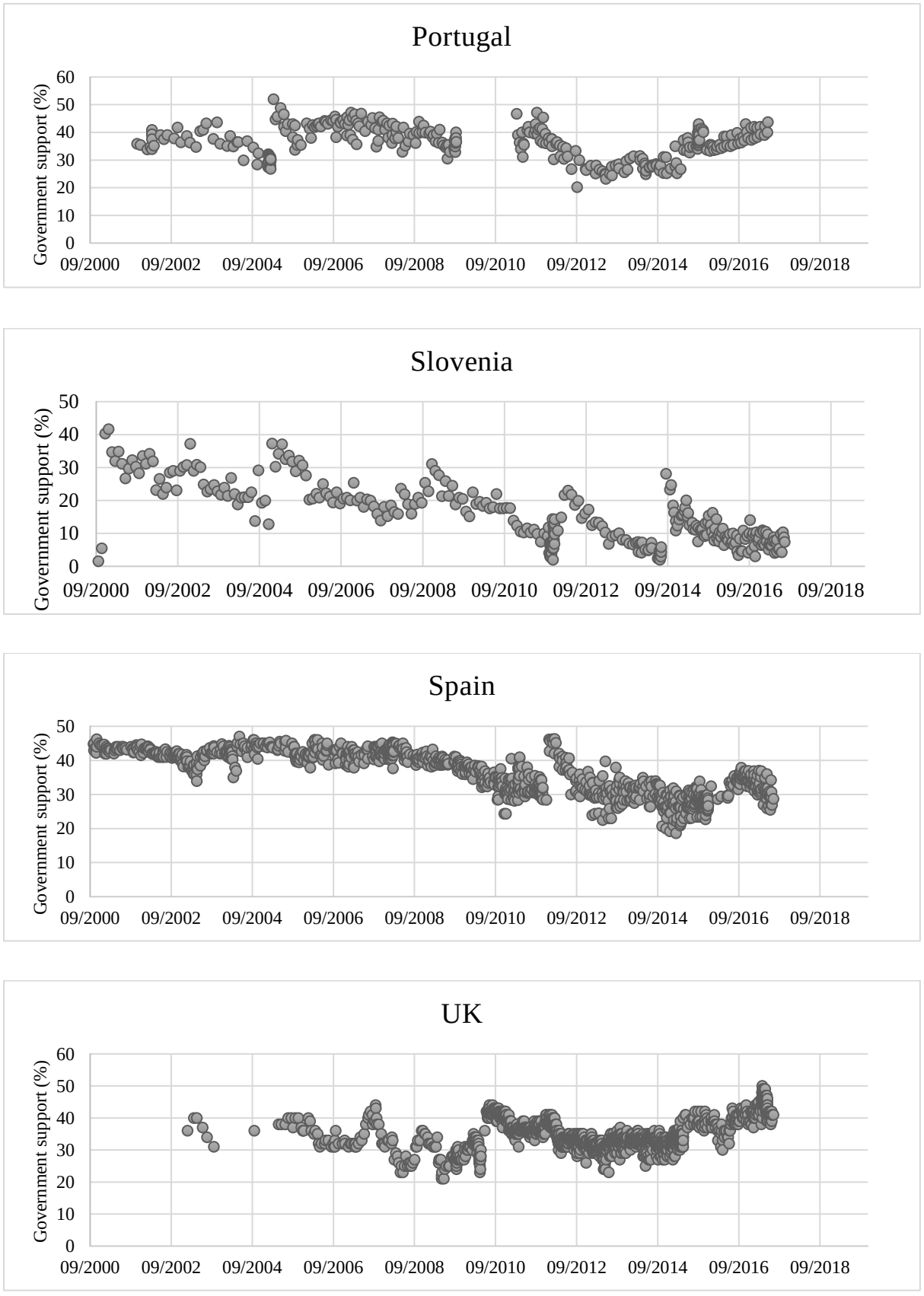
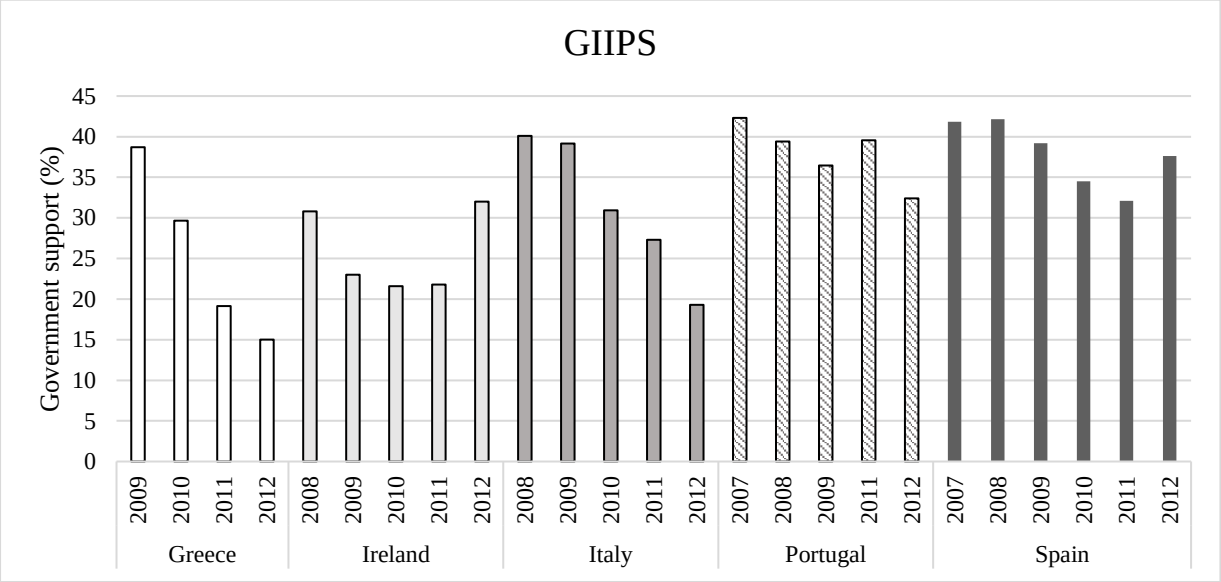


Figure 3.1 (Continued)



This figure presents government supports in the selected European countries from 2000 to 2017.

Figure 3.2 Government supports in GIIPS countries during financial and debt crises



The figure presents government supports in GIIPS countries for the period of the financial and debt crises from 2007 to 2012. Some years are missing due to the lack of polling data.

Appendices

Appendix 3.1 List of pollsters

Country	Period		Pollsters
Austria	12/07/2006	27/07/2017	Fessel-GfK; AKonsult/Mein Bezirk; Gallup; GfK; Hajek/ATV; Humaninstitut; IGF; IFES; IMAS; Karmasin; Market; Matzka; meinungsraum; OGM; ÖSTERREICH-Gallup; Profil-OGM; Research Affairs; Spectra; Unique Research.
Belgium	28/03/2010	27/06/2017	AQ Rate; Dedicated; De Standaard; ; Dimarso Het Laatste Nieuws; La Libre Belgique; l'Avenir; Le Soir; Standaard; TNS Media; Ipsos; iVox.
Bulgaria	15/02/2013	22/03/2017	AFIS; Alpha Research; CAM; Estat; Exacta; Focus; Gallup; Institute of Mordern Politics; MBMD; Mediana; Skala; Sova Haris; Trend.
Croatia	04/07/2008	25/07/2017	CRO Demoskop; GfK; IPSOS PULS; Mediana Fides; Polling Organisation; Promocija plus.
Cyprus	17/07/2015	13/05/2016	Cypronetwork; GPO; IMR; Kathimerini; PMR & C; Symmetron/Marc.
Czech	17/02/2001	26/07/2017	CVVM; Focus; Factum Invenio; Medea Research; Median; Protextl ppm factum; Phoenix Research; Sanep; SC&C; STEM; Student; TNS Asia; TNS Factum; TNS Kantar.
Denmark	20/01/2010	06/07/2017	Berlingske; Capacent; DR; Epinion; Gallup; Greens; Megafon; Norstat; Ramboll; Voxmeter; Wilke; Yougov.
Estonia	31/07/2006	28/07/2017	TNS Emor; Turu-uuringute AS.
Finland	31/01/2006	18/07/2017	Kantar TNS; Taloustutkimus; Tietoykkönen; TNS Gallup.
France	22/03/2007	21/04/2017	BVA; CSA; Elabe; Future Thinking; Harris; Ifop; Ipsos; LH2; Kantar; Le Terrain; Odoxa; Opinionway; Sofres; TNS.
Germany	21/09/2000	28/07/2017	Allensbach; Civey; Emnid; FGW; Forsa; Forschungsgruppe Wahlen; GMS; Infratest dimap; INSA; Ipsos; Trend Research; YouGov.
Greece	21/11/2009	05/07/2017	Alco; AUEB-STAT; Bridging Europe; Data RC; E-voice; Focus; Global Link; GPO; Interview; Kapa; Marc; Metrisi; Metron Analysis; MRB; Pamak; Patrisnews; Prorata; Pulse RC; Rass; Tothepoint; Vcitizens.
Hungary	17/11/2009	25/07/2017	Forsense; Gallup; Ipsos; Iranytu; Median; Nezopont; Publicus; Republikcon; Szazadveg; Tarki; ZRi.
Ireland	31/03/2008	21/07/2017	B&A; Ipsos; Millward Brown; RedC; OI; TNS.
Italy	25/06/2008	28/07/2017	AnalisiPolitica; Bidimedia; CISE; Coesis; Crespi; Datamedia; Datamonitor; Demopolis; DemosΠ Digis; EMG; EULAB; Epoke; Euromedia; Gfk Eurisko; GPG; GPS; IBS; Index; IPR; Ipsos; ISPO; Ixe; Lorien; Pareto; Piepoli; Politicalink; Quorum; SceneriPolitici; Snipcon; SWG; Tecne; TP.
Latvia	03/03/2015	24/04/2017	SKDS; Latvijas Fakti.
Lithuania	01/03/2012	10/09/2016	Spinter tyrimai; Vilmorus.
Malta	01/01/2015	25/05/2017	MaltaIndepednt; Malta Survey; MaltaToday; Xarabank.
Netherlands	10/06/2010	14/03/2017	De Stemming; TNS NIPO; Ipsos; Peil; I&O; Peilingwijzer.
Poland	15/10/2000	28/07/2017	Arianda; CBOS; Dobra Opinia; Demoskop; Estymator; ewybory.eu; Gfk; Homo Homini; IBRis; Ipsos; Kantar; Marcin Palade; Millward; OBW; PAS-P; PBBOUS; PBS; Pentor; PGB; Pollster; Pracownia; Pressmix; PPSP; SMG; TNS; TNS Poland; WAW.

Appendix 3.1 (continued)

Country	Period		Pollsters
Portugal	31/10/2001	11/06/2017	Aximage; Enrequipa; Eurosondagem; Euroteste; Intercampus; IPOM; Lusofona; Marktest; Pitagorica; UCP; Universidade Católica.
Romania	27/06/2008	14/03/2017	Avangarde; ARP; BCS; CCSB; CCSCC; CSCI; CSOP CIADO; CURS; SOCIOPOL; IMAS; INSCOP; INSOMAR; IRES; TNS.
Slovakia	16/01/2011	19/06/2017	AKO; Polis; Focus; MVK.
Slovenia	30/09/2000	21/07/2017	CRJM; Delo; Espicentre; Finance; FUDS; IFIMES; Interstat; Mediana; Ninamedia; Parsifal; Radio; RM plus; Slovenian Beat; Slovenski; UvRG; Valicon; Vecer.
Spain	21/10/2000	18/07/2017	A+M; Advice Strategic; Append; ASEP; CEMOP; Celeste-tel; CIS; Deimos Statistics; Demoscopia y Servicios; DYM; Encuestamos; Estudio; GAD3; Gesop; GETS; GIPEyop; HM-AI; IBES; IMOP; Iberconsulta; Ikerfel; Invymark; Ipsos; JJD; JM&A; Metra Seis; Metroscopia; My world; NC report; Netquest; Noxa; Obradoiro de Socioloxia; Opina Podemos; Redondo&Asociados; Sigma Dos; Simple Logica; Sondaxe; SociaMetrica; Sociología Consultores; SyM Consulting; tabula; TNS Demoscopia; Vox.
Sweden	06/10/2010	19/07/2017	APO; Demoskop; Inzio; Ipsos; Novus; Sentio; SCB; Sifo; SKOP; YouGov; United Minds; Synovate.
UK	30/01/2003	19/07/2017	Angus Reid; Ashcroft; BMG; BPIX; Communicate; ComRes; GfK; Harris; ICM; Ipsos; Marketing Science; Kantar; Opinium; ORB; Panelbase; Populus; Survation; TNS BMRB; Yougov.

Chapter 4 The impact of sovereign credit ratings on government support

4.1 Introduction

The impact of the 2007-09 global financial crisis and the 2010-12 European sovereign debt crisis has been more than just economic. In a period of difficult economic times, European countries have experienced a high degree of political polarisation towards right-wing extremist and populist parties (Funke et al., 2016). This is an evidence of political aftershocks of these crises, which highlights the need for understanding of the role of economic and financial instability in explaining the movement of political preferences. One measure, that may fully capture the performance of national economies and the country's financial stability, is sovereign credit ratings (see Section 2.2). Changes in sovereign credit ratings might affect the way voters expect governments to respond to the consequences. This Chapter aims to investigate the impact of sovereign credit ratings on the public support for governments in European countries.

There is a well-established literature on voters' reactions to economic outcomes (See Section 2.2.1), yet none of the prior studies considers sovereign credit ratings assigned by credit rating agencies (CRAs) as a proxy for economic and financial conditions. CRAs combine and analyse quantitative and qualitative information contained in economic, social, and political factors, and inform investors of a country's ability to repay sovereign debt (Vu et al., 2017), hence sovereign credit ratings are considered as indicators of national economic and financial health.[35] CRAs also builds their model to evaluate credit risk using public information and additional information supplied by the country's authorities (IMF, 2010). Credit ratings facilitate an efficient capital marketplace by providing transparent third-party information which is standardised for consistency and forward-looking (S&P, 2020). Investors can use information and metrics provided by CRAs to make informed decisions. Therefore, CRAs play an important informational and signalling role in the economy. In comparison to other economic variables, sovereign credit ratings contain much more information and act as a more stable measurement since CRAs use a through-the-cycle approach considering only permanent changes in a country's financial and economic health (Kiff et al., 2013). A series of sovereign

[35] For example, over the growing uncertainty about Brexit in the UK, Fitch has put the UK's AA credit rating on negative watch on February 20, 2019 (Allen, 2019). Later, Moody's also changed UK's credit outlook to negative from stable on November 8, 2019, saying that the country's institutions have weakened in the face of policy challenges and that British economic and fiscal strength are expected to soften (Rocco, 2019).

rating downgrades of several European countries during the debt crisis highlights the importance of examining the impact of sovereign rating events. These events significantly affect the rated country's equity, bond, currency and derivatives markets (e.g. Baum et al., 2016) and also influence the rated country's economic growth via the interest-rate and capital-flow channels (e.g. Chen et al., 2016c) (see Section 2.3.1). CRAs have gained considerable influence in financial markets and national economies, to the point of being able to impact the electoral prospects of incumbent politicians, affecting the level of political stability. Governments must be held responsible for the impact of rating actions by CRAs on economies and markets, hence sovereign credit ratings are expected to be signals that affect voters' perception about the political quality of the government. With their signalling role in the economy, CRAs provide a new way to link the economy and voters' preferences in the economic voting literature, while previously the standard macroeconomic variables, such as economic growth, inflation, and unemployment are mainly used (See Section 2.2.1). Sovereign credit ratings inform citizens of a country's economic and financial health, hence can be added as a key factor in explaining the mechanism behind changes in voters' preferences.

The resignation of Silvio Berlusconi – former Italian Prime Minister- on November 16, 2011 after a series of rating downgrades by S&P, Moody's, Fitch, and DBRS reveals the potential impact of CRAs' actions. However, there is a limited number of studies that examined the role of CRAs in politics. Cunha et al.'s (2019) study is the first to provide evidence on the political power of CRAs by investigating the impact of US municipal bond ratings on the likelihood of re-election of incumbent politicians at the county and congressional district level. To further the knowledge on the role of CRAs in politics, this Chapter examines the impact of sovereign credit ratings on government support measured by polling results across time (not electoral outcomes, i.e. Cunha et al., 2019). The daily polling data allows to closely track changes in government support in response to rating news by CRAs. Shifts in government support prior to elections driven by rating events might lead to changes in political power along with increased policy uncertainty.

Prior studies in economic voting are based on the 'responsibility' hypothesis which suggests that governments must be held responsible for the state of national economies and financial markets (Lewis-Beck and Stegmaier, 2019). Citizens reward the government when the economy improves and punish the government when the economy declines. Therefore, negative rating events, which lead to the uncertainty in financial markets and national economies, are expected to reduce government support. Since a country with a lower level of sovereign rating is considered to have a higher credit risk, a declining economy, and an unstable

financial market (See Section 2.3.1), citizens may blame the government for such changes and alter their political support. Voters hold the government accountable for such changes since the government has the power to drive the economy and financial markets using policy instruments. This refers to sociotropic voting whereby voters are more focused on the benefits for the national economy and society. At the national level, sovereign credit rating is a measure of the economic and financial health of the country. At the individual level, CRAs may also affect voters' preferences via their impact on voters' personal financial situation, which refers to as egocentric voting. Rating events have a significant market impact, hence could affect the level of wealth of voters who own stocks and bonds.

Sovereign credit ratings can have a direct effect on voters' preferences through their perceptions of the quality of government in managing the economy, financial markets, and future policies. In addition, sovereign credit rating upgrades can affect voters' preferences indirectly through their impacts on improving the country's economic conditions and vice versa. The reverse causality of changes in economic conditions on CRA actions (see Section 2.3) may affect the estimated parameters as voters might react to such changes before rating events. However, given the through-the-cycle philosophy of CRAs, the information content of sovereign credit ratings is more stable and different from other economic variables. CRAs actions provide signals that voters can rely on when evaluating a country's financial health. In addition, using the fixed effects model (FEM) and the propensity score matching (PSM) to analyse frequent polling results and adding macroeconomics factors as control variables in the empirical tests reduce these econometric issues.

To investigate whether sovereign credit ratings affect government support, a dataset of daily long-term foreign-currency ratings, outlook and watch signals, assigned to 27 EU countries (excluding Luxembourg) by S&P, Moody's, and Fitch from September 21, 2000 to July 28, 2017, is used.[36] A new dataset of polling results, which are hand-collected during the sample period, is employed (See Chapter 3). In the absence of elections, an opinion poll is the only indicator of the public support for the incumbent government. While previous studies (e.g. Kelly et al., 2016) focus on opinion polls on or around the elections, the polling dataset used in this thesis allows to look at opinion polls throughout the sample period, hence reducing endogeneity bias.

This chapter employs the FEM and PSM approach to control for the endogeneity bias caused by unobservable variables. The FEM is estimated to examine the effect of sovereign

[36] There is no polling data available for Luxembourg.

ratings, outlook and watch signals on government support. The results of the FEM reveal a significant relationship between the sovereign credit rating levels assigned by all three CRAS and government support, indicating that when the level of sovereign rating increases (decreases), citizens reward (punish) the party in office. The PSM calculates the difference in government support between the event countries which have experienced rating actions and their matching countries, separately for negative and positive rating events. The results of the PSM show an asymmetric effect of sovereign rating events. Particularly, negative sovereign credit signals result in decreases of government support by approximately 3% within 30 days after the rating action, while positive rating events do not appear to have a significant impact on the rated country's government support.

This chapter aims to bridge the intersection of finance and politics and enhance the understanding of the role of CRAs in politics beyond capital markets. The findings highlight that sovereign credit ratings are signals that affect the way voters perceive the political quality of the incumbent, and hence assist citizens in their voting decision. A negative sovereign credit action might be considered as a strong signal with respect to the quality of the government, which can bring voters to switch against the party in office. In response, the government would need to adopt policies to stabilise the economy and financial markets, in order to regain the confidence of the electorates and increase the likelihood of being re-elected. As a result, sovereign ratings can represent a new mechanism that explains the rational support/opposition for the government. Regulators and policymakers should consider the political power of CRAs when debating the new regulation and reform of CRAs.

The findings of this chapter are in line with the findings of previous studies, for example Sen and Donduran, (2017), Lewis-Beck and Stegmaier (2019), Tilley et al. (2018), Cunha et al. (2019), and Park (2019), indicating that the performance of national economies and financial markets affects voters' preferences. This chapter also contributes to the line of studies on the impact of sovereign credit ratings (e.g. Adelino and Ferreira, 2016; Baum et al., 2016; Cai et al., 2019; Tran et al., 2019). The findings highlight the political impact of sovereign credit ratings beyond their economic and market impact.

The remainder of the chapter is organised as follows. Section 4.2 reviews the related literature, Section 4.3 provides the hypothesis of the study, Section 4.4 describes the dataset, Section 4.5 presents empirical modelling approaches, Sections 4.6 and 4.7 report and discuss the empirical results, and Section 4.8 concludes.

4.2 Literature review

To the best of my knowledge, this study is the first to explore the impact of sovereign credit ratings on government support across time. Despite the absence of research that directly links sovereign credit ratings and voters' preferences, the relevant existing studies can be divided into two areas. The first strand of literature examines the link between voters' preferences and the performance of economies and financial markets. The second strand of literature focuses on the impact of sovereign ratings news on financial markets and economic conditions. Sovereign credit ratings are expected to affect voters' preferences, via their impact on economies and markets which reflects the government quality.

In the economic voting literature, economic outcomes are key predictors of government support either during elections (votes) or in pre-election periods (polls) (See Section 2.2.1). According to economic voting theory, in good economic conditions voters endorse the party in office, while in bad economic conditions they blame the party in office (Lewis-Beck and Stegmaier, 2019). The standard macroeconomic variables are unemployment, inflation, and economic growth (e.g. Fauvelle-Aymar and Stegmaier, 2013; Dassonneville and Lewis-Beck, 2014; Kirchgässner, 2016, Healy and Lenz, 2017). Prior studies find that retrospective voters tend to look backward to the performance of the economy when evaluating the government quality (e.g. Avdeenko, 2018). However, the effect of economic outcomes on government support might be asymmetric, with the government punished in bad economic times, but not rewarded in good economic times (e.g. Dassonneville and Lewis-Beck, 2014; Marinova and Anduiza, 2020).

Other studies find evidence supporting the effect of financial markets on voters' preference (see Section 2.2.1). Using survey results, such as presidential job approving ratings and government satisfaction rating, previous studies show that the performance of stock markets plays an important role in determining government support (e.g. Schwartz et al., 2008; Fauvelle-Aymar and Stegmaier, 2013; Sen and Donduran, 2017). Schwartz et al. (2008) find that the expected volatility of markets significantly affects the US presidential approval rating using a sample from 1990 to 2008. In the same vein, Fauvelle-Aymar and Stegmaier (2013) reveal that presidential approval is sensitive to the performance of stock markets using a sample of US presidential approval rating from 1960 to 2011 and the OLS model. They suggest that the deceleration in the stock market index reduces presidential approval, whereas a sharp rise in the index boosts the approval. They argue that stock markets capture both national economic health and the personal wealth of individuals who own stocks, hence significantly affect voters' preferences. Their findings support the literature on sociotropic and egocentric voting, which

indicates that voters are focused on the national economy (sociotropic) and their financial situation (egocentric) when evaluating the political quality of the government (Lewis-Beck and Stegmaier, 2019).

Using a sample of US presidential elections from 1932 to 2009, Pástor and Veronesi (2017) find that when the risk aversion is high resulting in a higher risk premium, a party which adds higher taxation to its platform is more likely to get elected. They examine the transition from one party to the other party using logistic regression and reveal that a Republican president is replaced by a Democratic president when poor economic performance and high volatility. Voters appear to be sensitive to shocks of financial markets and hold the government responsible for these shocks.

Although there are extended studies that investigated the determinants of government support, none of the prior studies employ sovereign credit ratings as indicators for the economic and market conditions, which inform voters about the government quality. Sovereign credit ratings often assist investors and policy makers with the information about the quality of a country's economic fundamentals and its ability to fulfil its debt in full and on time (Baum et al., 2016).

The literature in credit ratings indicates that sovereign rating events have a widespread impact on national economies and financial markets (e.g. equity, bond, CDS, currency, and derivatives markets) (e.g. Böninghausen and Zabel, 2015; Baum et al., 2016; Drago and Gallo, 2016; Tran et al., 2019) (See Section 2.3.1). However, prior studies also reveal the asymmetric effect of sovereign ratings events, with negative rating events having a significant impact on markets and economies, while positive rating events have a limited or insignificant impact (e.g. Gande and Parsley, 2005; Ferreira and Gama, 2007; Hill and Faff, 2010; Afonso et al., 2012; Chen et al., 2016c). Negative signals are typically more informative than positive signals as CRAs tend to avoid information leakages of negative rating news, while positive rating news are usually anticipated by market participants (Tran et al., 2019).

Negative rating announcements not only cause significant regional contagion to different financial markets (Arezki et al., 2011) but also spread to other countries' financial markets (e.g. Gande and Parsley, 2005; Arezki et al., 2011; Afonso et al., 2012; Böninghausen and Zabel, 2015; Drago and Gallo, 2016). Changes in sovereign ratings also have a significant impact on economic growth (e.g. Chen et al., 2016b; Chen et al., 2016c), yearly foreign direct investment (Kim and Wu, 2008; Cai et al., 2019), and monthly international portfolio flows (Gande and Parsley, 2014), bank credit ratings (e.g. Williams et al., 2013a; Adelino and Ferreira, 2016) and corporate credit ratings (e.g. Almeida et al., 2017; Hill et al., 2018).

Given their market and economic impacts, sovereign ratings are expected to play an important role in politics, affecting electoral prospects of the incumbent politicians. The potential political power of CRAs was first examined by Cunha et al. (2019), who find that credit rating actions have a significant impact on electoral outcomes. They investigate the effect of municipal bond rating upgrades due to Moody's recalibration in 2010 on US election outcomes at the county and congressional district level using the differences-in-differences (DID) approach.[37] By comparing the 2010-2012 elections to the 2006-2009 elections, they find that the incumbents in the upgraded municipalities have higher vote shares and higher likelihood of being re-elected. In comparison, this Chapter investigates the impact of sovereign ratings on government support across time measured by polling results (not election results).

In short, government support is determined by the performance of national economies and financial markets. The stability of financial markets and the level of economic growth present the quality of the government, which affects citizens' support/opposition for the government. Sovereign rating events have a significant impact on the entire financial markets and economic growth, hence are expected to influence voters' preferences over the party in office.

4.3 Hypothesis

In line with the research question about the impact of sovereign credit ratings on government support, the following hypothesis is tested:

H1: *Sovereign ratings have a significant impact on the rated-country's government support.*

Based on the economic voting theory (Lewis-Beck and Stegmaier, 2019), a higher (lower) level of sovereign credit rating is expected to increase (reduce) the support for the party in office. Since countries with higher (lower) sovereign ratings are considered to have lower (higher) credit risk, more (less) stable economies and financial markets. Citizens may endorse (blame) the government for such higher (lower) level of sovereign ratings.

There are two main reasons why the level of sovereign ratings should matter when it comes to the support/opposition for the government. As a measure of economic and financial

[37] Before recalibration, Moody's used a dual-class rating system which includes Municipal Rating Scale (MRS) and Global Rating Scale (GRS). Moody's recalibrated its MRS to align it with GRS in 2010 which resulted in upgrades by up to three notches of nearly 18,000 local government, corresponding to bonds worth more than $2.2 trillion in par value (Cunha et al., 2019).

conditions of a country, sovereign credit ratings are signals that might affect simultaneously both sociotropic and egocentric economic voting preferences (See Section 4.2). At the national level, sovereign credit ratings reflect the information contained in economic, social and political conditions (see Afonso et al., 2011; Chen et al., 2016c; Vu et al., 2017). If voters are sociotropic, their political decision will depend on whether the economy is improving or deteriorating while the party is in the office. The government has powerful policy instruments to drive the economy, and the level of sovereign credit ratings is one of the indicators of economic performance. Sanders (2000) argues that although voters may not know about economic conditions precisely, they are aware of how macroeconomic changes could affect them, which significantly influence their voting preferences. Additionally, sovereign ratings use public information as well as additional information supplied by the country's authorities that is not available in other public sources (IMF, 2010). Hence, voters can rely on sovereign credit ratings to signal the state of economic, financial and political stability of the country.

At the individual level, sovereign rating news, which has a significant impact on the financial markets (see Section 4.2), could affect the level of wealth of voters. Stocks are one of the components of personal wealth, hence improving stock markets bring greater wealth for those who own stocks, while declining stock markets have the opposite effect. The same logic is applied for bondholders and other market participants. The level of voters' personal wealth could shape their attitudes towards support/oppose the political parties (Nadeau et al., 2010), hence citizens are sensitive to changes in financial markets. Citizens reward (punish) the government for the good (bad) performance of financial markets since the government has the power to drive the market and influence the business by the policy and regulation systems.

For these reasons, regardless of whether voters are sociotropic or egocentric when engaging in rewarding or punishing the incumbent, sovereign credit ratings are expected to have a significant impact on the support for the government. However, it is not feasible for this study to separate sociotropic and egocentric voting as the hypotheses may require estimations at individual level using survey data. Future research can examine the causality of these mechanisms behind changes in voters' preferences.

4.4 Data

The aim of this section is to describe the dataset which is used in the empirical analysis. Section 4.4.1 discusses the scale of sovereign credit ratings. Section 4.4.2 provides data description of sovereign credit ratings and summary statistics. Data description of polling results for the incumbent party is presented in Chapter 3.

4.4.1 Rating scales

Sovereign credit ratings are transformed into a discrete variable using 18-notch and 52-point numerical comprehensive credit rating scale (CCR), presented in Appendix 4.1 (See Sy (2004) for 58-point numerical scale).[38] While the 18-notch ratings capture actual rating changes (e.g. if any sovereign is downgraded by one notch from AAA/Aaa to AA+/Aa1, the score decreases from 18 to 17), the 52-point CCR is employed to capture the outlook and watch status together with the actual ratings. Watch and outlook status are designed to signal rating reviews and possible future rating changes (Binici and Hutchison, 2018), and hence are more timely and more informative than actual rating changes (Hill and Faff, 2010).[39] The top rating triple-A (AAA/ Aaa) is attributed to the level 52. It is followed by AA+/ Aa1=49, AA/ Aa2=46, AA-/ Aa3 = 43… CC/ Ca to C/SD/D = 1. In this scale, the lowest rating category is CC/ Ca to C/SD/ D, where the rated-country is typically in default and has a little prospect for recovery. This scale also accounts for outlook/watch actions by adjusting "± 1" when a sovereign has been put on positive/negative outlook; "± 2" for positive/negative watch; and "0" for stable outlook (see Sy, 2004; Alsakka and ap Gwilym, 2013; Williams et al., 2015).

The logit-type transformation of CCR, known as LCCR rating scale, is employed to address possible non-linearity in the rating scale, as follows (see Sy, 2004; Alsakka and ap Gwilym, 2013; Williams et al., 2015):

$$LCCR_t = \ln\left[\frac{CCR_t}{53-CCR_t}\right] \qquad \text{Eq. (4.1)}$$

Where CCR_t is the comprehensive sovereign rating according to a 52-point numerical rating scale. In the LCCR rating scale, AAA/Aaa = 3.95, AA+/Aa1 = 2.51, AA/Aa2=1.88, AA-/Aa3 =1.46… CC/Ca to C/SD/D = -3.95. The LCCR rating scale also takes into account the outlook/watch information along with the actual changes in rating, but it indicates that the differential between Aaa/AAA and AA1/AA+ rating (which equals to -1.44) is different from

[38] Fitch removed modifiers for CCC since 2006. Hence, this Chapter uses 52-point rating scale.
[39] See Section 2.3 for the definitions of outlook and watch signals.

that between AA1/AA+ and Aa2/AA (which equals to -0.63). Hence, the impact of a downgrade action from Aaa/AAA to Aa1/AA+ rating is treated differently from a downgrade action from AA1/AA+ and Aa2/AA rating in the linear regression. The CCR scale considers the gap between adjacent rating categories the same, hence does not address the non-linearity issue of the credit rating scale, while the LCCR scale does.

4.4.2 Summary statistics

The dataset of sovereign credit ratings is obtained from the three largest CRAs: S&P, Moody's, and Fitch. The initial sample includes daily observations of long-term foreign-currency ratings[40], outlook, and watch signals for 28 EU countries from 21 September 2000 to 28 July 2017.[41] S&P and Moody's provide 123116 daily observations while Fitch observations are 122760 (see Appendix 4.2).[42] In the event of actual rating changes i.e. upgrade/downgrade actions based on the 18-notch rating scale, a change is considered as a solo rating action if the action is not combined with changes in outlook/watch status. Otherwise, in case of rating changes with an indication of further upgrade/downgrade in future indicated by outlook/watch status, it is counted as a combined upgrade/downgrade with outlook/watch action. Outlook and watch signals are defined as follows. Positive (negative) outlook signals contain (i) changes to positive (negative) outlook from stable/negative (positive), and (ii) changes to stable outlook from negative (positive) outlook. Positive (negative) watch signals consist of cases (i) when a given country is placed on watch for possible upgrade (downgrade), and (ii) when a given country is confirmed its rating (i.e. no change in rating level) after being on watch for possible downgrade (upgrade). For 28 EU countries, the total number of positive (negative) rating events of S&P, Moody's, and Fitch is 157 (152), 112 (107), and 125 (122), respectively (see Appendix 4.2). The differences in the number of positive (negative) rating events between the CRAs might be due to variations in policies and methodologies that CRAs employ to evaluate sovereign ratings.

[40] CRAs assign both domestic-currency and foreign-currency ratings because the rated country has a different capacity to meet its obligations denominated in its local currency from obligations denominated in a foreign-currency. Hill and Faff (2010) indicate that the foreign-currency ratings have additional emphasis on the external liquidity and debt burden of the rated country. The local-currency rating is often higher than foreign-currency rating since governments have a greater ability and willingness to meet their local obligations by printing more money or increasing tax (Kohlscheen, 2010). In this Chapter, foreign-currency and local-currency ratings for EU countries are equal to all rated countries in the study sample.

[41] As Fitch began to assign the outlook status to sovereign ratings on 21 September 2000, the data sample period starts on that date.

[42] Fitch started rating Cyprus from 1 February 2002. Hence, the number of daily observations of Fitch is less than S&P and Moody's.

After matching polling data with sovereign ratings data, the sovereign ratings data is reduced since opinion polls are not always conducted with daily frequency. There are 27 EU countries (excluding Luxembourg) that have polling results data available. The total number of daily rating observations by each CRA that have polling data available within 30 days of the rating event is 71,810 for 27 EU countries from 21 September 2000 to 28 July 2017. Figure 4.1 presents the distribution of daily ratings across different rating levels. The majority of the ratings dataset belongs to the investment grade ratings group.[43] AAA/Aaa ratings account for approximately half of the total daily observations. The average ratings by each CRA is 44 ('AA/Aa2').

Table 4.1 summarises the daily sovereign credit events by each CRA that have polling data available within 30 days after the rating action.[44] The total number of positive (negative) rating events by S&P, Moody's, and Fitch, which are 61 (78), 39 (53), and 34 (61) respectively (Rows 8 and 19 of Table 4.1). There is a larger number of negative than positive rating events by CRAs. S&P surpasses the other two CRAs with 139 rating events. Fitch stands at the second place with 95 rating events, followed by Moody's with 92 events (Row 24 of Table 4.1).

The dataset comprises: 1 (17), 2 (9), 1 (7) solo positive (negative) watch actions by S&P, Moody's, and Fitch (Rows 2 and 14 of Table 4.1). S&P is more active than the other CRAs in assigning watch actions, followed by Moody's and Fitch. The number of negative watch actions exceeds the number of positive watch actions for the three CRAs. Even though S&P has the lowest number of solo positive watch actions, S&P placed EU countries on a watch for possible downgrade most frequently among the CRAs.[45] S&P also surpasses the other two CRAs in assigning outlook signals, hence S&P tends to release more rating events than the other two CRAs. The number of positive (negative) outlook changes is 31 (21) by S&P, 20 (15) by Moody's, and 18 (18) by Fitch (Rows 3 and 15 of Table 4.1). S&P has the highest number of outlook changes (52 events compared to 35 by Moody's and 36 by Fitch). However, Moody's tends to adjust its ratings by multiple notches more frequently than the other CRAs (Rows 12 and 23 of Table 4.1). Consistent with prior studies (e.g. Alsakka and ap Gwilym, 2013), this pattern indicates that S&P focuses more on short-term accuracy, while Moody's on rating stability, confirming the difference in rating practices among CRAs.

[43] There are two rating grades: investment grade (from AAA/Aaa to BBB/Baa2) and speculative grade (from BBB-/Baa3 to C/D) (Fitch, 2017; Moody's, 2017; S&P, 2017a) (see Section 2.3).

[44] In the empirical analysis, polling results are aggregated by taking the average of polls in different time windows [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] days with 0 is the rating date (see Section 3.3). Sovereign credit rating events that have polling data available within 30 days window after the rating event are employed for descriptive statistics since using a time window of less than 30 days would reduce the number of events.

[45] The only case of positive watch action by S&P is when it adjusted Germany watch from negative to stable level on 13 January 2012.

Figure 4.2 shows the distribution of rating signals. Positive rating signals outweigh negative rating signals until 2008 due to the accession of some countries to the European Union from 2000 to 2008 that boosts up their economies. The number of negative rating signals increases dramatically from 2008 to 2013, reaching a peak in 2011 with approximately 50 rating events. Such downgrade pressure is driven by a weakening public finance and economic growth, along with excessive long-term government debt in some countries (e.g. Greece, Italy, Ireland, Portugal, and Spain) during the European debt crisis. The weak upward trend of positive events since 2014 is subject to the efforts in structural adjustment and institutional reform which significantly improve the economies.

4.5 Methodology

This section describes two empirical approaches employed to examine the effect of sovereign credit ratings on government support of the rated-countries: (1) the FEM and (2) the PSM. Section 4.5.1 and Section 4.5.2 discuss the two models respectively.

4.5.1 Fixed-effects model

To examine Hypothesis H1, whether sovereign credit ratings affect government support, the following benchmark regression model is estimated following Cai et al. (2019):

$$Govsup_{it+s} = \alpha + \beta Rating_{it} + \delta_j \sum_{j=1}^{n} Controls_{it} + \xi Co_i + \gamma Year_t + \varepsilon_{it}$$

Eq. (4.2)

$Govsup_{it+s}$ is the level of support for the incumbent party of country i over the time windows $(t + s)$. $Govsup_{it+s}$ is aggregated by taking the average of polling results for the incumbent party in different time windows *s*: [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] days with 0 is the rating date (see Section 3.3 for details).[46] The average of polling results over short time windows controls for any information contamination problem (Ferreira and Gama, 2007).

The variable of interest is $Rating_{it}$, which is the sovereign credit rating of country i on date t based on both 18-notch and 52-point numerical CCR scales. $Rating_{it}$ is either *S&P18* (*S&P52*), *Moody18* (*Moody52*), or *Fitch18 (Fitch52)* for estimations using ratings by S&P, Moody's, and Fitch based on 18-notch (52-point) rating scale respectively. *Rating-All18* and

[46] As a robustness test, polling results are aggregated by taking a simple average every three days.

Rating-All52 are used in estimations using ratings by all CRAs pooled together based on 18-notch and 52-point scale respectively. *S&P LCCR, Moody LCCR,* and *Fitch LCCR* are used when LCCR is employed instead of CCR (see Section 4.4.1 for the definition of LCCR).

$Controls_{it}$ represents a set of control variables suggested in the literature that influence the government support (see Veiga and Veiga, 2004; Kayser and Peress, 2012; Castro and Martins, 2013; Gassebner et al., 2011; Fauvelle-Aymar and Stegmaier, 2013), including *GDP per capita growth*, *Inflation*, *Honeymoon* and *Independent party* (See Appendix 4.3 for the definition and summary statistics of control variables). Macroeconomic variables are added as control variables to take account of the effect of economic outcomes on government support. It is expected that good (poor) economic conditions increase (decrease) government support (Lewis-Beck and Stegmaier, 2019). In addition, *Honeymoon* and *Independent Party* are included to control for political factors. The government time in office (*Honeymoon*) can influence government support since the incumbent is not responsible for the economic conditions that prevail during the first few months in office (Fauvelle-Aymar and Stegmaier, 2013). Voters' intention also depends on the ideology of the incumbent (Veiga and Veiga, 2004). Thus, when the government is led by an independent candidate (*Independent party)*, the government support may decrease as there is an increase in the uncertainty in the ideology or policies of the incumbent.

Co_i and $Year_t$ are country and year fixed-effects (FE) respectively. While country FE control for unobserved country characteristics, time FE capture the economywide conditions such as general shocks. Eq. (4.2) is estimated using Co_i and $Year_t$ FE, as well as the interacted term of Co_i*$Year_t$ FE. According to Jiménez et al. (2012), the interaction term of Co_i*$Year_t$ FE could account for the impact of all observed time-varying country characteristics and unobserved time-varying country characteristics on *Govsup*. However, Thompson (2011) and Jiménez et al. (2012) suggest the need to drop the macroeconomic covariates from the regression because they become co-linear with the dummy variables, since the identification of macroeconomic conditions derives entirely from the interactions. Hence, macroeconomics factors are excluded from the regression when Eq. (4.2) is estimated using the interacted Co_i*$Year_t$ FE.

ε_{it} is the error term. This study uses robust Huber-White standard errors to account for heteroscedasticity.

For robustness checks, Eq. (4.2) is estimated separately for ratings based on 18-notch and 52-point rating scales and repeatedly for each CRA and all CRAs pooled together. In the case of pooled CRAs, two dummy variables *M* and *F* indicating ratings by Moody's and Fitch

respectively are added to Eq. (4.2), while S&P is the reference CRA. For estimation using 18-notch scale $Rating_{it}$, a robustness test is employed by adding a dummy variable to the regression, which indicates whether the sovereign rating is investment or speculative grade, to control for the non-linearity in rating scale. For estimation using 52-point scale $Rating_{it}$, a robustness test is employed by using logit-type transformation of the rating, i.e. LCCR (see Section 4.4.1), to address possible non-linearity in the rating scale. Eq. (4.2) is also estimated outside the campaign period, which is defined as a month prior to election days. This eliminates the effect of electoral campaigns on polling results. Prior studies show that voters learn from media campaigns about election issues and candidates (Druckman, 2004). Hence, what goes on during the campaign period, for example, campaign events, party strategies and proposals, may shift public opinion (Bélanger and Soroka, 2012). Finally, additional control variables are added to Eq. (4.2) to control for different political factors, including the number of opposition parties (*Op_parties*), a dummy variable indicating whether the government is a coalition (*Coalition*), and a dummy variable for the incumbent's ideology (e.g. left, centre left, centre, centre right, and right wing party) (*Ideology*).

Methods used to investigate the link between sovereign ratings and polling results may suffer from endogeneity problems, including reverse causality, so that, changes in polling results may cause CRAs to consider a revision of the current rating. However, such reverse direction of causality is highly implausible as changes in polling results in the short period of time cannot induce CRAs to change ratings, given the through-the-cycle rating philosophy applied by CRAs (Kiff et al., 2013). Another cause of endogeneity is the omitted variables bias, which is reduced when using daily pre-election poll data to measure government support across time, since polls closely track changes in voters' preferences in response to rating events. Having frequent polling data controls for the information contamination problem, which is the potential influence of temporal clustering of events (Afonso et al., 2012). To further reduce the unobserved variable bias, the FEM is employed. The use of the FEM has some limitations. First, it is unable to control for the reverse causality. Second, the FEM is a within estimator and as such controls automatically for time-invariant unobserved variables only, while time varying omitted variables can still cause bias. However, overall, the omitted variable bias gets smaller (Wooldridge, 2016). The FEM produces unbiased standard errors but only when the country and time effect are permanent (Petersen, 2009). Hence, estimating the FEM with the standard errors clustered by country and year can be a useful robustness check. This test produces unbiased coefficients and correctly sized confidence intervals whether the country and time effects are permanent or temporary (dies away as the time between observations

grows). If the country and time effects are temporary, the residuals are still correlated within the cluster, hence the FEM may underestimate the true standard errors. Finally, matching method is also used to deal with confounding variables as explained in Section 4.5.2.

4.5.2 Matching approach

This Section discusses the matching approach. Section 4.5.2.1 introduces the PSM method, and Section 4.5.2.2 explains how to assess the matching quality.

4.5.2.1 Propensity score matching

The empirical modelling objective is to examine the causal effect of credit rating changes ($Ratchg_{it}$) on the support for the incumbent party in country i over the time window $t+s$ ($Govsup_{it+s}$). Assume that country i has two potential outcomes:

Let $Govsup^{1}_{it+s}$ be the polling result for the incumbent party at time $t+s$, $s \geq 0$, following sovereign credit rating change at time t (treatment group).

Let $Govsup^{0}_{it+s}$ be the polling result for the incumbent party at time $t+s$, $s \geq 0$, if country i had no rating change at time t (control group).

Let $Ratchg_{it}$ be the indicator of treatment, set to 1 if country i has experienced a credit rating action at time t, and 0 otherwise. Countries in the control group must not have had experienced rating actions within a six-month window around each rating event day by any CRAs in order to mitigate rating contamination (Ferreira and Gama, 2007). Rating changes are defined based on the 52-point CCR rating scale described in Section 4.4.1. Using the CCR can capture the impact of changes in actual ratings, outlook and watch status.[47] The matching estimators are calculated separately for negative and positive rating events, for all CRAs pooled together and each CRA.

The causal effect of a credit rating change for country i at time $t+s$ is defined as:

$$Govsup^{1}_{it+s} - Govsup^{0}_{it+s} \qquad \text{Eq. (4.3)}$$

Following Girma and Görg (2007), the average treatment effect on the treated (ATT) country is therefore defined as:

[47] This analysis does not employ ratings based on 18-notch scale. When using 18-notch scale, only actual rating changes are observed. There is a much smaller number of rating events based on 18-notch scale compared to 52-point scale, therefore results may not be robust.

$$E(Govsup_{it+s}^{1} - Govsup_{it+s}^{0} | Ratchg_{it} = 1)$$

$$= E(Govsup_{it+s}^{1} | Ratchg_{it} = 1) - E(Govsup_{it+s}^{0} | Ratchg_{it} = 1) \quad \text{Eq. (4.4)}$$

The term $E(Govsup_{it+s}^{0} | Ratchg_{it} = 1)$ in Eq. (4.4), which represents the average outcome that the rated-country would have experienced had they not experienced a credit rating signal, is not observed. Following Angrist and Pischke (2008), the outcomes of the control group is assumed to be equal to what the treated outcomes would have been, had they not been treated (experienced a rating action) after controlling for a set of observable characteristics X_{it} (defined later in this section). Therefore,

$$E(Govsup_{it+s}^{0} | X_{it}, Ratchg_{it} = 0) = E(Govsup_{it+s}^{0} | X_{it}, Ratchg_{it} = 1)$$

Eq. (4.5)

Where the term $E(Govsup_{it+s}^{0} | X_{it}, Ratchg_{it} = 0)$ is the average outcome of the control group after controlling for X_{it}.

And the term $E(Govsup_{it+s}^{0} | X_{it}, Ratchg_{it} = 1)$ is the average outcome of the treatment group if they had not been treated after controlling for X_{it}.

Hence, as can be seen from (4.4) and (4.5), ATT is calculated as follows:

$$E(Govsup_{it+s}^{1} | X_{it}, Ratchg_{it} = 1) - E(Govsup_{it+s}^{0} | X_{it}, Ratchg_{it} = 0)$$

Eq. (4.6)

In the absence of experimental data, the selection of valid control group is an important feature. One way to tackle this issue is to apply a matching method, where each treated country is paired to a country that has not undergone any rating change within a six-month window around each credit event's days by any CRAs. The match is based on a set of macroeconomic and political factors enabling the analysis to produce unbiased estimates of the treatment effect on government support. The PSM model, which is derived by the pioneering work of Rosenbaum and Rubin (1983), is used. The PSM performs the matching on the basis of single index called the Propensity Score (PS). The PS is the probability of receiving treatment conditioning on the observed characteristics, hence it can be obtained by the probit (or logit) model. This reduces the dimensionality problem, making matching more feasible when there is a large number of covariates. Accordingly, in this Chapter, the probability that country i has experienced a sovereign rating action at time t is estimated using a probit model, as follows:

$$P(Ratchg_{it} = 1) = F(X_{it-1}) \quad \text{Eq. (4.7)}$$

Following Caliendo and Kopeinig (2008), I include only covariates that affect simultaneously the treatment status (*Ratchg*) and the outcome variable (*Govsup*), while at the same time they are not being affected by rating changes. Thus, only variables fixed over time or measured before the event date (pre-treatment characteristics at time $t-1$) are employed.[48] The choice of variables should be based on economic theory and previous empirical findings to build up the model. In this analysis, countries are matched based on their pre-treated country characteristics: *GDP per capita, Inflation, Honeymoon, Type of government, Fiscal balance, Government consumption, Freedom of information act (FOIA), Corruption, Government effectiveness, Rule of law* (see Appendix 4.4 for the description of this set of variables).[49]

Augurzky and Schmidt (2001) and Caliendo and Kopeinig (2008) indicate that extraneous variables in the model exacerbate the support problem.[50] This analysis therefore starts with a model containing a set of ten variables included in vector X_{it-1}, then modifies the PS by adding or dropping other variables until achieving satisfied balance set based on the results of matching quality tests as explained in Section 4.5.2.2 (see Appendix 4.9 for the procedure to conduct the PSM).

After calculating the PS measuring the probability of credit rating events for each country, countries with similar PS on the same event date t are matched using one-to-one Nearest Neighbour matching (NNM) (e.g. Xia, 2014, Chen et al., 2016a).[51] NNM is a straightforward matching estimator that matches a treated individual with an individual from the control group that is closest in terms of PS. PS distributions of the two groups are different, thus NNM with replacement is used rather than NNM without replacement.[52] By allowing replacement, the average quality of matching will increase while the bias will decrease (Caliendo and Kopeinig, 2008). Moreover, in order to avoid NNM pairing countries that are not showing close enough characteristics, caliper matching is imposed [53], so that treated countries will be matched with countries from the control group that lie within the caliper and

[48] Almeida et al. (2017) employ pre-treatment variables a year prior to the sovereign downgrade, while Xia (2014) matches firms based on their pre-treated characteristics in one-quarter prior to the treatment period.

[49] Both sets of quarterly and yearly data are employed because there is no quarterly data available for some macroeconomics and political variables (see Appendix 4.4)

[50] According to Caliendo and Kopeinig (2008), ATT is only defined in the region of common support. It means that Matching can be consistently estimated not only over all the support of X_{it} but also the support of X_{it} common to both treated and untreated groups.

[51] Using more than one NNM involves a trade-off between variance and bias, with variance reducing as a result of using more information to construct the counterfactual for each participant, while bias increases as a result of an average poorer matches (Caliendo and Kopeinig, 2008).

[52] Matching with replacement allows an untreated individual to be used more than once as a match, while it is considered only once in case of matching without replacement.

[53] A caliper is defined as a tolerance level on the maximum PS distance. Hence, Caliper matching is finding comparison units within a certain width of PS of the treated units to get matched (Caliendo and Kopeinig, 2008).

closest in terms of PS. In this Chapter, caliper is set at 1% following Serfling (2016), Klusak et al. (2017), and Chen et al. (2019).

4.5.2.2 Matching quality

In order to check matching quality, it is necessary to compare the mean of pre-treatment variables before and after matching to find if any differences remain after conditioning on the PS (Caliendo and Kopeinig, 2008). Hence, I analyse the standardized bias, the t-statistics testing the differences in covariate means for the two groups, and the statistics evaluating the joint significance of country characteristics in determining the treatment likelihood using Pseudo-R^2 and the likelihood ratio test.

Standardized bias is an indicator for comparing univariate mean, defined as the standardized mean difference in covariate means (Rosenbaum and Rubin, 1985):

$$SB = (\bar{x}_t - \bar{x}_c)/\sqrt{(s_t^2 + s_c^2)/2} \qquad \text{Eq. (4.8)}$$

Where: $\bar{x}_t$ (s_t^2) is the mean (variance) of the treatment group and $\bar{x}_c$ (s_c^2) the mean (variance) of the control group. The standardized bias should be ideally as close as possible to zero, especially for those covariates that are theoretically expected to highly correlated with selection and potential outcomes (Steiner and Cook, 2013). Yet, there are no clear guidelines to find out how close is enough. Following Stuart and Rubin (2007), the absolute standardized bias of the PS logit and each covariate should be less than 25%. Following Xia (2014), a threshold of 10% for the mean of absolute standardized bias of all covariates is required.[54]

Rosenbaum and Rubin (1985) suggest the use of a two-sample t-test to check if there are significant differences in covariate means for both groups. After matching, all covariates should be balanced, hence the t-test should be insignificant. The t-test is widely used in prior studies that employ the PSM (e.g. Rosenbaum and Rubin, 1985; Dehejia and Wahba, 2002; Girma and Görg, 2007; Xia, 2014; Klusak et al., 2017; Chen et al., 2018).

The Pseudo-R^2 is obtained from probit (logit) estimation of the conditional treatment probability (PS). It indicates how well the pre-treatment variables X_{it-1} explain the participation probability. Sianesi (2004) suggests comparing the Pseudo-R^2 from estimating PS on all variables before matching and the Pseudo-R^2 from the same estimation on the matched samples (including only the treated and the matched). After matching, it is expected to have a

[54] Shadish et al. (2008) and Steiner et al. (2011) use of benchmark of 10% for standardized bias, while Xia (2014) requires a mean of absolute standardized bias below 10%. Lee (2013) and Rosenbaum and Rubin (1985) consider a standardized bias of greater than 20% as large.

fairly low Pseudo-R^2 because there are no systematic differences in the distributions of covariates between both groups. Furthermore, a likelihood ratio test on the joint significance of all regressors in the probit (logit) model is also employed before and after matching. The test is expected not to be rejected before and rejected after matching. In many applications, both tests are employed to test for the joint significance of the standardized differences between the treatment and control groups (e.g. Sianesi, 2004; Martincus and Carballo, 2008; Caliendo and Künn, 2011; Xia, 2014; Chen et al., 2018).

4.6 Empirical results

This Section presents the results of the empirical analysis on the impact of sovereign credit ratings on voters' preferences. Section 4.6.1 discusses the results of the FEM (Eq. (4.2)). Section 4.6.2 presents the results of the PSM, separately for negative and positive rating events.

4.6.1 Fixed-effects model

Referring to Section 4.5.1, Eq. (4.2) is estimated to examine the impact of sovereign credit ratings on government support for each CRA separately. The variable of interest "$GovSup_{it+s}$" is the average of polling results of country *i* within different time windows 1 day, 3 days, 7 days, 14 days, and 30 days, where the rating is observed on date t= 0.[55] Eq. (4.2) is estimated using both country and year FE and using the interaction term of country and year FE. In the latter case, macroeconomic variables are not included.

Table 4.2, Table 4.3, and Table 4.4 present FEM results for S&P, Moody's, and Fitch respectively. Panels A and B in each table report FEM results for each CRA based on 18-notch and 52-point CCR rating scales, respectively. *Rating* coefficients are positive across time windows, CRAs, and rating scales, and in all cases statistically significant at the 1% level. The results indicate that not only the actual rating changes but also outlook and watch signals have a significant impact on the support for the incumbent party across time windows. For example, when using the 18-notch scale, one notch increase in *S&P18, Moody18* and *Fitch18* (i.e. 3-CCR points) results in 1.00%, 1.10% and 1.20% increases in the government support over the [0;1] time window respectively (Column 1 of Panels A in Table 4.2, Table 4.3, and Table 4.4). When using the 52-point scale, 1-CCR point increase, which is equivalent to outlook signal, of *S&P52, Moody52*, and *Fitch52* results in 0.30%, 0.40% and 0.40% increases in the government

[55] The number of observations varies across regressions with different time windows.

support over the [0;1] time window, respectively (Column 1 of Panels B in Table 4.2, Table 4.3, and Table 4.4). The results are consistent when using interacted or separate country and year FE. The effects of *Rating* on government support go beyond the effect of economic and political conditions as several economic and political variables commonly used in the existing literature to explain government support are included as controls in the estimations.

Overall, *Rating* has the expected sign, which implies that when the level of sovereign rating increases (decreases), government support increases (decreases) (see Section 4.3). Higher sovereign credit ratings reflect improvements in economic conditions and voters attribute these to the actions of the party in office. Moreover, countries with higher sovereign ratings are considered to have lower credit risks, easier and cheaper access to financing. Hence, the higher level of sovereign credit ratings has important effects on economic conditions and is rewarded by voters. These findings are consistent with the economic voting theory, which indicates that voters reward (punish) the incumbents when the economy improves (declines) (Lewis-Beck and Stegmaier, 2019). The results also support the view that citizens are sensitive to changes in financial markets (Fauvelle-Aymar and Stegmaier, 2013) and CRAs' rating actions (Cunha et al., 2019). Sovereign ratings play an important role in the performance of financial markets that in turn affect personal wealth. If voters are egocentric, they will reward/punish the government based on the expected change in their level of wealth following sovereign rating signals.

Regarding control variables, *GDP per capita growth* has a significant positive impact on the government support. If *GDP per capita growth* increases by 1.00%, citizens will give the government 0.07% - 0.16% higher support across time windows, statistically significant at the 1% level, except for the [0; 1] time window whereby *GDP per capita growth* is insignificant (Column 1 of Panels A and B in Table 4.2, Table 4.3, and Table 4.4). However, *Inflation* has mixed effects (negative effect in the [0; 1] time window and positive effect in the remaining time windows). This is consistent with prior studies indicating that inflation has mixed and inconsistent effects on the government support which operates in ways consistent with the priorities of the party in office (see Section 2.2.1). Particularly, voters expect right-wing (left-wing) governments to deal better with inflation (unemployment) (Powell and Whitten, 1993). Therefore, they punish (reward) the right-wing incumbents for high (low) inflation. Political factors have a significant effect on the public support of the government. Being in the honeymoon period and being led by an independent candidate have statistically significant effects on the support for the government. Consistent with previous studies (Fauvelle-Aymar and Stegmaier, 2013; Veiga and Veiga, 2004), *Honeymoon* has a significant positive impact,

while *Independent party* has a significant negative effect on government support. A new incumbent in office can benefit from a strong positive honeymoon effect: if the new president or prime minister is sitting in their office for the first quarter, citizens give them approximately 3% higher support than those who are not in the honeymoon period. The coefficient on *Independent party* indicates that if the government is led by an independent candidate, it is less supported by 4% - 11%. This is consistent with the idea that voter intentions depend on the ideology of the incumbent. Independent candidates tend to be non-partisan politicians, so they may have ideologies or support policies which are different from those of the major political parties in the country, thus reducing public support.

A battery of robustness tests is conducted as discussed in Section 4.5.1, with results reported in Appendix 4.6.[56] First, the effect of ratings by all CRAs pooled together on government support is estimated, based on 18-notch and 52-point scale separately (Panel A in Appendix 4.6). *Rating-All18* and *Rating-All52* are consistently positive across all time windows, statistically significant at 1% level. Second, in order to control for the non-linearity in the rating scale, other robustness tests are used. For the 18-notch scale, a dummy controlling for investment-grade versus speculative-grade rating levels is added to Eq. (4.2) (Panel B in Appendix 4.6). For the 52-point CCR scale, the LCCR is employed instead of using ratings based on the CCR scale in Eq. (4.2) (Panel C in Appendix 4.6). Third, the regression is estimated using the sample without campaign periods (Panel D in Appendix 4.6). Fourth, the regression is estimated using additional political variables (*Op_parties*, *Coalition*, and *Ideology*) which control for the number of opposing parties, coalition government, and the incumbent's ideology (Appendix 4.7).[57] All the tests provide robust results. Finally, a simple average of polls every three days is used as an alternative method to aggregate polling results. The estimation results are reported in Appendix 4.5 for each CRA. Panels A and B present the estimations based on 18-notch and 52-point rating scale respectively. *Rating* coefficients have consistently positive signs across CRAs and rating scales, and statistically significant at the 1% level.

To control for both permanent and temporary country and time effects, Eq. (4.2) is estimated with clustered standard errors by country and year. The results are reported in

[56] Details about control variables are not shown to avoid cumbersome repetitions, but they have expected signs. Results are available upon request.

[57] Robustness tests show that an increase in the number of opposing parties is associated with a decrease in government support by 0.04% to 0.2%. *Coalition* and *Ideology* have mixed effects on government support. Appendix 4.7 only reports the coefficients for *Rating* to avoid cumbersome, the full results are available upon requested.

Appendix 4.8. The estimations show that the main results are robust to different specifications (e.g. across CRAs, rating scales, and time windows).

4.6.2 Propensity score matching

The average treatment effect on the treated country's government support is estimated in the [0;30] time window where the rating event is observed on date t = 0. The polling data is aggregated by taking the average polling results for the incumbent party within 30 days.[58]

The first step is to estimate the PS using the probit model - Eq. (4.7) - and the following economic and political variables: *GDP per capita, Inflation, Honeymoon, Type of government, Fiscal balance, Government consumption, FOIA, Corruption, Government effectiveness, Rule of law*. After estimating the PS for the treatment and the control groups, scores are plotted to check common support. Any observation of the control group, which is in the nonoverlap region, is excluded.[59] The set of pre-treatment variables is then adjusted until achieving the satisfied balancing set by three balancing tests: standardized bias, t-test, and joint significance test (see Section 4.5.2.2). More details on how to estimate the PS are described in Appendix 4.9.

The matching estimators are calculated separately for negative and positive rating events, using the dataset of all CRAs pooled together and each CRA. *Ratchg* is defined based on the 52-point CCR rating scale.

4.6.2.1 Negative rating events

PS estimations using negative rating events by all CRAs pooled together, S&P, Moody's and Fitch are reported in Table 4.5, Table 4.6, Table 4.7, and Table 4.8 respectively. Panels A and B report the results of balancing tests performed after the PSM. Specifically, Panels A present standardized bias and t-test on the mean differences of each covariate before and after matching. Panels B report the mean bias and joint significance test for the overall covariates using Pseudo-R^2 and the likelihood ratio test. Panels C report the ATT as the difference in government support between the treated and the matched groups within 30 days after sovereign rating events.

[58] Unlike the FEM, in this case using a time window of less than 30 days would reduce drastically the number of rating actions' observations and raise robustness issues.
[59] In each estimation, the PS provides results of strong overlapping support regions before matching (see Figure 4.3 to Figure 4.8), hence the PSM matches the treated and the control in the common support.

In the estimation using ratings by all CRAs pooled together, the vector of pre-treatment variables consists of 8 variables, since *Type of government* and *Government consumption* are dropped to satisfy the balancing tests for each covariate and overall covariates (Panel A in Table 4.5).[60] All t-tests on differences in the covariate means for both groups are not statistically significant at the 10% level after matching, indicating that covariates are balanced in both groups after matching. In addition, the absolute standardized bias falls significantly, with the highest being 13.5% for *Honeymoon*. The overall bias is 7.7% (Panel B in Table 4.5). Panel B shows that the value of Pseudo-R^2 from estimating the PS on the matched samples is 0.02, implying that there are no systematic differences in the distributions of covariates between the two groups. Additionally, the result of the likelihood ratio test is statistically significant before matching but not significant after matching.

Panel C in Table 4.5 reports the result of ATT, which indicates the impact of negative rating events (in the sample of pooled CRAs) on the treated country's government support. This analysis employs NNM with replacement and maximum 1% caliper, under the conditions that 150 out of 187 events are matched.[61] The remaining 37 events are outside the support area and therefore are excluded from the sample. ATT is calculated by analysing the difference in *GovSup* between the treated and the matched groups within 30 days after sovereign rating events. ATT is -3.2%, and statistically significant at the 1% level, implying that a negative rating signal results in a decline of government support.

The results of ATT are robust when using ratings by each CRA separately, even though the smaller number of events slightly decreases the statistical precision. The results of the PSM using sovereign rating signals by S&P, Moody's and Fitch are presented in Table 4.6, Table 4.7, and Table 4.8 respectively. The number of pre-treatment variables used in estimations varies across CRAs. This is not surprising given that CRAs form their opinions on the sovereign creditworthiness based not only on common factors but also on different qualitative and quantitative factors with different weights (S&P, 2017; Moody's, 2019c; Fitch, 2020b) (see Section 2.3).

In case of S&P (Table 4.6), the set of pre-treatment variables includes the entire set of ten variables and 71 out of 78 negative events are matched. Negative rating changes by S&P are associated with a 3.3% decrease in government support in treated countries compared to matched countries. For Moody's, 7 variables are employed to calculate PS (Table 4.7). The

[60] See Appendix 4.10 for the PSM using a full set of 10 variables.
[61] Total number of negative rating events is slightly lower than the total number of negative rating events by each CRA in Table 4.1 (187 compared to 192 events), due to multiple actions by CRAs on the same day.

balance tests after the PSM provide satisfactory results after dropping: *Fiscal balance, Government consumption* and *Rule of law*, and all the 53 events are matched.[62] Negative rating signals by Moody's lead to decreases in government support by 3.1% compared to matched countries. For Fitch, the vector of pre-treatment variables includes 9 variables, where *Fiscal balance* is removed (Table 4.8).[63] With 60 out of 61 events matched, Fitch's negative rating signals result in a 3.1% decrease in government support compared to matched countries.

4.6.2.2 Positive rating events

The same PSM procedure is employed to estimate the impact of positive rating events on government support, however in this case there is neither significant nor consistent results of ATT across CRAs and all CRAs pooled together.

Results of the PSM using ratings by S&P are presented in Table 4.9. The set of pre-treatment variables includes 8 variables, where *Honeymoon* and *Type of Government* are removed (Panel A in Table 4.9).[64] After adjusting, all t-tests for the differences in means of all covariates are insignificant. The absolute standardized bias is below 15% for all covariates and the average bias is 9.4%. These indicate that all covariates are balanced after matching. Moreover, results of Pseudo-R^2 and the likelihood ratio show no systematic differences in the distributions of both groups after matching. Although results of balancing tests meet the requirements, ATT shows an insignificant impact with all 61 positive events matched.

Estimation using ratings by Moody's is reported in Table 4.10. The vector of pre-treatment variables consists of 7 variables (Panel A in Table 4.10). *Honeymoon*, *Fiscal balance* and *FOIA* are dropped to achieve balancing.[65] Although the mean bias is higher than the threshold by 4.3%, other balancing tests are satisfied (Panels A and B in Table 4.10). All 39 positive rating events by Moody's are matched with comparison events. However, ATT shows an insignificant effect.

The results indicate that positive rating events by S&P and Moody's do not appear to have a significant impact on government support. A possible driver for this could be the smaller number of positive events compared to negative ones (see Table 4.1). Another explanation is that, unlike negative events, positive rating changes are usually anticipated by market

[62] See Appendix 4.11 for the PSM using a full set of 10 variables.
[63] See Appendix 4.12 for the PSM using a full set of 10 variables.
[64] See Appendix 4.13 for the PSM using a full set of 10 variables.
[65] See Appendix 4.14 for the PSM using a full set of 10 variables.

participants (Ferreira and Gama, 2007). While the event country might release pre-event information of the imminent upgrade, CRAs tend to avoid information leakages of negative rating news. Hence, rating events can possibly have an asymmetric effect, as consistent with the findings of prior studies for financial markets (see Ferreira and Gama, 2007; Arezki et al., 2011; Afonso et al., 2012). These findings also provide evidence of the asymmetric effect of economic conditions on government support (e.g. Marinova and Anduiza, 2020). They argue that citizens tend to acquire the abundant information on the state of the economy during poor economic times, in order to blame the government for its failure.

For the case of Fitch, even though reducing the number of pre-treatment variables down to 5, it is not possible to find matched pairs which satisfy matching balancing tests, i.e. the t-test on differences in the covariate means for both control and treatment groups is statistically significant after matching, indicating that covariates are not balanced in both groups after matching. Hence, the estimate ATT would be biased. This might be due to the small number of events (34 positive events compared to 61 negative events). This issue also creates problems for the estimations using the pooled CRAs' dataset.

4.7 Discussion

The findings show that sovereign ratings, particularly negative rating signals, have a significant impact on polling results for the incumbent party. There are several ways through which sovereign credit ratings can affect government support. Sovereign credit ratings represent a signal of the incumbent's ability to stabilise the economy and financial markets, hence might affect simultaneously both sociotropic and egocentric voters' preferences. While sociotropic voters make decision based on the economic conditions, egocentric ones focus on personal wealth (Lewis-Beck and Stegmaier, 2019).

If sociotropic voting is in play, citizens could use the sovereign ratings as a measure of national economic health. The findings indicate that sovereign ratings have a significant effect on government support beyond the effects of other macroeconomics and political factors. Sovereign credit ratings are used in political speech as a proxy for economic conditions[66] and

[66] For example, Donald Trump mentioned the AAA credit rating of the State of Indiana bonds, where Mike Pence was governor as a way to prove the performance of the vice president candidate in his interview on CBS television on July 17, 2016. Mike Pence introduced himself with the rating of Indiana at the Republican National Convention on July 20, 2016. Another example is that the mayor of Waterville Paul LePage was credited in the local news for the increase of city's rating.

the public tends to show an increase in interest in credit ratings around election campaign[67] (Cunha et al., 2019).

Sovereign credit ratings can also have an indirect impact on government support. Specifically, the lower level of sovereign ratings results in an expected increase in the borrowing cost for the government. Incumbents, in turn, may adopt a contractionary fiscal policy by decreasing government expenditure or increasing taxation, therefore decreasing the support for the government. Sovereign rating events also affect economic growth via the interest rate and capital flow channels (Chen et al., 2016c). Negative rating news are associated with increased interest rates and net capital outflows, which hampers economic growth. If citizens are forward looking, then the anticipated reduction in economic growth could decrease government support.

Although citizens may not be completely informed with regards to the economic conditions, they may be aware of the important effect of macroeconomic changes (Sanders, 2000). In the absence of perfect information, sovereign credit ratings can be used as a signal for the state of the economy. As an indication of national economy, the findings show that CRAs' actions (including changes in actual ratings and outlook/watch signals) can assist citizens in perceiving the political quality of incumbents, even if the rating changes are outside of the government's control. This could be because average citizens might be unable to separate political skills from external factors (Cunha et al., 2019).

If egocentric voting is in play, citizens are more concerned about the performance of their stocks and bonds following sovereign rating changes. However, the overall effect should be strengthened in the case of higher rates of stock or bond ownership translating in more attention to sovereign credit ratings news and the other way around. The differences in the effects for stockholders/bondholders could be the object of future research, subject to the availability of data.

4.8 Conclusion

This Chapter examines whether CRAs have political power in affecting voters' preferences. It finds that the level of sovereign rating is positively associated with the level of support for the government. However, sovereign rating actions affect voters' preferences in an asymmetric way, whereby negative rating events have a significant impact while the effect of

[67] Cunha et al. (2019) find an increase in searches for the term "credit rating" in some US states using Google Trends for the period around political campaigns from 2006 to 2012.

positive rating events is limited. These findings imply that sovereign ratings affect political decisions and can be added as a key factor in explaining the mechanism of voting behaviour. Changes in sovereign ratings signal the quality of the incumbent government and alter voters' preferences, hence possibly increasing political instability. While a variety of studies on the impact of sovereign credit ratings are insightful, none of them considers explicitly how sovereign credit ratings can affect voters' preferences over the party in office. The role of CRAs in politics needs more attention, hence this Chapter fills these voids and brings vital insights relating to sovereign ratings to the forefront.

In order to address the research question, a rich dataset of daily observations of long-term foreign-currency ratings, outlook and watch signals by S&P, Moody's and Fitch for EU countries from September 21, 2000 to July 28, 2017 is used. Credit ratings are transformed into a discrete variable using 18-notch and 52-point scales, whereby the 18-notch scale accounts for actual ratings and the 52-point scale accounts for actual ratings and outlook/watch signals. The dataset of polling results is a unique set and is hand-collected from different pollsters whenever available (see Chapter 3). This dataset unifies polling data for several countries outside of the election periods, not only on or around elections. Raw polling data is combined by aggregating the polling data of each country within different time windows.

The results are robust to various specifications and unlikely to suffer from reverse causality, as it is implausible that a polling change in a short period results in a rating change, given the through-the cycle rating philosophy applied by CRAs (Kiff et al., 2013). However, there might be confounding variables that can affect both polling results and ratings, even though using a short time window reduces drastically this concern. Hence, both FEM and PSM are employed to control for the omitted variables' bias. The results of the FEM consistently support the significant relationship between the sovereign credit ratings and government support across CRAs and time windows, suggesting that when the level of sovereign rating is higher (lower), citizens reward (punish) the party in office. Several robustness checks are conducted, and robust results are obtained.

The PSM is employed to make sure there are no time-varying unobservable issues, by exploring the reaction of the public to sovereign credit rating signals. The results of the PSM show asymmetric effects for negative and positive rating events. A negative rating news results in a significant decrease in government support by approximately 3% compared to the matched countries. In contrast, positive rating news does not seem to have a significant impact on the rated country's government support. This is consistent with prior studies indicating that while

negative rating events significantly influence the rated country's financial markets, the reaction is limited and not significant in the case of positive rating events (e.g. Afonso et al., 2012).

This Chapter contributes to two strands of literature. First, the findings confirm the link between government support and both financial markets and economies. Voter's preferences are sensitive to the performance of financial markets (e.g. Fauvelle-Aymar and Stegmaier, 2013; Cunha et al., 2019). The results indicate that short term shocks to financial markets in general, and sovereign rating events in particular, can have a significant impact on the support for government, causing political instability outcomes. The findings also support the economic voting theory that economic conditions affect voting behaviour (Lewis-Beck and Stegmaier, 2019). When economic conditions are good voters reward the government, when economic conditions are bad voters punish the government. With imperfect information about the state of the economy, sovereign credit ratings are used as a signal about the economic stability in a given country. Second, this Chapter highlights the political power of CRAs beyond their influence on national economies and financial markets. This contributes to the line of studies on the impact of sovereign credit ratings (e.g. Adelino and Ferreira, 2016; Baum et al., 2016; Cai et al., 2019; Tran et al., 2019).

The findings of this Chapter have several implications. Negative rating actions by CRAs shift voters' preferences, thus potentially altering the electoral prospects of the incumbents. The strong effects on government support might increase the likelihood of early elections or might induce changes in prime minister or president or the cabinet. Hence, CRAs can have long-lasting consequences on political outcomes. Political instability measured by frequent changes of the government and the cabinet in turn has distortive effects on fiscal policies and government borrowing, playing an important role behind economic crises (e.g. Fic and Saqib, 2006). In order to maintain the level of support and increase the likelihood of being re-elected, incumbents need to implement fiscal policies that would stabilise the performance of national economy and financial markets to ensure no negative rating actions assigned. However, at the same time austerity measures that might boost the future credit rating would worsen the economic conditions in the short term and would not be well received by the public.

This Chapter also implies that CRAs can act as a disciplining force to limit the actions of incumbents that may tip the scale and increase substantially the weight of public debt. Regulators and policymakers should be aware of the influence of CRAs on political preferences and political instability. As the political concerns over the role of CRAs become clearer, they should look into the need for further reforms of CRAs by proposing legal liability rules for CRAs so that CRAs are held more accountable.

Tables

Table 4.1 Descriptive statistics of rating actions

		S&P	Moody's	Fitch	All CRAs
1	Solo Rating Upgrades	22	10	13	45
2	Solo Positive Watch Actions	1	2	1	4
3	Solo Positive Outlook Actions	31	20	18	68
4	Combined Events of Rating Upgrades and Positive Watch	0	1	0	1
5	Combined Events of Rating Upgrades and Positive Outlook	2	4	1	7
6	Negative Watch to Negative Outlook Signal	5	2	1	8
7	All Rating Upgrades (Row 1+4+5)	24	15	14	53
8	Total Positive Events (Row 2+3+6+7)	61	39	34	133
9	- Of which by 1-Point Positive Actions (% Row 8)	59.02%	64.10%	52.94%	58.65%
10	- Of which by 2-Point Positive Actions (% Row 8)	14.75%	7.69%	20.59%	14.29%
11	- Of which by 3-Point Positive Actions (% Row 8)	21.31%	10.26%	20.59%	18.05%
12	- Of which by > 3-Point Positive Actions (% Row 8)	4.92%	17.95%	5.88%	9.02%
13	Solo Rating Downgrades	12	6	12	30
14	Solo Negative Watch Actions	17	9	7	32
15	Solo Negative Outlook Actions	21	15	18	52
16	Combined Events of Rating Downgrades and Negative Watch	6	4	3	12
17	Combined Events of Rating Downgrades and Negative Outlook	22	19	21	61
18	All Rating Downgrades (Row 13+16+17)	40	29	36	103
19	Total Negative Events (Row 14+15+18)	78	53	61	187
20	- Of which by 1-Point Negative Actions (% Row 19)	39.74%	35.85%	39.34%	38.50%
21	- Of which by 2-Point Negative Actions (% Row 19)	26.92%	22.64%	14.75%	21.93%
22	- Of which by 3-Point Negative Actions (% Row 19)	16.67%	11.32%	18.03%	16.04%
23	- Of which by > 3-Point Negative Actions (% Row 19)	16.67%	30.19%	27.87%	23.53%
24	Total Sovereign Credit Rating Signals (Row 8+19)	139	92	95	320

This table presents descriptive statistics of ratings actions based on 18-notch and 52-point rating scale by S&P, Moody's, Fitch, and all CRAs pooled together that have polling data available within 30 days after the rating action for EU countries from 2000 to 2017.
Note: the total number of rating events of all CRAs pooled together is slightly lower than the total number of rating events by S&P, Moody's, and Fitch, due to multiple actions by CRAs on the same day.

Table 4.2 FEM. S&P

Panel A. 18-notch rating scale										
Time window	[0;1]		[0; 3]		[0;7]		[0;14]		[0;30]	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
S&P18	0.010***	0.009***	0.011***	0.010***	0.010***	0.011***	0.009***	0.011***	0.007***	0.011***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.091		0.071		0.173***		0.333***		0.521***	
	(0.096)		(0.061)		(0.043)		(0.033)		(0.025)	
GDP per capita growth	-0.001		0.089***		0.139***		0.158***		0.130***	
	(0.031)		(0.020)		(0.015)		(0.012)		(0.010)	
Honeymoon	0.030***	0.032***	0.030***	0.030***	0.034***	0.033***	0.035***	0.034***	0.032***	0.032***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Independent party	-0.110***	-0.058***	-0.102***	-0.053***	-0.092***	-0.051***	-0.084***	-0.047***	-0.077***	-0.042***
	(0.004)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
Constant	0.110***	0.293***	0.096***	0.261***	0.096***	0.247***	0.106***	0.243***	0.134***	0.248***
	(0.012)	(0.015)	(0.008)	(0.010)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.005)
Observations	13,596	13,596	26,752	26,752	40,589	40,589	54,911	54,911	71,810	71,810
R-squared	0.744	0.909	0.713	0.904	0.702	0.905	0.694	0.905	0.686	0.908
Country FE	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Year FE	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Country X Year FE	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES

Table 4.2 (continued)

Panel B. 52-point rating scale										
Time window	[0;1]		[0; 3]		[0;7]		[0;14]		[0;30]	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
S&P52	0.003***	0.003***	0.004***	0.003***	0.003***	0.004***	0.003***	0.004***	0.003***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.113		0.058		0.165***		0.329***		0.519***	
	(0.096)		(0.061)		(0.043)		(0.033)		(0.025)	
GDP per capita growth	-0.008		0.081***		0.132***		0.153***		0.125***	
	(0.031)		(0.020)		(0.015)		(0.012)		(0.010)	
Honeymoon	0.030***	0.032***	0.030***	0.030***	0.034***	0.033***	0.035***	0.034***	0.032***	0.032***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Independent party	-0.109***	-0.058***	-0.101***	-0.053***	-0.092***	-0.051***	-0.083***	-0.048***	-0.077***	-0.041***
	(0.004)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
Constant	0.118***	0.302***	0.104***	0.274***	0.103***	0.261***	0.112***	0.257***	0.137***	0.262***
	(0.012)	(0.015)	(0.008)	(0.009)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.005)
Observations	13,596	13,596	26,752	26,752	40,589	40,589	54,911	54,911	71,810	71,810
R-squared	0.744	0.909	0.713	0.904	0.702	0.905	0.694	0.905	0.687	0.908
Country FE	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Year FE	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Country X Year FE	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES

The table presents the coefficient estimates of Eq. (4.2) using a sample of European countries rated by S&P during September 2000 – July 2017. $GovSup_{it+s}$: the dependent variable is the level of support for government of country i aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where rating is on date $t = 0$. *S&P18* and *S&P52* present sovereign credit rating of country i on date t using either 18-notch and 52-point rating scale rated by S&P respectively. Panels A and B present estimations using 18-notch and 52-point rating scale respectively. Macroeconomics factors include *Inflation* and *GDP per capita growth*. *Honeymoon* takes value of 1 if a new government sitting in their office for the first quarter, 0 otherwise. *Independent party* takes value of 1 if the party in office is independent, 0 otherwise. For each time window, FE are captured by a full set of both country and year dummies presented in the first column, then by the interaction term of country and year dummies in the second column. Macroeconomics factors are excluded from the regression when employing the interacted dummy variable of country and year. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5% and 10% respectively

Table 4.3 FEM. Moody's

Panel A. 18-notch rating scale										
Time window	[0;1]		[0; 3]		[0;7]		[0;14]		[0;30]	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Moody18	0.011***	0.008***	0.011***	0.008***	0.011***	0.007***	0.010***	0.007***	0.009***	0.007***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.169*		0.013		0.124***		0.281***		0.467***	
	(0.091)		(0.058)		(0.041)		(0.032)		(0.025)	
GDP per capita growth	0.003		0.082***		0.128***		0.147***		0.122***	
	(0.030)		(0.019)		(0.014)		(0.012)		(0.010)	
Honeymoon	0.032***	0.032***	0.031***	0.030***	0.034***	0.033***	0.035***	0.034***	0.032***	0.032***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Independent party	-0.104***	-0.055***	-0.096***	-0.051***	-0.088***	-0.051***	-0.081***	-0.048***	-0.076***	-0.042***
	(0.004)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
Constant	0.097***	0.295***	0.080***	0.295***	0.077***	0.303***	0.085***	0.301***	0.107***	0.304***
	(0.012)	(0.015)	(0.008)	(0.010)	(0.007)	(0.008)	(0.006)	(0.006)	(0.006)	(0.006)
Observations	13,596	13,596	26,752	26,752	40,589	40,589	54,911	54,911	71,810	71,810
R-squared	0.751	0.910	0.723	0.904	0.712	0.904	0.704	0.905	0.696	0.908
Country FE	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Year FE	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Country X Year FE	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES

Table 4.3 (Continued)

Panel B. 52-point rating scale										
Time window	[0;1]		[0; 3]		[0;7]		[0;14]		[0;30]	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Moody52	0.004***	0.003***	0.004***	0.003***	0.004***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.168*		0.015		0.128***		0.286***		0.473***	
	(0.091)		(0.058)		(0.041)		(0.032)		(0.025)	
GDP per capita growth	-0.015		0.065***		0.110***		0.131***		0.108***	
	(0.030)		(0.019)		(0.015)		(0.012)		(0.010)	
Honeymoon	0.032***	0.032***	0.031***	0.030***	0.034***	0.033***	0.035***	0.034***	0.033***	0.032***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Independent party	-0.103***	-0.054***	-0.096***	-0.051***	-0.088***	-0.051***	-0.081***	-0.048***	-0.076***	-0.042***
	(0.004)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
Constant	0.101***	0.291***	0.086***	0.294***	0.083***	0.302***	0.092***	0.301***	0.113***	0.304***
	(0.011)	(0.014)	(0.008)	(0.009)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.005)
Observations	13,596	13,596	26,752	26,752	40,589	40,589	54,911	54,911	71,810	71,810
R-squared	0.752	0.910	0.723	0.904	0.712	0.904	0.704	0.905	0.696	0.908
Country FE	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Year FE	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Country X Year FE	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES

The table presents the coefficient estimates of Eq. (4.2) using a sample of European countries rated by Moody's during September 2000 – July 2017. $GovSup_{it+s}$: the dependent variable is the level of support for government of country i aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where rating is on date $t = 0$. *Moody18* and *Moody52* present sovereign credit rating of country i on date t using either 18-notch and 52-point rating scale rated by Moody's respectively. Panels A and B present estimations using 18-notch and 52-point rating scale respectively. Macroeconomics factors include *Inflation* and *GDP per capita growth*. *Honeymoon* takes value of 1 if a new government sitting in their office for the first quarter, 0 otherwise. *Independent party* takes value of 1 if the party in office is independent, 0 otherwise. For each time window, FE are captured by a full set of both country and year dummies presented in the first column, then by the interaction term of country and year dummies in the second column. Macroeconomics factors are excluded from the regression when employing the interacted dummy variable of country and year. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5% and 10% respectively

Table 4.4 FEM. Fitch

Panel A. 18-notch rating scale										
Time window	[0;1]		[0; 3]		[0;7]		[0;14]		[0;30]	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fitch18	0.012***	0.011***	0.012***	0.012***	0.012***	0.013***	0.011***	0.014***	0.009***	0.014***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.174*		0.017		0.133***		0.299***		0.497***	
	(0.095)		(0.060)		(0.043)		(0.033)		(0.025)	
GDP per capita growth	0.026		0.108***		0.151***		0.164***		0.129***	
	(0.030)		(0.020)		(0.015)		(0.012)		(0.010)	
Honeymoon	0.032***	0.032***	0.031***	0.030***	0.035***	0.033***	0.035***	0.035***	0.033***	0.033***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Independent party	-0.108***	-0.059***	-0.100***	-0.053***	-0.091***	-0.052***	-0.083***	-0.048***	-0.078***	-0.042***
	(0.004)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
Constant	0.074***	0.263***	0.061***	0.232***	0.064***	0.212***	0.076***	0.205***	0.104***	0.208***
	(0.013)	(0.013)	(0.008)	(0.008)	(0.007)	(0.006)	(0.007)	(0.005)	(0.006)	(0.005)
Observations	13,596	13,596	26,752	26,752	40,589	40,589	54,911	54,911	71,810	71,810
R-squared	0.748	0.910	0.718	0.904	0.707	0.905	0.699	0.906	0.691	0.909
Country FE	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Year FE	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Country X Year FE	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES

Table 4.4 (continued)

Panel B. 52-point rating scale										
Time window	[0;1]		[0; 3]		[0;7]		[0;14]		[0;30]	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fitch52	0.004***	0.005***	0.004***	0.005***	0.004***	0.005***	0.004***	0.005***	0.003***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.165*		0.027		0.146***		0.311***		0.507***	
	(0.094)		(0.060)		(0.042)		(0.032)		(0.025)	
GDP per capita growth	0.011		0.096***		0.141***		0.155***		0.120***	
	(0.030)		(0.020)		(0.015)		(0.012)		(0.010)	
Honeymoon	0.032***	0.033***	0.032***	0.031***	0.035***	0.033***	0.036***	0.035***	0.033***	0.033***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Independent party	-0.106***	-0.059***	-0.099***	-0.052***	-0.090***	-0.051***	-0.083***	-0.048***	-0.077***	-0.042***
	(0.004)	(0.004)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
Constant	0.074***	0.221***	0.064***	0.214***	0.068***	0.206***	0.079***	0.204***	0.106***	0.211***
	(0.012)	(0.013)	(0.008)	(0.008)	(0.007)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)
Observations	13,596	13,596	26,752	26,752	40,589	40,589	54,911	54,911	71,810	71,810
R-squared	0.750	0.910	0.719	0.905	0.708	0.906	0.699	0.906	0.692	0.909
Country FE	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Year FE	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Country X Year FE	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES

The table presents the coefficient estimates of Eq. (4.2) using a sample of European countries rated by Fitch during September 2000 – July 2017. $GovSup_{it+s}$: the dependent variable is the level of support for government of country i aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where rating is on date $t = 0$. *Fitch18* and *Fitch52* present sovereign credit rating of country i on date t using either 18-notch and 52-point rating scale rated by Fitch respectively. Panels A and B present estimations using 18-notch and 52-point rating scale respectively. Macroeconomics factors include *Inflation* and *GDP per capita growth*. *Honeymoon* takes value of 1 if a new government sitting in their office for the first quarter, 0 otherwise. *Independent party* takes value of 1 if the party in office is independent, 0 otherwise. For each time window, FE are captured by a full set of both country and year dummies presented in the first column, then by the interaction term of country and year dummies in the second column. Macroeconomics factors are excluded from the regression when employing the interacted dummy variable of country and year. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5% and 10% respectively

Table 4.5 PSM. All CRAs 52-point negative rating events.

Panel A:	**Covariate balance test between the treated and the matched sample**						
Variable	Sample	Mean		%bias	%reduct |bias|	t-test	
		Treated	Control			t	p>|t|
GDP per capita	Unmatched	5773.80	6695.00	-33.10		-4.03	0.00
	Matched	5722.00	5531.30	6.90	79.30	0.59	0.55
Inflation	Unmatched	95.91	93.04	40.40		4.78	0.00
	Matched	95.49	95.36	1.90	95.30	0.20	0.84
Honeymoon	Unmatched	0.14	0.06	27.50		4.75	0.00
	Matched	0.09	0.05	13.50	50.90	1.33	0.19
Fiscal balance	Unmatched	-0.07	-0.02	-84.70		-16.31	0.00
	Matched	-0.05	-0.04	-7.80	90.80	-1.00	0.32
FOIA	Unmatched	4.19	4.00	10.90		1.45	0.15
	Matched	4.07	4.17	-5.70	47.60	-0.58	0.56
Corruption	Unmatched	0.90	1.33	-59.70		-7.81	0.00
	Matched	0.96	1.02	-8.60	85.60	-0.75	0.45
Government effectiveness	Unmatched	1.01	1.33	-64.50		-8.12	0.00
	Matched	1.04	1.09	-9.40	85.40	-0.79	0.43
Rule of law	Unmatched	1.07	1.35	-52.60		-7.07	0.00
	Matched	1.08	1.12	-8.20	84.50	-0.67	0.51
Panel B:	**Overall covariance balance test**						
Sample	Pseudo R^2	LR chi^2	$p>chi^2$	Mean Bias			
Unmatched	0.11	261.85	0.00	46.70			
Matched	0.02	8.39	0.40	7.70			
Panel C:	**ATT**						
	Treated	Controls	Difference	S.E.	T-stat		
Unmatched	0.267	0.286	-0.018	0.007	-2.74***		
ATT	0.263	0.295	-0.032	0.012	-2.73***		
	No. of obs.		Total				
	Off support	On support					
Untreated	0	39,633	39,633				
Treated	37	150	187				
Total	37	39,783	39,820				

The table presents results of three balancing tests performed directly after the PSM and ATT for 52-point negative rating events by all CRAs pooled together. Panel A presents the balance test results for the treated and the matched sample on all the covariates. Panel B presents the overall covariates balance tests results. Panel C reports the average treatment effect on the treated country's government support by ATT 30 days after negative rating events. Caliper does not exceed 1% in absolute value. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Table 4.6 PSM. S&P 52-point negative rating events.

Panel A:	**Covariate balance test between the treated and the matched sample**						
Variable	Sample	Mean		%bias	%reduct |bias|	t-test	
		Treated	Control			t	p>|t|
GDP per capita	Unmatched	5503.80	6695.00	-42.60		-3.37	0.00
	Matched	5371.80	5645.10	-9.80	77.10	-0.58	0.56
Inflation	Unmatched	95.28	93.04	30.40		2.41	0.02
	Matched	95.02	94.70	4.30	85.90	0.32	0.75
Honeymoon	Unmatched	0.12	0.06	20.60		2.18	0.03
	Matched	0.08	0.06	10.00	51.20	0.65	0.52
Type of government	Unmatched	3.94	3.39	27.30		2.79	0.01
	Matched	3.90	3.97	-3.50	87.20	-0.21	0.83
Fiscal balance	Unmatched	-0.06	-0.02	-71.20		-9.20	0.00
	Matched	-0.05	-0.04	-14.90	79.10	-1.22	0.23
Government consumption	Unmatched	0.20	0.21	-11.00		-0.85	0.40
	Matched	0.20	0.20	-8.90	19.40	-0.56	0.58
FOIA	Unmatched	4.13	4.00	7.30		0.62	0.53
	Matched	4.03	4.08	-3.30	55.50	-0.23	0.82
Corruption	Unmatched	0.91	1.33	-58.70		-4.98	0.00
	Matched	0.93	1.00	-9.50	83.70	-0.57	0.57
Government effectiveness	Unmatched	1.01	1.33	-63.30		-5.26	0.00
	Matched	1.02	1.07	-10.30	83.70	-0.60	0.55
Rule of law	Unmatched	1.06	1.35	-54.90		-4.76	0.00
	Matched	1.05	1.11	-10.90	80.20	-0.62	0.54

Panel B:	**Overall covariance balance test**			
Sample	Pseudo R^2	LR chi^2	$p>chi^2$	Mean Bias
Unmatched	0.08	85.25	0.00	38.70
Matched	0.02	3.55	0.97	8.50

Panel C:	**ATT**				
	Treated	Controls	Difference	S.E.	T-stat
Unmatched	0.271	0.286	-0.015	0.010	-1.40
ATT	0.272	0.306	-0.033	0.018	-1.80*

	No. of obs.		Total
	Off support	On support	
Untreated	0	39,633	39,633
Treated	7	71	78
Total	7	39,704	39,711

The table presents results of three balancing tests performed directly after the PSM and ATT for 52-point negative rating events by S&P. Panel A presents the balance test results for the treated and the matched sample on all the covariates. Panel B presents the overall covariates balance tests results. Panel C reports the average treatment effect on the treated country's government support by ATT 30 days after negative rating events. Caliper does not exceed 1% in absolute value. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Table 4.7 PSM. Moody's 52-point negative rating events.

Panel A:	**Covariate balance test between the treated and the matched sample**						
Variable	Sample	Mean		%bias	%reduct |bias|	t-test	
		Treated	Control			t	p>|t|
GDP per capita	Unmatched	6049.10	6699.10	-23.80		-1.53	0.13
	Matched	6049.10	5747.20	11.10	53.60	0.57	0.57
Inflation	Unmatched	96.48	92.84	55.60		3.21	0.00
	Matched	96.48	95.71	11.80	78.80	1.03	0.31
Honeymoon	Unmatched	0.15	0.06	31.10		2.96	0.00
	Matched	0.15	0.13	6.20	80.00	0.28	0.78
Type of government	Unmatched	3.58	3.36	11.60		0.93	0.36
	Matched	3.58	4.02	-22.80	-97.10	-1.20	0.23
FOIA	Unmatched	4.11	3.96	8.60		0.62	0.53
	Matched	4.11	4.02	5.20	39.20	0.30	0.76
Corruption	Unmatched	0.94	1.34	-57.00		-3.93	0.00
	Matched	0.94	0.95	-1.20	97.80	-0.06	0.95
Government effectiveness	Unmatched	1.03	1.34	-62.70		-4.06	0.00
	Matched	1.03	1.05	-2.70	95.70	-0.13	0.90
Panel B:	**Overall covariance balance test**						
Sample	Pseudo R^2	LR chi^2	$p>chi^2$	Mean Bias			
Unmatched	0.05	36.43	0.00	35.80			
Matched	0.03	4.07	0.77	8.70			
Panel C:	**ATT**						
	Treated	Controls	Difference	S.E.	T-stat		
Unmatched	0.277	0.287	-0.010	0.013	-0.80		
ATT	0.277	0.308	-0.031	0.018	-1.69*		
	No. of obs.		Total				
	Off support	On support					
Untreated	0	40,281	40,281				
Treated	0	53	53				
Total	0	40,334	40,334				

The table presents results of three balancing tests performed directly after the PSM and ATT for 52-point negative rating events by Moody's. Panel A presents the balance test results for the treated and the matched sample on all the covariates. Panel B presents the overall covariates balance tests results. Panel C reports the average treatment effect on the treated country's government support by ATT 30 days after negative rating events. Caliper does not exceed 1% in absolute value. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Table 4.8 PSM. Fitch 52-point negative rating events.

Panel A:	**Covariate balance test between the treated and the matched sample**						
Variable	Sample	Mean		%bias	%reduct |bias|	t-test	
		Treated	Control			t	p>|t|
GDP per capita	Unmatched	5809.80	6699.60	-31.70		-2.23	0.03
	Matched	5838.30	5576.70	9.30	70.60	0.48	0.64
Inflation	Unmatched	96.02	93.01	41.10		2.86	0.00
	Matched	95.91	95.36	7.60	81.60	0.54	0.59
Honeymoon	Unmatched	0.15	0.06	29.80		3.02	0.00
	Matched	0.13	0.08	16.60	44.50	0.88	0.38
Type of government	Unmatched	3.72	3.38	17.70		1.52	0.13
	Matched	3.65	3.77	-6.10	65.40	-0.36	0.72
Government consumption	Unmatched	0.20	0.21	-0.40		-0.03	0.98
	Matched	0.20	0.21	-3.90	-911.80	-0.19	0.85
FOIA	Unmatched	4.36	4.00	21.00		1.58	0.12
	Matched	4.33	4.05	16.40	21.60	1.00	0.32
Corruption	Unmatched	0.87	1.34	-63.70		-4.81	0.00
	Matched	0.89	1.00	-15.40	75.80	-0.80	0.43
Government effectiveness	Unmatched	0.99	1.33	-68.10		-4.92	0.00
	Matched	1.00	1.09	-17.60	74.10	-0.90	0.37
Rule of law	Unmatched	1.06	1.35	-55.10		-4.26	0.00
	Matched	1.06	1.08	-3.10	94.30	-0.15	0.88
Panel B:	**Overall covariance balance test**						
Sample	Pseudo R^2	LR chi^2	$p>chi^2$	Mean Bias			
Unmatched	0.05	48.32	0.00	36.50			
Matched	0.08	13.62	0.14	10.70			
Panel C:	**ATT**						
	Treated	Controls	Difference	S.E.	T-stat		
Unmatched	0.258	0.286	-0.028	0.012	-2.39***		
ATT	0.260	0.291	-0.031	0.018	-1.74*		
	No. of obs.		Total				
	Off support	On support					
Untreated	0	39,724	39,724				
Treated	1	60	61				
Total	1	39,784	39,785				

The table presents results of three balancing tests performed directly after the PSM and ATT for 52-point negative rating events by Fitch. Panel A presents the balance test results for the treated and the matched sample on all the covariates. Panel B presents the overall covariates balance tests results. Panel C reports the average treatment effect on the treated country's government support by ATT 30 days after negative rating events. Caliper does not exceed 1% in absolute value. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Table 4.9 PSM. S&P 52-point positive rating events.

Panel A:	**Covariate balance test between the treated and the matched sample**						
Variable	Sample	Mean		%bias	%reduct |bias|	t-test	
		Treated	Control			t	p>|t|
GDP per capita	Unmatched	5145.90	6695.00	-52.60		-3.87	0.00
	Matched	5145.90	5375.40	-7.80	85.20	-0.47	0.64
Inflation	Unmatched	94.32	93.04	14.50		1.22	0.22
	Matched	94.32	94.98	-7.50	48.20	-0.42	0.68
Fiscal balance	Unmatched	-0.03	-0.02	-26.10		-2.03	0.04
	Matched	-0.03	-0.03	-8.50	67.50	-0.44	0.66
Government consumption	Unmatched	0.20	0.21	-30.60		-2.23	0.03
	Matched	0.20	0.20	-10.30	66.30	-0.62	0.53
FOIA	Unmatched	4.02	4.00	0.80		0.06	0.95
	Matched	4.02	3.87	8.20	-906.90	0.47	0.64
Corruption	Unmatched	0.91	1.33	-62.70		-4.44	0.00
	Matched	0.91	0.95	-6.00	90.40	-0.36	0.72
Government effectiveness	Unmatched	1.07	1.33	-51.50		-3.66	0.00
	Matched	1.07	1.14	-12.50	75.80	-0.75	0.45
Rule of law	Unmatched	1.09	1.35	-51.00		-3.73	0.00
	Matched	1.09	1.16	-14.40	71.80	-0.86	0.39

Panel B:	**Overall covariance balance test**			
Sample	Pseudo R^2	LR chi^2	$p>chi^2$	Mean Bias
Unmatched	0.03	29.11	0.00	36.20
Matched	0.03	5.24	0.73	9.40

Panel C:	**ATT**				
	Treated	Controls	Difference	S.E.	T-stat
Unmatched	0.257	0.286	-0.029	0.012	-2.46***
ATT	0.257	0.276	-0.019	0.019	-0.99

	No. of obs.		Total
	Off support	On support	
Untreated	0	39,633	39,633
Treated	0	61	61
Total	0	39,694	39,694

The table presents results of three balancing tests performed directly after the PSM and ATT for 52-point positive rating events by S&P. Panel A presents the balance test results for the treated and the matched sample on all the covariates. Panel B presents the overall covariates balance tests results. Panel C reports the average treatment effect on the treated country's government support by ATT 30 days after positive rating events. Caliper does not exceed 1% in absolute value. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

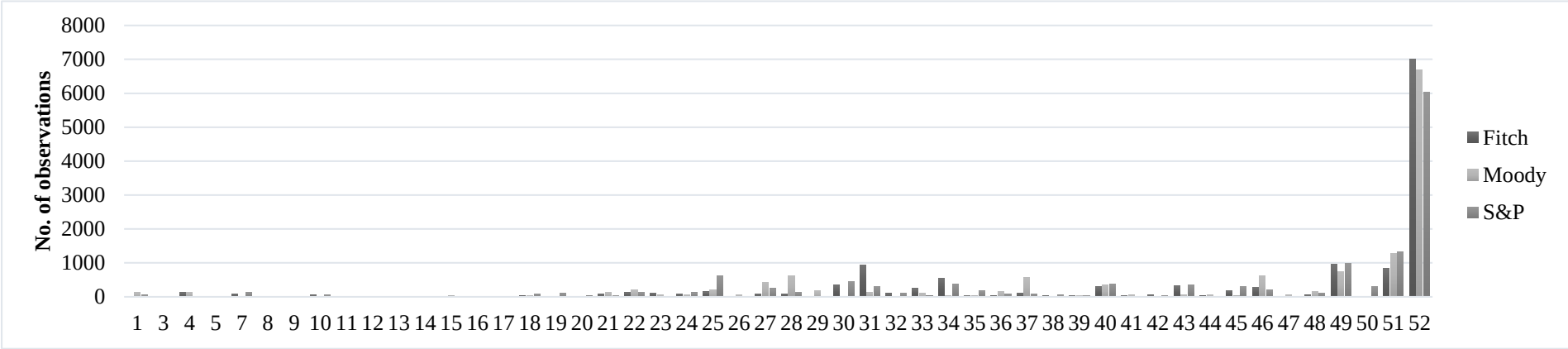
Table 4.10 PSM. Moody's 52-point positive rating events.

Panel A:	**Covariate balance test between the treated and the matched sample**						
Variable	Sample	Mean		%bias	%reduct |bias|	t-test	
		Treated	Control			t	p>|t|
GDP per capita	Unmatched	5207.70	6699.60	-47.80		-2.98	0.00
	Matched	5207.70	4817.90	12.50	73.90	0.64	0.52
Inflation	Unmatched	93.13	93.01	1.20		0.09	0.93
	Matched	93.13	93.78	-6.60	-443.60	-0.27	0.79
Type of government	Unmatched	4.54	3.38	54.60		4.15	0.00
	Matched	4.54	4.08	21.80	60.00	0.83	0.41
Government consumption	Unmatched	0.19	0.21	-60.60		-3.37	0.00
	Matched	0.19	0.19	-15.50	74.30	-0.82	0.41
Corruption	Unmatched	0.89	1.34	-68.10		-3.70	0.00
	Matched	0.89	0.97	-12.00	82.40	-0.62	0.53
Government effectiveness	Unmatched	1.04	1.33	-61.00		-3.40	0.00
	Matched	1.04	1.11	-14.70	75.90	-0.73	0.47
Rule of law	Unmatched	1.06	1.35	-58.10		-3.35	0.00
	Matched	1.06	1.14	-16.60	71.40	-0.84	0.40
Panel B:	**Overall covariance balance test**						
Sample	Pseudo R^2	LR chi^2	$p>chi^2$	Mean Bias			
Unmatched	0.05	28.63	0.00	50.20			
Matched	0.06	6.25	0.51	14.30			
Panel C:	**ATT**						
	Treated	Controls	Difference	S.E.	T-stat		
Unmatched	0.28	0.29	-0.01	0.01	-0.40		
ATT	0.28	0.31	-0.03	0.02	-1.23		
	No. of obs.		Total				
	Off support	On support					
Untreated	0	39,724	39,724				
Treated	0	39	39				
Total	0	39,763	39,763				

The table presents results of three balancing tests performed directly after the PSM and ATT for 52-point positive rating events by Moody's. Panel A presents the balance test results for the treated and the matched sample on all the covariates. Panel B presents the overall covariates balance tests results. Panel C reports the average treatment effect on the treated country's government support by ATT 30 days after positive rating events. Caliper does not exceed 1% in absolute value. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

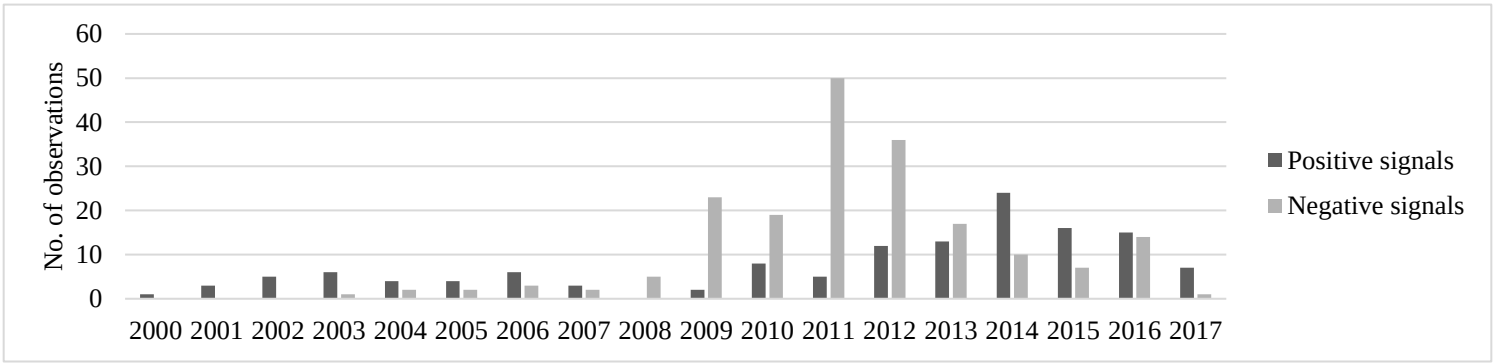
Figures

Figure 4.1 Distribution of daily sovereign ratings



The figure presents the distribution of daily sovereign ratings of European countries based on 52-point rating scale after matching with polling data from 2000 to 2017.

Figure 4.2 Distribution of negative and positive rating signals



The figure presents the distribution of negative and positive signals based on 52-point scale (including actual rating changes and outlook/watch changes) that have polling data available within 30 days after the rating action for European countries from 2000 to 2017.

Figure 4.3 Propensity Score before and after matching: all CRAs 52-point negative rating events using set of 8 pre-treatment variables

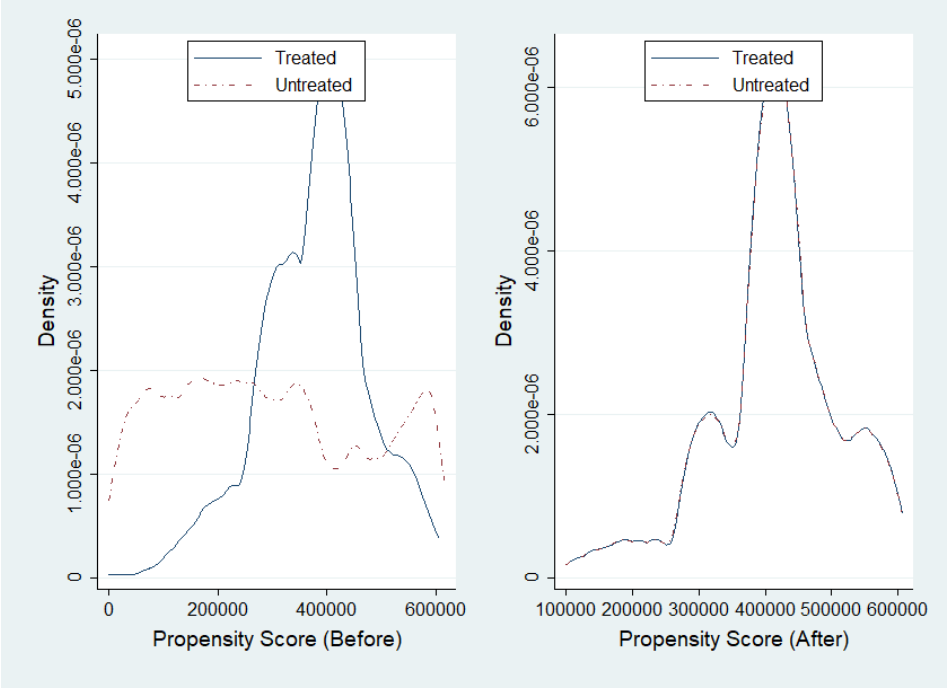


Figure 4.4 Propensity Score before and after matching: S&P 52-point negative rating events using set of 10 pre-treatment variables

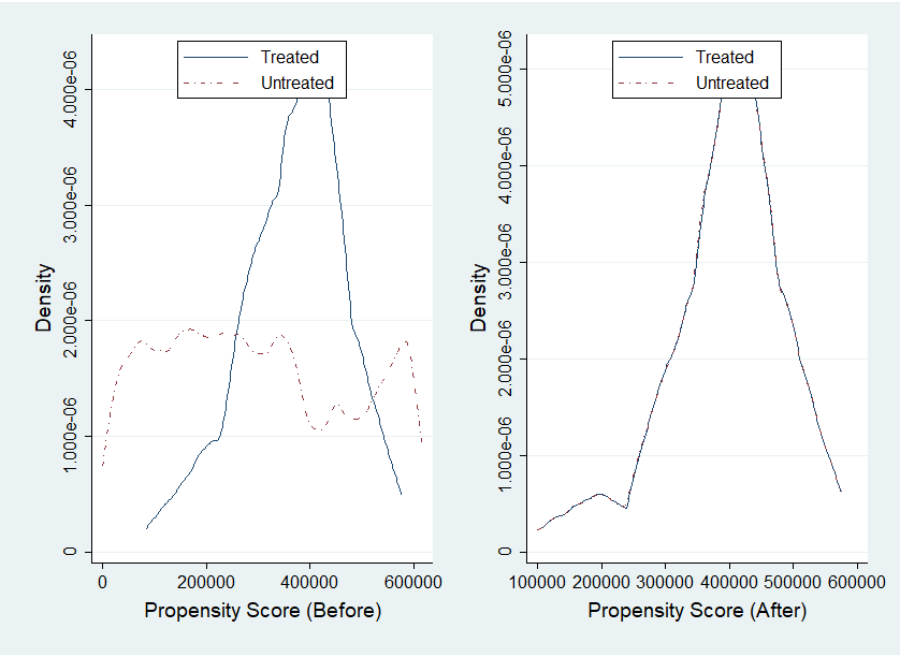


Figure 4.5 Propensity Score before and after matching: Moody's 52-point negative rating events using set of 7 pre-treatment variables

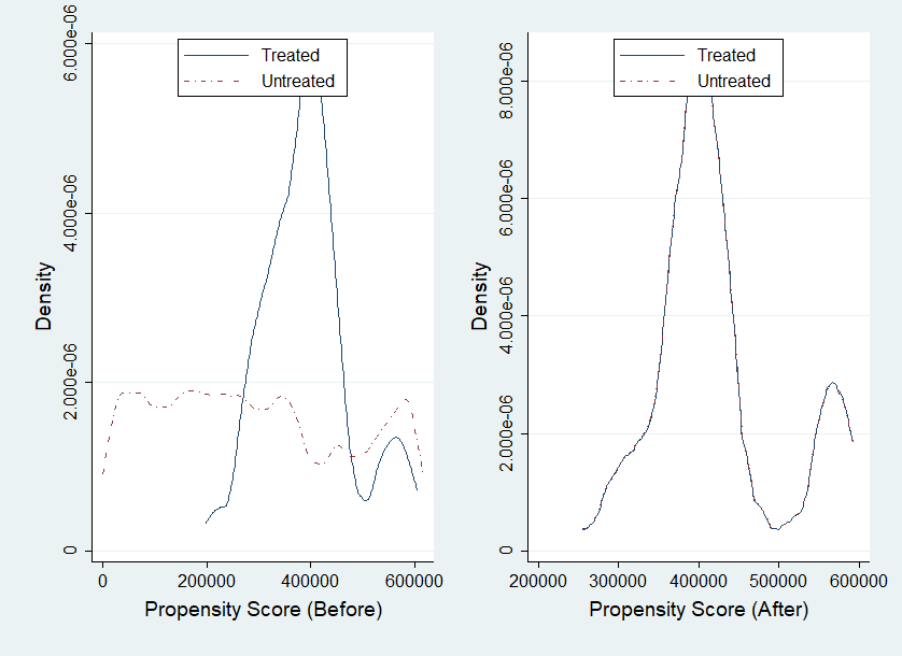


Figure 4.6 Propensity Score before and after matching: Fitch 52-point negative rating events using set of 9 pre-treatment variables

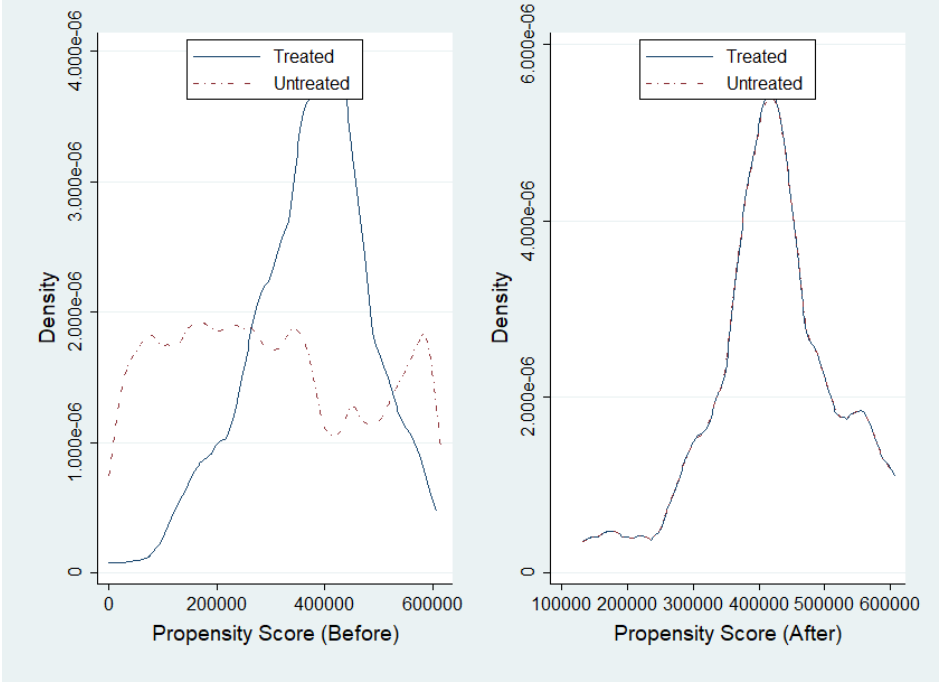


Figure 4.7 Propensity Score before and after matching: S&P 52-point positive rating events using set of 8 pre-treatment variables

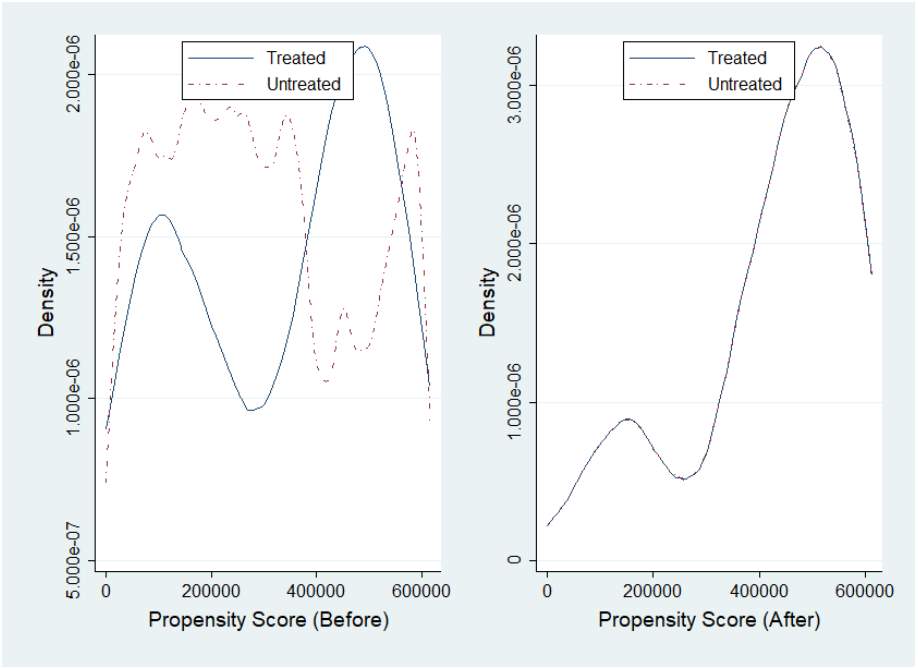
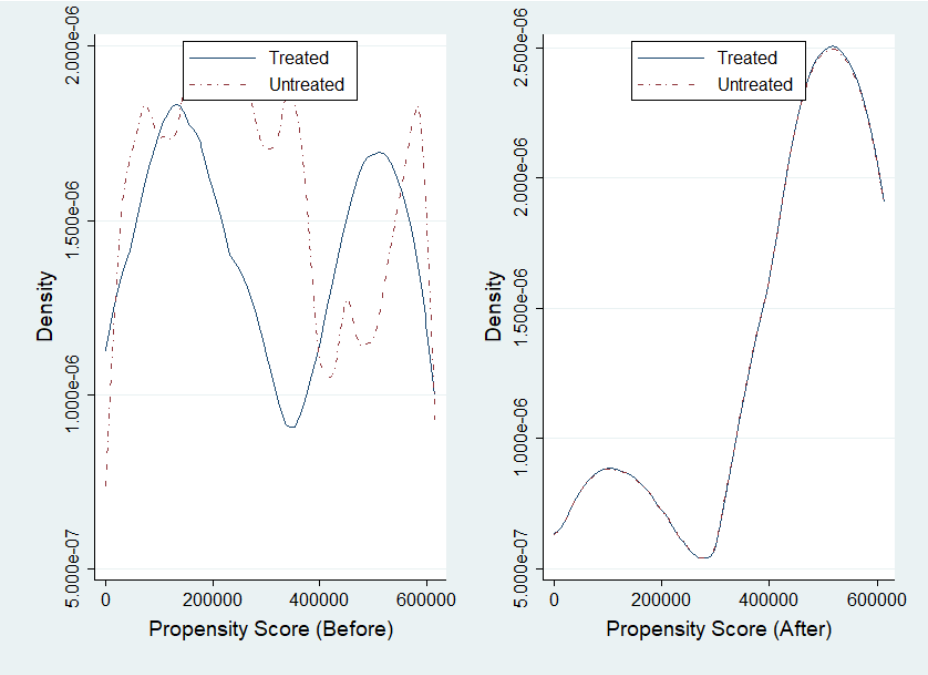


Figure 4.8 Propensity Score before and after matching: Moody's 52-point positive rating events using set of 7 pre-treatment variables



Appendices

Appendix 4.1 Numerical scale of sovereign credit ratings

Rating S&P,Fitch/Moody's	Outlook/watch	18-notch scale	52-point scale	Adjust -ments	52-point CCR scale	LCCR scale
Panel A: Investment grade ratings						
AAA/Aaa	Stable watch/outlook	18	52	0	52	3.95
AAA/Aaa	Negative outlook	18		-1	51	3.24
AAA/Aaa	Negative watch	18		-2	50	2.81
AA+/Aa1	Positive watch	17		2	51	3.24
AA+/Aa1	Positive outlook	17		1	50	2.81
AA+/Aa1	Stable watch/outlook	17	49	0	49	2.51
AA+/Aa1	Negative outlook	17		-1	48	2.26
AA+/Aa1	Negative watch	17		-2	47	2.06
AA/Aa2	Positive watch	16		2	48	2.26
AA/Aa2	Positive outlook	16		1	47	2.06
AA/Aa2	Stable watch/outlook	16	46	0	46	1.88
AA/Aa2	Negative outlook	16		-1	45	1.73
AA/Aa2	Negative watch	16		-2	44	1.59
AA-/Aa3	Positive watch	15		2	45	1.73
AA-/Aa3	Positive outlook	15		1	44	1.59
AA-/Aa3	Stable watch/outlook	15	43	0	43	1.46
AA-/Aa3	Negative outlook	15		-1	42	1.34
AA-/Aa3	Negative watch	15		-2	41	1.23
A+/A1	Positive watch	14		2	42	1.34
A+/A1	Positive outlook	14		1	41	1.23
A+/A1	Stable watch/outlook	14	40	0	40	1.12
A+/A1	Negative outlook	14		-1	39	1.02
A+/A1	Negative watch	14		-2	38	0.93
A/A2	Positive watch	13		2	39	1.02
A/A2	Positive outlook	13		1	38	0.93
A/A2	Stable watch/outlook	13	37	0	37	0.84
A/A2	Negative outlook	13		-1	36	0.75
A/A2	Negative watch	13		-2	35	0.66
A-/A3	Positive watch	12		2	36	0.75
A-/A3	Positive outlook	12		1	35	0.66
A-/A3	Stable watch/outlook	12	34	0	34	0.58
A-/A3	Negative outlook	12		-1	33	0.50
A-/A3	Negative watch	12		-2	32	0.42
BBB+/Baa1	Positive watch	11		2	33	0.50
BBB+/Baa1	Positive outlook	11		1	32	0.42
BBB+/Baa1	Stable watch/outlook	11	31	0	31	0.34
BBB+/Baa1	Negative outlook	11		-1	30	0.27
BBB+/Baa1	Negative watch	11		-2	29	0.19
BBB/Baa2	Positive watch	10		2	30	0.27
BBB/Baa2	Positive outlook	10		1	29	0.19
BBB/Baa2	Stable watch/outlook	10	28	0	28	0.11
BBB/Baa2	Negative outlook	10		-1	27	0.04
BBB/Baa2	Negative watch	10		-2	26	-0.04

Appendix 4.1 (continued)

Rating S&P,Fitch/Moody's	Outlook/watch	18-notch scale	52-point scale	Adjust -ments	52-point CCR scale	LCCR scale
Panel B: Speculative grade ratings						
BBB-/Baa3	Positive watch	9		2	27	0.04
BBB-/Baa3	Positive outlook	9		1	26	-0.04
BBB-/Baa3	Stable watch/outlook	9	25	0	25	-0.11
BBB-/Baa3	Negative outlook	9		-1	24	-0.19
BBB-/Baa3	Negative watch	9		-2	23	-0.27
BB+/Ba1	Positive watch	8		2	24	-0.19
BB+/Ba1	Positive outlook	8		1	23	-0.27
BB+/Ba1	Stable watch/outlook	8	22	0	22	-0.34
BB+/Ba1	Negative outlook	8		-1	21	-0.42
BB+/Ba1	Negative watch	8		-2	20	-0.50
BB/Ba2	Positive watch	7		2	21	-0.42
BB/Ba2	Positive outlook	7		1	20	-0.50
BB/Ba2	Stable watch/outlook	7	19	0	19	-0.58
BB/Ba2	Negative outlook	7		-1	18	-0.66
BB/Ba2	Negative watch	7		-2	17	-0.75
BB-/Ba3	Positive watch	6		2	18	-0.66
BB-/Ba3	Positive outlook	6		1	17	-0.75
BB-/Ba3	Stable watch/outlook	6	16	0	16	-0.84
BB-/Ba3	Negative outlook	6		-1	15	-0.93
BB-/Ba3	Negative watch	6		-2	14	-1.02
B+/B1	Positive watch	5		2	15	-0.93
B+/B1	Positive outlook	5		1	14	-1.02
B+/B1	Stable watch/outlook	5	13	0	13	-1.12
B+/B1	Negative outlook	5		-1	12	-1.23
B+/B1	Negative watch	5		-2	11	-1.34
B/B2	Positive watch	4		2	12	-1.23
B/B2	Positive outlook	4		1	11	-1.34
B/B2	Stable watch/outlook	4	10	0	10	-1.46
B/B2	Negative outlook	4		-1	9	-1.59
B/B2	Negative watch	4		-2	8	-1.73
B-/B3	Positive watch	3		2	9	-1.59
B-/B3	Positive outlook	3		1	8	-1.73
B-/B3	Stable watch/outlook	3	7	0	7	-1.88
B-/B3	Negative outlook	3		-1	6	-2.06
B-/B3	Negative watch	3		-2	5	-2.26
CCC+/CCC/CCC-, CCC, Caa1/Caa2/Caa3	Positive watch	2		2	6	-2.06
CCC+/CCC/CCC-, CCC, Caa1/Caa2/Caa3	Positive outlook	2		1	5	-2.26
CCC+/CCC/CCC-, CCC, Caa1/Caa2/Caa3	Stable watch/outlook	2	4	0	4	-2.51
CCC+/CCC/CCC-, CCC, Caa1/Caa2/Caa3	Negative outlook	2		-1	3	-2.81
CCC+/CCC/CCC-, CCC, Caa1/Caa2/Caa3	Negative watch	2		-2	2	-3.24
CC/ Ca to C/SD/D			1		1	-3.95

This table presents the numerical scale of sovereign credit ratings based on 18-notch, 52-point CCR and LCCR rating scales, where LCCR = ln [CCR/(53-CCR)]. Different categories can generate the same CCR score (e.g. AAA/Aaa with negative outlook has 51 point which equals to AA+/Aa1 with positive watch.

Appendix 4.2 Rating actions for 28 EU countries

		S&P	Moody's	Fitch
1	No. of Countries	28	28	28
2	Total No. of Daily Observations	123116	123116	122760
3	Daily Positive Outlook Observations	13881	9991	13253
4	Daily Negative Outlook Observations	17785	13854	14703
5	Daily Stable Outlook/Watch Observations	89859	96761	93750
6	Daily Positive Watch Observations	0	1019	212
7	Daily Negative Watch Observations	1591	1491	842
8	Solo Rating Upgrades	57	38	54
9	Solo Positive Watch Actions	1	13	4
10	Solo Positive Outlook Actions	71	46	51
11	Combined Events of Rating Upgrades and Positive Watch	0	1	0
12	Combined Events of Rating Upgrades and Positive Outlook	18	10	13
13	Negative Watch to Negative Outlook Signal	10	4	3
14	All Rating Upgrades (Row 8+11+12)	75	49	67
15	- of which by > 1-notch (%Row 14)	5.33%	28.57%	5.97%
16	- of which by 2-notches (%Row 14)	5.33%	18.37%	5.97%
17	- of which by > 2-notches (%Row 14)	0.00%	10.20%	0.00%
18	Total Positive Events (Row 9+10+13+14)	157	112	125
19	Solo Rating Downgrades	23	12	24
20	Solo Negative Watch Actions	34	21	15
21	Solo Negative Outlook Actions	38	29	41
22	Combined Events of Rating Downgrades and Negative Watch	11	6	4
23	Combined Events of Rating Downgrades and Negative Outlook	46	39	38
24	All Rating Downgrades (Row 19+22+23)	80	57	66
25	- of which by > 1-notch (%Row 24)	20.00%	40.35%	27.27%
26	- of which by 2-notches (%Row 24)	17.50%	24.56%	18.18%
27	- of which by > 2-notches (%Row 24)	2.50%	15.79%	9.09%
28	Total Negative Events (Row 20+21+24)	152	107	122
29	Total Sovereign Credit Rating Signals (Row 18+28)	309	219	247

This table presents descriptive statistics of ratings actions by S&P, Moody's, Fitch for 28 EU countries from 2000 to 2017 based on 18-notch scale.

Appendix 4.3 FEM. Control variables

Variables	Expected sign	Definition (Source)	Mean	Std. dev.
Inflation	+/-	Yearly inflation, consumer prices in year t-1 (World Bank)	0.020	0.020
GDP per capita growth	+	Yearly GDP per capita growth in year t-1 (World Bank)	0.012	0.036
Honeymoon	+	Time in office at time t. A dummy variable equals to 1 in the quarter when a new president/ prime minister first sitting in the office, and 0 otherwise (Multiple sources, including https://www.parlament.gv.at/WWER/PAD_02941/index.shtml, https://www.gov.uk/government/ministers/prime-minister, https://www.government.se/government-of-sweden/prime-ministers-office/stefan-lofven/cv-stefan-lofven/ , etc)	0.072	0.258
Independent party	-	A dummy variable equals to 1 if the government is led by independent candidate and 0 otherwise at time t (Multiple sources, including https://www.britannica.com/biography/Mario-Monti and https://howlingpixel.com/i-en/Tihomir_Orešković, etc.)	0.028	0.166

Appendix 4.4 PSM. Pre-treatment variables

Variables	Definition (Source)
GDP per capita	Quarterly GDP per capita in quarter t-1 (Eurostat)
Inflation	Quarterly harmonized consumer price index (HCPI) where 2015=100, in quarter t-1 (Eurostat)
Honeymoon	Time in office at time t. A dummy variable equals to 1 in the quarter when a new president/ prime minister first sitting in the office, and 0 otherwise (Multiple sources)
Type of government	A dummy variable for different type of government at time t (e.g. left/centre left/ centre/ centre right/ right wing party) (Multiple sources)
Fiscal balance	Quarterly fiscal balance as a percentage of GDP in quarter t-1 (ECB)
Government consumption	Quarterly government consumption as percentage of GDP in quarter t-1 (ECB)
FOIA	Yearly proxy of the government's quality of information disclosure in year t-1. (Following Vu et al. (2017), FOIA is defined based on the data obtained from the report named "Overview of all FOI laws" in Vleugels (2011))
Corruption	Yearly corruption score in year t-1 (Worldwide Governance Indicator, World Bank)
Government effectiveness	Yearly government effectiveness score in year t-1 (Worldwide Governance Indicator, World Bank)
Rule of law	Yearly rule of law score in year t-1 (Worldwide Governance Indicator, World Bank)

Appendix 4.5 FEM. Aggregating polls every three days.

Panel A. 18-notch rating scale						
Time window	S&P18		Moody18		Fitch18	
	(1)	(2)	(3)	(4)	(5)	(6)
Rating	0.011***	0.010***	0.011***	0.007***	0.012***	0.011***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Inflation	0.064		0.004		0.008	
	(0.105)		(0.100)		(0.104)	
GDP per capita growth	0.095***		0.089***		0.115***	
	(0.034)		(0.034)		(0.034)	
Honeymoon	0.031***	0.029***	0.032***	0.029***	0.032***	0.029***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Independent party	-0.103***	-0.055***	-0.097***	-0.053***	-0.101***	-0.056***
	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)
Constant	0.088***	0.264***	0.073***	0.302***	0.054***	0.245***
	(0.014)	(0.017)	(0.013)	(0.018)	(0.014)	(0.014)
Observations	8,944	8,944	8,944	8,944	8,944	8,944
R-squared	0.714	0.906	0.724	0.905	0.719	0.906
Country FE	YES	NO	YES	NO	YES	NO
Year FE	YES	NO	YES	NO	YES	NO
Country X Year FE	NO	YES	NO	YES	NO	YES

Appendix 4.5 (continued)

Panel B. 52-point rating scale						
Time window	S&P52		Moody52		Fitch52	
	(1)	(2)	(3)	(4)	(5)	(6)
Rating	0.004***	0.003***	0.004***	0.003***	0.004***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	0.052		0.006		0.019	
	(0.106)		(0.100)		(0.104)	
GDP per capita growth	0.087**		0.071**		0.102***	
	(0.034)		(0.034)		(0.034)	
Honeymoon	0.032***	0.029***	0.033***	0.029***	0.033***	0.030***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Independent party	-0.102***	-0.055***	-0.097***	-0.053***	-0.100***	-0.055***
	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)
Constant	0.096***	0.278***	0.078***	0.300***	0.057***	0.226***
	(0.014)	(0.016)	(0.013)	(0.017)	(0.014)	(0.014)
Observations	8,944	8,944	8,944	8,944	8,944	8,944
R-squared	0.714	0.906	0.724	0.906	0.720	0.906
Country FE	YES	NO	YES	NO	YES	NO
Year FE	YES	NO	YES	NO	YES	NO
Country X Year FE	NO	YES	NO	YES	NO	YES

The table presents the coefficient estimates of Eq. (4.2) using a sample of European countries rated by S&P, Moody's, and Fitch during September 2000 – July 2017. $GovSup_{it+s}$: the dependent variable is the level of support for government of country i aggregated by taking average of polling results for the incumbent party every 3 days. *S&P18* (*Moody18* and *Fitch18*) and *S&P52* (*Moody52* and *Fitch52*) represent $Rating_{it}$: sovereign credit rating of country i on date t using 18-notch and 52-point rating scale rated by S&P (Moody's and Fitch). Panel A and Panel B present estimations using 18-notch and 52-point rating scale respectively. Macroeconomics factors include *Inflation* and *GDP per capita growth*. *Honeymoon* takes value of 1 if a new government sitting in their office for the first quarter, 0 otherwise. *Independent party* takes value of 1 if the party in office is independent, 0 otherwise. FE are captured by a full set of both country and year dummies presented in the first column, then by the interaction term of country and year dummies in the second column of each Panel. Macroeconomics factors are excluded from the regression when employing the interacted dummy variable of country and year. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5% and 10% respectively

Appendix 4.6 FEM. Robustness tests – controlling for rating scales and campaign period

Time window	[0;1]		[0; 3]		[0;7]		[0;14]		[0;30]	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: All rating actions by 3 CRAs										
Rating-All18	0.010***	0.003***	0.011***	0.004***	0.010***	0.004***	0.009***	0.004***	0.008***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rating-All52	0.003***	0.001***	0.004***	0.001***	0.003***	0.001***	0.003***	0.001***	0.003***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Panel B: controlling for rating grades										
S&P18	0.010***	0.008***	0.011***	0.009***	0.011***	0.010***	0.010***	0.011***	0.009***	0.010***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Moody18	0.012***	0.010***	0.012***	0.011***	0.012***	0.011***	0.012***	0.011***	0.011***	0.010***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Fitch18	0.013***	0.011***	0.013***	0.012***	0.012***	0.014***	0.012***	0.014***	0.010***	0.014***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Panel B: LCCR										
S&P LCCR	0.022***	0.009***	0.024***	0.013***	0.024***	0.016***	0.023***	0.017***	0.020***	0.018***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Moody LCCR	0.029***	0.015***	0.028***	0.016***	0.027***	0.017***	0.025***	0.018***	0.023***	0.018***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Fitch LCCR	0.031***	0.029***	0.030***	0.029***	0.028***	0.028***	0.027***	0.028***	0.024***	0.027***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Year FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Country X Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Appendix 4.6 (continued)

Time window	[0;1]		[0; 3]		[0;7]		[0;14]		[0;30]	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel D: outside campaign period										
S&P52	0.003***	0.003***	0.003***	0.003***	0.003***	0.004***	0.003***	0.004***	0.002***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Moody52	0.003***	0.003***	0.004***	0.003***	0.004***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Fitch52	0.004***	0.005***	0.004***	0.005***	0.004***	0.005***	0.004***	0.005***	0.003***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Year FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Country X Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

The table presents the coefficient estimates of Eq. (4.2) using a sample of European countries rated by S&P, Moody's, and Fitch during September 2000 – July 2017. $GovSup_{it+s}$: the dependent variable is the level of support for government of country i aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where rating is on date $t = 0$. Panel A presents estimations on all CRAs' rating actions, *Rating-All18* and *Rating-All52* representing ratings by all CRAs pooled together based on 18-notch and 52-point rating scale respectively. Panel B presents estimations controlling for rating grade (investment or speculative grade) using 18-notch scale (*S&P18, Moody18,* and *Fitch18*). Panel C presents estimations using logit-type transformation of the rating LCCR (*S&P LCCR, Moody LCCR,* and *Fitch LCCR*). Panel D presents estimations on the sample outside campaign period, using 52-point rating scale (*S&P52, Moody52,* and *Fitch52*). *Controls* include control variables defined in Appendix 4.3. For each time window, FE are captured by a full set of both country and year dummies presented in the first column, then by the interaction term of country and year dummies in the second column. Macroeconomics factors are excluded from the regression when employing the interacted dummy variable of country and year. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Appendix 4.7 FEM. Robustness tests – controlling for political variables

Time window	[0;1]		[0; 3]		[0;7]		[0;14]		[0;30]	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: controlling for the number of opposing parties										
S&P52	0.003***	0.003***	0.004***	0.003***	0.004***	0.004***	0.003***	0.004***	0.003***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Moody52	0.004***	0.003***	0.004***	0.003***	0.004***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Fitch52	0.004***	0.005***	0.004***	0.005***	0.004***	0.005***	0.004***	0.005***	0.003***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Panel B: controlling for coalition government										
S&P52	0.004***	0.003***	0.004***	0.003***	0.003***	0.004***	0.003***	0.004***	0.003***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Moody52	0.004***	0.003***	0.004***	0.003***	0.004***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Fitch52	0.004***	0.005***	0.004***	0.005***	0.004***	0.005***	0.003***	0.005***	0.003***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Year FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Country X Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Appendix 4.7 (continued)

Panel C: controlling for ideologies										
S&P52	0.003***	0.003***	0.004***	0.003***	0.003***	0.004***	0.003***	0.004***	0.003***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Moody52	0.004***	0.003***	0.004***	0.003***	0.004***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Fitch52	0.004***	0.005***	0.004***	0.005***	0.004***	0.005***	0.004***	0.005***	0.003***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Year FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Country X Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

The table presents the coefficient estimates of Eq. (4.2) using a sample of European countries rated by S&P, Moody's, and Fitch based on the 52-point rating scale (*S&P52*, *Moody52*, and *Fitch52*) during September 2000 – July 2017. $GovSup_{it+s}$: the dependent variable is the level of support for government of country i aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where rating is on date $t = 0$. Panel A presents estimations controlling for the number of opposing parties. Panel B presents estimations controlling for the coalition government. Panel C presents estimations controlling for the incumbent's ideology. *Controls* include control variables defined in Appendix 4.3. For each time window, FE are captured by a full set of both country and year dummies presented in the first column, and by the interaction term of country and year dummies in the second column. Macroeconomics factors are excluded from the regression when employing the interacted dummy variable of country and year. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Appendix 4.8 FEM. Robustness tests – Clustered standard errors by country and year

Time window	[0;1]		[0; 3]		[0;7]		[0;14]		[0;30]	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
S&P18	0.010***	0.009***	0.011***	0.010***	0.010***	0.011***	0.009***	0.011***	0.007***	0.011***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
Moody18	0.011***	0.008***	0.011***	0.008**	0.011***	0.007**	0.010***	0.007**	0.009***	0.007**
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
Fitch18	0.012***	0.011***	0.012***	0.012***	0.012***	0.013***	0.011***	0.014***	0.009***	0.014***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
S&P52	0.003***	0.003**	0.004***	0.003***	0.003***	0.004***	0.003***	0.004***	0.003***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Moody52	0.004***	0.003***	0.004***	0.003***	0.004***	0.003**	0.003***	0.003**	0.003***	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Fitch52	0.004***	0.005***	0.004***	0.005***	0.004***	0.005***	0.004***	0.005***	0.003***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Year FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Country X Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

The table presents the coefficient estimates of Eq. (4.2) using a sample of European countries rated by S&P, Moody's, and Fitch during September 2000 – July 2017. $GovSup_{it+s}$: the dependent variable is the level of support for government of country i aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where rating is on date $t = 0$. *S&P18* (*Moody18* and *Fitch18*) and *S&P52* (*Moody52* and *Fitch52*) represent $Rating_{it}$: sovereign credit rating of country i on date t using 18-notch and 52-point rating scale rated by S&P (Moody's and Fitch). *Controls* include control variables defined in Appendix 4.3. For each time window, FE are captured by a full set of both country and year dummies presented in the first column, then by the interaction term of country and year dummies in the second column. Macroeconomics factors are excluded from the regression when employing the interacted dummy variable of country and year. Clustered standard errors by country and year are reported in parentheses. ***, **, and * indicate significance at the 1%, 5% and 10%, respectively.

Appendix 4.9 PSM procedure

The first step in estimating the treatment effect is to estimate PS. PS is estimated by probit model based on a set of pre-treatment variables. After matching, the mean and distribution of the covariates should be approximately the same across the treated and comparison groups. Balancing tests after matching include standardized bias, t-test, and joint significance test (see Section 4.5.2.2). When the covariates are not balanced, modify the probit model by dropping one or more variables. The procedure is described as follows and is repeated until the covariates are balanced.

1. Start with a probit model – Eq. (4.7) - to estimate the score using 10 pre-treatment variables as described in Appendix 4.4.
2. One-to-one NNM with replacement based on PS. Caliper does not exceed 1% in absolute value.
3. Balancing test: for all covariates, the absolute standardized bias does not exceed 25% and mean bias is about 10%. Results of t-test for all covariates show that differences in means across treated and comparison unit are not significantly different from zero. Finally, employ Pseudo-R^2 and Likelihood test for the joint significance of the standardized differences between the treatment and control groups. After matching, it is expected to have a fairly low Pseudo-R^2 and reject likelihood ratio test on the joint significance of all regressors. If one of the three balancing tests is not satisfied, unbalancing persists.
    a. If all covariates are balanced between treated and comparison observations, stop.
    b. If one or some covariates are unbalanced between treated and comparison observations, modify the probit by dropping out one or more covariates and re-evaluate. The dropped variables are assumed to be not too much relevant for explaining the outcome.

Appendix 4.10 PSM. All CRAs 52-point negative rating events. 10 variables.

Panel A:	**Covariate balance test between the treated and the matched sample**						
Variable	Sample	Mean		%bias	%reduct	t-test	
		Treated	Control		|bias|	t	p>|t|
GDP per capita	Unmatched	5773.80	6695.00	-33.10		-4.03	0.00
	Matched	5747.30	5889.20	-5.10	84.60	-0.43	0.66
Inflation	Unmatched	95.91	93.04	40.40		4.78	0.00
	Matched	95.41	95.31	1.40	96.60	0.15	0.88
Honeymoon	Unmatched	0.14	0.06	27.50		4.75	0.00
	Matched	0.09	0.08	2.30	91.70	0.21	0.84
Type of government	Unmatched	3.79	3.39	20.40		3.13	0.00
	Matched	3.77	3.95	-9.30	54.30	-0.83	0.41
Fiscal balance	Unmatched	-0.07	-0.02	-84.70		-16.31	0.00
	Matched	-0.05	-0.04	-13.40	84.20	-1.71	0.09
Government consumption	Unmatched	0.20	0.21	-3.10		-0.37	0.71
	Matched	0.20	0.21	-15.00	-384.00	-1.35	0.18
FOIA	Unmatched	4.19	4.00	10.90		1.45	0.15
	Matched	4.05	4.33	-15.80	-45.20	-1.61	0.11
Corruption	Unmatched	0.90	1.33	-59.70		-7.81	0.00
	Matched	0.97	1.07	-13.40	77.60	-1.15	0.25
Government effectiveness	Unmatched	1.01	1.33	-64.50		-8.12	0.00
	Matched	1.05	1.12	-14.90	76.90	-1.20	0.23
Rule of law	Unmatched	1.07	1.35	-52.60		-7.07	0.00
	Matched	1.08	1.16	-14.10	73.30	-1.12	0.26

Panel B:	**Overall covariance balance test**			
Sample	Pseudo R^2	LR chi^2	p>chi^2	Mean Bias
Unmatched	0.11	265.14	0.00	39.70
Matched	0.02	10.00	0.44	10.50

The table presents results of three balancing tests performed directly after the PSM and ATT for 52-point negative rating events by all CRAs. Panel A presents the balance test results for the treated and the matched sample on all the covariates. Panel B presents the overall covariates balance tests results. Caliper does not exceed 1% in absolute value. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Appendix 4.11 PSM. Moody's 52-point negative rating events. 10 variables.

Panel A:	**Covariate balance test between the treated and the matched sample**						
Variable	Sample	Mean		%bias	%reduct	t-test	
		Treated	Control		|bias|	t	p>|t|
GDP per capita	Unmatched	6105.80	6695.00	-21.60		-1.36	0.17
	Matched	6075.00	5018.20	38.70	-79.40	1.76	0.08
Inflation	Unmatched	96.67	93.04	56.40		3.20	0.00
	Matched	96.52	96.15	5.70	89.80	0.44	0.66
Honeymoon	Unmatched	0.15	0.06	31.50		2.97	0.00
	Matched	0.14	0.11	7.40	76.40	0.32	0.75
Type of government	Unmatched	3.58	3.39	9.90		0.79	0.43
	Matched	3.57	3.82	-13.10	-31.70	-0.69	0.49
Fiscal balance	Unmatched	-0.08	-0.02	-94.30		-9.62	0.00
	Matched	-0.06	-0.05	-19.00	79.90	-1.16	0.25
Government consumption	Unmatched	0.21	0.21	3.40		0.21	0.84
	Matched	0.20	0.20	-1.50	55.50	-0.07	0.94
FOIA	Unmatched	4.13	4.00	7.30		0.53	0.59
	Matched	4.00	4.30	-16.30	-122.40	-0.88	0.38
Corruption	Unmatched	0.94	1.33	-55.50		-3.80	0.00
	Matched	1.00	0.87	18.30	67.10	0.86	0.39
Government effectiveness	Unmatched	1.03	1.33	-60.80		-3.91	0.00
	Matched	1.07	1.02	10.10	83.30	0.45	0.65
Rule of law	Unmatched	1.11	1.35	-45.00		-3.19	0.00
	Matched	1.13	0.99	26.50	41.10	1.17	0.25
Panel B:	**Overall covariance balance test**						
Sample	Pseudo R^2	LR chi^2	$p>chi^2$	Mean Bias			
Unmatched	0.12	95.82	0.00	38.60			
Matched	0.12	14.79	0.14	15.70			

The table presents results of three balancing tests performed directly after the PSM and ATT for 52-point negative rating events by Moody's. Panel A presents the balance test results for the treated and the matched sample on all the covariates. Panel B presents the overall covariates balance tests results. Caliper does not exceed 1% in absolute value. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Appendix 4.12 PSM. Fitch 52-point negative rating events. 10 variables.

Panel A:	**Covariate balance test between the treated and the matched sample**						
Variable	Sample	Mean		%bias	%reduct	t-test	
		Treated	Control		|bias|	t	p>|t|
GDP per capita	Unmatched	5855.00	6695.00	-30.00		-2.08	0.04
	Matched	5805.70	5184.90	22.20	26.10	1.14	0.26
Inflation	Unmatched	96.17	93.04	43.00		2.96	0.00
	Matched	95.98	95.45	7.40	82.90	0.47	0.64
Honeymoon	Unmatched	0.15	0.06	30.50		3.06	0.00
	Matched	0.11	0.11	0.00	100.00	0.00	1.00
Type of government	Unmatched	3.72	3.39	17.20		1.47	0.14
	Matched	3.64	3.81	-8.90	48.50	-0.46	0.65
Fiscal balance	Unmatched	-0.08	-0.02	-96.30		-10.15	0.00
	Matched	-0.06	-0.04	-37.90	60.70	-2.50	0.01
Government consumption	Unmatched	0.21	0.21	1.90		0.13	0.90
	Matched	0.21	0.20	1.40	25.40	0.07	0.94
FOIA	Unmatched	4.38	4.00	22.10		1.65	0.10
	Matched	4.25	4.15	5.50	75.30	0.32	0.75
Corruption	Unmatched	0.87	1.33	-63.60		-4.78	0.00
	Matched	0.91	0.90	2.40	96.20	0.13	0.90
Government effectiveness	Unmatched	0.99	1.33	-67.80		-4.87	0.00
	Matched	1.01	1.02	-1.20	98.20	-0.06	0.95
Rule of law	Unmatched	1.05	1.35	-55.10		-4.24	0.00
	Matched	1.06	1.02	6.60	88.00	0.32	0.75
Panel B:	**Overall covariance balance test**						
Sample	Pseudo R^2	LR chi^2	$p>chi^2$	Mean Bias			
Unmatched	0.12	104.19	0.00	42.70			
Matched	0.09	13.37	0.20	9.30			

The table presents results of three balancing tests performed directly after the PSM and ATT for 52-point negative rating events by Fitch. Panel A presents the balance test results for the treated and the matched sample on all the covariates. Panel B presents the overall covariates balance tests results. Caliper does not exceed 1% in absolute value. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Appendix 4.13 PSM. S&P 52-point positive rating events. 10 variables.

Panel A:	**Covariate balance test between the treated and the matched sample**						
Variable	Sample	Mean		%bias	%reduct	t-test	
		Treated	Control		|bias|	t	p>|t|
GDP per capita	Unmatched	5145.90	6695.00	-52.60		-3.87	0.00
	Matched	5145.90	5286.90	-4.80	90.90	-0.29	0.77
Inflation	Unmatched	94.32	93.04	14.50		1.22	0.22
	Matched	94.32	94.78	-5.20	64.10	-0.29	0.77
Honeymoon	Unmatched	0.02	0.06	-21.90		-1.38	0.17
	Matched	0.02	0.08	-34.90	-59.00	-1.68	0.10
Type of government	Unmatched	4.56	3.39	57.80		5.26	0.00
	Matched	4.56	3.70	42.10	27.20	2.31	0.02
Fiscal balance	Unmatched	-0.03	-0.02	-26.10		-2.03	0.04
	Matched	-0.03	-0.03	-4.30	83.60	-0.23	0.82
Government consumption	Unmatched	0.20	0.21	-30.60		-2.23	0.03
	Matched	0.20	0.20	-4.90	83.80	-0.31	0.76
FOIA	Unmatched	4.02	4.00	0.80		0.06	0.95
	Matched	4.02	3.61	22.80	-2697.00	1.31	0.19
Corruption	Unmatched	0.91	1.33	-62.70		-4.44	0.00
	Matched	0.91	0.93	-2.80	95.60	-0.16	0.87
Government effectiveness	Unmatched	1.07	1.33	-51.50		-3.66	0.00
	Matched	1.07	1.12	-8.90	82.70	-0.55	0.58
Rule of law	Unmatched	1.09	1.35	-51.00		-3.73	0.00
	Matched	1.09	1.12	-5.70	88.80	-0.34	0.74
Panel B:	**Overall covariance balance test**						
Sample	Pseudo R^2	LR chi^2	$p>chi^2$	Mean Bias			
Unmatched	0.05	46.46	0.00	36.90			
Matched	0.09	14.70	0.14	13.60			

The table presents results of three balancing tests performed directly after the PSM and ATT for 52-point positive rating events by S&P. Panel A presents the balance test results for the treated and the matched sample on all the covariates. Panel B presents the overall covariates balance tests results. Caliper does not exceed 1% in absolute value. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Appendix 4.14 PSM. Moody's 52-point positive rating events. 10 variables.

Panel A:	**Covariate balance test between the treated and the matched sample**						
Variable	Sample	Mean		%bias	%reduct	t-test	
		Treated	Control		|bias|	t	p>|t|
GDP per capita	Unmatched	5207.70	6695.00	-47.70		-2.97	0.00
	Matched	5207.70	4805.10	12.90	72.90	0.68	0.50
Inflation	Unmatched	93.13	93.04	0.90		0.07	0.95
	Matched	93.13	93.85	-7.40	-732.50	-0.29	0.77
Honeymoon	Unmatched	0.00	0.06	-35.00		-1.54	0.12
	Matched	0.00	0.08	-46.70	-33.50	-1.78	0.08
Type of	Unmatched	4.54	3.39	54.40		4.14	0.00
government	Matched	4.54	4.41	6.10	88.90	0.23	0.82
Fiscal balance	Unmatched	-0.04	-0.02	-27.40		-2.37	0.02
	Matched	-0.04	-0.02	-34.50	-25.90	-1.50	0.14
Government	Unmatched	0.19	0.21	-60.60		-3.37	0.00
consumption	Matched	0.19	0.19	-8.50	86.00	-0.45	0.65
FOIA	Unmatched	3.79	4.00	-11.10		-0.72	0.47
	Matched	3.79	3.56	12.30	-11.60	0.53	0.60
Corruption	Unmatched	0.89	1.33	-67.90		-3.69	0.00
	Matched	0.89	0.92	-5.20	92.40	-0.27	0.79
Government	Unmatched	1.04	1.33	-60.70		-3.38	0.00
effectiveness	Matched	1.04	1.07	-7.10	88.30	-0.34	0.73
Rule of law	Unmatched	1.06	1.35	-58.00		-3.34	0.00
	Matched	1.06	1.08	-3.40	94.20	-0.17	0.86

Panel B:	**Overall covariance balance test**			
Sample	Pseudo R^2	LR chi^2	p>chi^2	Mean Bias
Unmatched	0.06	36.74	0	42.4
Matched	0.047	4.86	0.846	14.4

The table presents results of three balancing tests performed directly after the PSM and ATT for 52-point positive rating events by Moody's. Panel A presents the balance test results for the treated and the matched sample on all the covariates. Panel B presents the overall covariates balance tests results. Caliper does not exceed 1% in absolute value. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Chapter 5 The impact of terrorist attacks on government support

5.1 Introduction

This Chapter aims to examine the political effects of terrorist attacks on government support in European countries. Several major cities, including Paris, London, and Brussels, have been targeted and suffered deadly attacks in recent years. Terrorism, as a form of political instability, has grave socioeconomic consequences. Beyond the loss of lives and personal injuries, terrorist actions adversely affect personal wealth, macroeconomic conditions, and the performance of financial markets (e.g. Chesney et al., 2011; Dai et al., 2020; Gaibulloev and Sandler, 2019). This may in turn influence voters' feeling and perception of the incumbent's level of preparedness and response to loss, and hence alter voters' preferences (Ashworth et al., 2018).

The aftermath of previous large-scale terrorist attacks suggests that terrorism has political effects. For example, bombings in Madrid in March 2004 killed 191 people, wounded 1,500 people (Montalvo, 2011), and had a significant negative impact on stock indices (Chesney et al., 2011).[68] Only three days later, the Spanish general election was held in which the Conservative party (the incumbent party) was replaced by the Socialist party, although the polls were favourable to the Conservative party during the weeks before the election. A similar loss of lives and economic damage were documented in the 9/11 attacks in the US in 2001, albeit on a much higher scale.[69] After these attacks, the level of trust in the US government significantly increased, with President George W. Bush' approval rating soaring to 90 percent from 51 percent in two weeks, which is the highest approval rating in the Gallup poll history (Park and Bali, 2017).

Previous studies also find evidence supporting the effect of terrorist attacks on electoral outcomes and cabinet durations. For example, Park and Bali (2017) find that terrorism alters electoral preferences, resulting in an increased likelihood of the autocratic government being replaced. Gassebner et al. (2011) and Williams et al. (2013b) also show that terrorism increases

[68] MSCI Europe has -4.91% cumulative abnormal return within 6-day after the attack (Chesney et al., 2011).
[69] 9/11 attacks in the US in 2001 came at a cost of 2753 lives and 123 billion US dollars of economic loss (CNN, 2018). The consequences of the attacks spread to financial markets, whereby Wall Street closed to trading one hour after the attacks and three days later it reopened with an opening loss of more than 7% in the Dow Jones Index (Brounen and Derwall, 2010).

the probability of government failure and shortens cabinet duration.[70] However, prior studies are unable to capture immediate changes in public support for governments after terrorist attacks at a multi-country level. This Chapter fills this void and examines the impact of terrorist attacks on government support measured by polling results in European countries. Polls infer current voters' preferences, hence using polling data can capture the immediate change in government support in the aftermath of terrorist attacks. In comparison with studies about the effect of terrorism on election results, the dataset of frequent polling results reduces the potential endogeneity bias caused by unobservable variables and reverse causality. The polling dataset, therefore, allows to examine the political effect of terrorist attacks in a more robust way. Rather than using single-country or single-event in previous studies (e.g. Montalvo, 2011), this Chapter exploits a larger dataset at the multi-country scale. This captures the differences in political systems across countries.

Given that elections are infrequent, examining the impact of terrorism on government support across time measured by polling results is important since polls are the only indicator of the public support for the party in power, showing the electoral prospect of the incumbents. After terrorist attacks, an increase in government support could signal opportunities to increase the likelihood of being re-elected as voters perceive the government quality in terms of level of preparedness, investigation, and response to loss, while a decrease in government support could signal the need to enact policies to boost public support before the next mandated election. Hence, such changes in government support possibly cause partisan conflicts and policy changes. This highlights the need for understanding of the circumstances under which citizens tend to shift towards more or less support for the government.

There are two competing theories to explain the potential impact of terrorist attacks on government support. First, the rally effect theory argues that citizens tend to provide more support for the government with the hope that the government can solve problems and guarantee their safety (Chowanietz, 2011). The tie between citizens and the government is mainly driven by patriotism and a desire for safety (Lambert et al., 2010). Showing support for the government is a way to strengthen the international status of the citizens' nation and defend the country against external threats (Mueller, 1970). A desire for safety is triggered by psychological reasons, whereby crisis situations evoke feelings of distress, anxiety, and hopelessness which drive citizens to look for protection from their leaders (Merolla et al.,

[70] Cabinet duration is measured by a replacement of more than 50% of all ministers in the cabinet and/or the replacement of the prime minister (Gassebner et al., 2011).

2007). Second, the public good effect theory argues that citizens might shift their support away from the government as they think it is incompetent (Gassebner et al., 2011). The government takes responsibility for the national security, thus experiencing terrorist attacks is perceived as a failure of the incumbent. In addition, psychological factors such as depression and anxiety following terrorist attacks cause citizens to criticise governments (Nowak, 2018).

This Chapter examines the impact of terrorism on government support using a dataset of 27 EU countries (excluding Luxembourg) during the period from September 2000 to July 2017.[71] The measure for government support is derived from opinion polls in each country. The polling dataset is collected manually from various available sources (see Chapter 3). While prior studies (e.g. Kelly et al., 2016) focus on opinion polls only on or around elections, the polling dataset in this thesis allows the examination of government support across time. The dataset of terrorist attacks is taken from Global Terrorism Database (GTD) for the sample period. GTD dataset is updated to the present and consists of both domestic and transnational terrorist attacks.[72]

The Fixed-effects model (FEM) and the Propensity Score Matching (PSM) approach are employed to investigate the impact of terrorist attacks on government support following Dai et al. (2020). The results of the FEM reveal that citizens tend to provide more support for the government in the aftermath of terrorist attacks, as expected by the rally effect theory. Despite terrorism putting a burden on society, terrorist attacks do not appear to have a significant effect on government support in Germany and France. In comparison to the remaining countries, this different effect might be driven by variations in economic conditions, social and political reasons such as trust in government and media effects (Baum, 2002; Lai and Reiter, 2005; Chowanietz, 2011; Chatagnier, 2012). Focusing on the sample without Germany and France, this study constructs different sub-samples based on different country groups, type of attacks, level of fatalities, and repeated attacks in order to take into account the possibility that not every terrorist attack is identical, obtaining robust results. Moreover, when the level of fatalities increases, the magnitude of rally effect increases. Finally, the magnitude of the rally effect increases if terrorist attacks occur repeatedly in shorter time period.

The PSM is employed as a robustness check to control for potential differences in the observable characteristics of the treatment (attacked country-dates) and the control (non-attacked country-dates) groups. The results of the PSM support the rally effect theory, showing

[71] Polling data is not available for Luxembourg.
[72] See Section 5.4 for the definitions of domestic and transnational terrorism.

that governments in attacked countries have more support from their citizens compared to their matched countries. This rally effect implies that citizens tend to affiliate with their leaders, since they hope that the leaders can provide the security they need. Hence, in order to maintain public support and increase the likelihood of winning in next elections, incumbents should show voters that protection against terrorism is a strong priority in their political agenda. They should further enact effective policies with respect to counter terrorism issues in a way that strengthens or at least does not weaken their political support. Foreign policy failure due to overreaction to terrorism might lead to the political leaders' ousters (Park and Bali, 2017).

The findings contribute to two strands of literature. First, this study furthers understanding about the political consequences of terrorism (e.g. Gassebner et al., 2008; Dreher and Fischer, 2010; Gassebner, 2011; Williams et al., 2013b; Nowak, 2018). Second, this study extends the literature that examines voters' rationality in response to exogenous events, which are beyond the control of the government (e.g. Healy and Malhotra, 2010; Cole et al., 2012; Ashworth et al., 2018).

The remainder of this Chapter is laid out as follows. Section 5.2 reviews the related studies, Section 5.3 provides the hypothesis of the study, Section 5.4 presents the data sample, Section 5.5 describes the methodology used, Section 5.6 discusses results, and Section 5.7 concludes.

5.2 Literature review

Empirical literature indicates that incumbent electoral fortunes are affected by exogenous events (See Section 2.2.2). These shocks typically take the form of terrorist attacks (e.g. Getmansky and Zeitzoff, 2014; Park and Bali, 2017; Nowak, 2018) or natural disasters (e.g. Cole et al., 2012; Carlin et al., 2014; Ashworth et al., 2018). This Chapter focuses on the effects of terrorism as many European countries have been targeted in recent years, resulting in not only the destruction of human and physical capital but also the instability in economic and market conditions.

Voters consider terrorism as a major factor determining their voting choice (Jacobson, 2003; Langer and Cohen, 2005). Particularly, after the 9/11 event, using the US pre-elections polls in 2002 by Gallup, Jacobson (2003) shows that voters put terrorism at the top of their list of concerns, shifting the political focus from domestic issues to national defence and foreign policy. This trend became clearer in the 2004 US national election Exit Poll when the terrorism

was ranked third among the issues presented to voters on the questionnaire that mattered most in their vote (with 19%) (Langer and Cohen, 2005). Yet, previous studies that examined the impact of terrorist attacks on voters' preferences provide mixed findings.

On the one side, some authors suggest that public support for the government increases in the aftermath of terrorist attacks, international crises, and wars (e.g. Mueller, 1970; Chowanietz, 2011; Chatagnier, 2012; Feinstein, 2016; Nowak, 2018). Driven by patriotism (Mueller, 1970) and a desire for safety (Lambert et al., 2010), citizens tend to increase their support for national leaders since they hope that their leaders will solve the problem and provide the security they need; this is known as "rally around the flag" phenomenon. Hence, the rally effect shows that facing severe events can strengthen the tie between citizens and their government. Hetherington and Nelson (2003) document that the 9/11 terrorist attacks led to an increase in the US presidential support for George W. Bush from 51% on September 10, 2011 to 86% on September 15, 2011. This 35-point increase is nearly double the previous record. Using a sample of 163 countries from 1968 to 2004 and the logit model, Park and Bali (2017) examine how international terrorism affects the political survival of leaders measured by the probability that incumbent leaders remain in power. They find that terrorism may not destabilise democratic governments as a result of rally effects, while autocratic governments are more likely to exit power. The difference in the effect between democracies and autocracies might be driven by variations in political rights and civil liberties. However, they argue that rally effects are short lived in threatening times. Nowak (2018) finds significant positive effects of Islamist terror attacks on German's evaluations of national government measured by the government satisfaction, using the logit model to analyse individual-level data from survey interviews conducted by the European Social Survey from 2014 to 2017.[73] Rather than using a government satisfaction proxy, this study exploits individuals' intentions to vote for the incumbent party in the next election after terrorist attacks. Given more polling data available, this Chapter allows the examination of government support over time and across countries.

Lai and Reiter (2005) investigate whether international crises and wars lead to rally effects in UK. Using data of the intention to vote for the ruling party from 1948 to 2001, they find the presence of the rally effect in the UK during the Gulf War, while there were no significant rally effects during the Korean, Suez, or Kosovo Wars. The findings indicate that

[73] The government satisfaction is based on the survey question: "Now thinking about the [country] government, how satisfied are you with the way it is doing its job?". The answer ranges from 0 to 10, where a value of 10 reflects the highest level of satisfaction (Nowak, 2018).

the rally effect is infrequent and most likely to happen when there is intense and direct threat to national interests. Other studies also highlight that the rally effect occurs in different intensities depending on different factors, such as the government's crisis management, trust in the government, the certain level and magnitude of terror, media coverage of the events, or contemporary economic circumstances (e.g. Baker and Oneal, 2001; Baum, 2002; Chowanietz, 2011; Nowak, 2018).

On the other hand, several studies suggest that terrorist attacks might lead to changes in voting intention in the opposite direction of the rally effect theory (Gassebner et al., 2011; Montalvo, 2011; Williams et al., 2013b). The government is in charge of national security as a public good, hence voters hold the incumbent accountable for the lack of provision of public goods when terrorism increases (Gassebner et al., 2011). This so-called public good effect describes the failure of the government in the aftermath of terrorist attacks. Montalvo (2011) investigates whether bombings in Madrid in 2004 (three days before the election) affected the results of the 2004 congressional election. They find that the Conservative party lost the election against the Socialist party even though the polls were quite favourable to them in the weeks before election, using the differences-in-differences (DID) approach. Spanish citizens punished the incumbent in response to the attacks showing how terror attacks might cause a counter effect compared to the rally theory. Instead of focusing on electoral outcomes, Gassebner et al. (2011) examine the effect of terrorism on cabinet duration using a data set of 2400 cabinets in over 150 countries from 1970 to 2002.[74] They employ a conditional FE logit model and find that terrorism significantly increases the probability of cabinet failure, thus shortening cabinet duration. In the same vein, Williams et al. (2013b) examine how terrorism influences government durability outside of the scheduled election. Regarding partisan effects, they provide evidence that terrorist attacks are more likely to increase the likelihood of failure for left-wing governments than right-wing governments based on a duration model on a sample of 18 advanced parliamentary democracies.[75] These findings suggest that partisanship conditions the effects of terror attacks on government duration. Moreover, there is a higher level of criticism from opposition parties after terrorist attacks occurred repeatedly in France, Germany, Spain, US, and UK (Chowanietz, 2011).

[74] Cabinet change is defined as a replacement of more than 50% of all ministers and/or the replacement of the prime minister (Gassebner et al., 2011)
[75] Their sample includes Australia, Canada, Israel, Japan, and 14 countries in Europe.

In voting decisions, rational voters may consider whether changes in their own and others' standards of living are coming from external forces and other factors within the government's control (Healy and Malhotra, 2010). Thus, citizens do not simply emotionally punish the government for extreme events that happen beyond its control. They may blame the government for the consequences of the events on economic and financial loss that matter with regards to their personal wealth and therefore demand government action. These losses may involve lower economic growth (Abadie and Gardeazabal, 2003; Eckstein and Tsiddon, 2004), reduced foreign direct investment (Abadie and Gardeazabal, 2008; Bandyopadhyay et al., 2014), less trade (Nitsch and Schumacher, 2004), reduced tourism (Drakos and Kutan, 2003), or lost value of stock and bond markets (Chesney et al., 2011; Kollias et al., 2013). These studies show that terrorist attacks adversely affect national economies and financial markets. At a micro-level, Dai et al. (2020) find that CEOs, who are employed at US firms located near terrorist attacks during 1992 to 2013, seek an increase in terrorist attacks compensation to allow them to bear the risks and face increased psychological stress. They use the DID model with firm and year FE, and the PSM to capture the impact of terrorist attacks on the level and composition of CEO compensation where the attack indicator variable is time-varying.

In summary, prior studies mainly examine the political effects of terrorism on election outcomes or government duration, thus offering a limited view on public attitudes following terrorist attacks. Previous studies are unable to identify in which circumstances the rally effect or the public good effect dominates in determining the impact of terrorism on political support. This Chapter overcomes this limitation by looking at the immediate changes in government support measured by polling results in the aftermath of terrorist attacks. This Chapter consistently studies the effect of terrorist attacks on government support across multiple countries and continuous time for the first time. To the best of my knowledge, no prior study has focused on the immediate changes in government support after extreme events on a multi-country scale. Thus, this Chapter overcomes the commonly used single-country or single event approach employed in previous studies (e.g. Hetherington and Nelson, 2003; Lai and Reiter, 2005; Montalvo, 2011) and furthers the understanding of the political impact of terrorism.

5.3 Hypothesis

This study aims to investigate the effect of terrorism on government support; hence the following hypothesis is tested:

H_1: *Severe terrorist attacks have a significant impact on public support for the government in the event countries.*

As terrorists strive for maximum publicity and mainly target civilians, it is expected that severe terrorist attacks can change public opinion about the government, albeit the direction is unclear.[76] According to the "rally around the flag" effect, citizens may gather and look to the government to solve the problem, hence increasing government support. The rally effect is mainly driven by patriotism (Mueller, 1970) and a desire for safety (Lambert et al., 2010). Regarding patriotism, people support their government to strengthen and defend their country against external threat (Mueller, 1970). This is due to the fact that rally effects occur as a symbolic act to strengthen the international status of the citizens' nation (Feinstein, 2016). Increased support can also be explained by psychological reasons. People desire security and safety, especially when they feel threatened, hence they look for the power to guarantee their safety from the incumbents (Lambert et al., 2010). Using a data sample from a 2004 experimental study about the concerns of terrorist attacks that preceded the U.S. presidential election, Merolla et al. (2007) demonstrate that during periods of crises, voters had higher perceptions of charisma of the incumbent compared to voters interviewed during stable periods. They argue that crisis situations evoke feelings of distress, anxiety, and hopelessness which draw citizens to their leaders whom they believe are capable to solve the problems and deliver better conditions. As a result, crises magnify perceptions of charismatic leadership. In case of crisis, citizens are more willing to overlook poor policy performance and are more likely to sacrifice their personal resources for the candidacy.[77]

In the context of the public good effect, the electorates hold the incumbent accountable for the provision of public goods, mainly national security and an honest government (Gassebner et al., 2011). Hence, citizens may perceive a terrorist attack as a failure of the incumbent in protecting them against extreme threats. The experience of terrorist attacks causes citizens to criticise incumbents, destabilises governments, or even leads to the loss of

[76] Severe terrorist attacks are terrorist events that result in at least one person injured/killed (See Section 5.4 for more details).
[77] Self-sacrifice behaviour is related to campaign-related activities, such as making phone calls to get out the vote, attending a rally, driving the candidate's supporters to the polls, and contributing money to the campaign.

incumbents at elections (Gassebner et al., 2011; Montalvo, 2011). Although Nowak (2018) finds that the support for the government significantly increases in the aftermath of Islamist terror attacks, the effect decreases with repeated exposure to terror attacks and even reverses when a certain level of terror is reached. This is attributable to the fact that repeated terrorist attacks in one country create the impression that the government is no longer able to provide required safety for their citizens. Thus, it appears that severe events do not always strengthen the ties between citizens and their leaders. Psychological factors may provide another possible explanation that, when economic conditions are good, voters feel happier, hence they become more lenient toward the government and vice versa (Bagues and Esteve-Volart, 2016). This argument points out that depression and anxiety caused by bad shocks might weaken the support for the government. This is consistent with Frey et al.'s (2009) findings that terrorism negatively affects individuals' assessment of life satisfaction (LSA). They use LSA as a tool to estimate the social costs of terrorism and find that the psychological costs go far beyond the economic loss from terrorism in France and British Isles during the period of 1973 - 2002.

Ashworth et al.'s (2018) theoretical model analyses how electoral outcomes respond to exogenous events outside the control of politicians, such as terrorist attacks, natural disasters, or economic shocks originating outside of the local economy (See Section 2.2.2). They show that even if voters are rational, such events can affect the incumbent's electoral fortunes either positively or negatively. These events shape politics by providing voters with opportunities to learn new information about the incumbent. This implies that the damage caused by terrorist attacks is influenced by the government policies in terms of terrorism prevention and investigation, and emergency preparedness. Consequently, citizens can infer the incumbent's quality by observing the consequences of the events and learning about the level of preparedness, hence reward (punish) parties for (not) fulfilling the task of protecting them.

In short, extreme events outside the control of the government affect voters' preferences, either increasing government support or leading to a punishment of the incumbent government. Although the governments do not plan for them, severe terrorist attacks can influence its support, either via voters' emotion or via new information from which voters learn about the government's quality. In this Chapter, the rally effect is expected when citizens desire the incumbents to protect them from external threat. In contrast, the public good effect is expected when citizens feel anxious and depressed in the aftermath of terrorist attacks as well as when they believe that the government has failed to protect them.

5.4 Data

In this Chapter, polling results for the party in office are used. The data description of opinion polls for 27 EU countries (exclude Luxembourg) from September 2000 to July 2017 is presented in Chapter 3.

Terrorist events are collected from GTD, provided by the National Consortium for the Study of Terrorism and Responses to Terrorism (START).[78] According to Sandler (2015), there are two types of terrorist events. First, terrorism is classified as a domestic event when the perpetrators, victims and audience are from the venue country where the attack occurs. Second, transnational terrorism is an incident in the venue country when the perpetrators or victims are from another country. The GTD database is employed because it is constantly updated and includes both domestic and transnational terrorist incidents.[79]

GTD defines terrorist attack as the threat or actual use of illegal force and violence by a non-state actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation (START, 2018). In practice, the incident must fulfil all the three criteria: (1) the incident must be intentional; (2) the incident must entail some level of violence or immediate threat of violence; and (3) the perpetrators of the incidents must be sub-national actors. If incidents occur in the same geographic and temporal point, they are considered as a single incident. However, if either the time of occurrence of incidents or their locations are discontinuous, the events will be considered as separate incidents.

The full sample in this Chapter includes 3134 terrorist attacks for 26 EU countries (excluding Luxembourg and Lithuania) during the sample period.[80] Each terrorist attack is characterised by its location, time, perpetrators, targets, weapons and tactics, casualties and consequences, and general information. Given a huge number of attacks which are not serious in terms of fatalities and economic consequences, this Chapter focuses only on severe terror events which are events that result in at least one person injured or killed (Gassebner et al., 2011).[81] The number of observations of severe terror attacks is 564. Terrorist event dates are

[78] START (2018) Global Terrorism Database [Data file]. Available at: https://www.start.umd.edu/gtd (Accessed: 17 May 2019).
[79] Enders et al. (2011), Gaibulloev (2015), and Sandler (2015) employ, in addition to GTD, International Terrorism, Attributes of terrorist events (ITERATE) and RAND dataset. However, ITERATE only includes transnational terrorist attacks and RAND has not been updated since 2009.
[80] There are no terrorist attacks in Luxembourg and Lithuania during the sample period.
[81] Prior studies that have addressed questions related to the effect of terror attacks employed different samples of terror events. Chesney et al. (2011) use a sample of 77 terrorist events that occurred in 25 countries from 1994 to 2005. The selected terrorist attacks are marked as "significant" by the Terrorism Research Centre and the UK Foreign and Commonwealth Office (the data sources). The sample countries include Argentina, Austria, Chile,

defined as dates that have at least one severe attack, and hence the dataset covers 510 event dates (which is termed *Attack*).[82]

As opinion polls are not always conducted daily, in the empirical analysis, polling results for the incumbent party (*Govsup*) are aggregated by taking the average of polls in different time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30], where *Attack* is observed on date 0 (See Section 3.3). Table 5.1 presents descriptive statistics of terrorist attacks that have polling data available within 30 days after the attack date.[83] Panel A in Table 5.1 reports the distribution of attacks for each country. After matching polling data with terrorism data, the number of attacks is reduced to 354 occurring in 19 EU countries, while 8 EU countries have not experienced terror attacks during the sample period. The UK suffered more severe terror attacks than other EU countries, with 122 cases accounting for approximately one-third of the total number of attacks in the sample. In contrast, 4 countries, Estonia, Hungary, Netherlands, and Slovakia, have experienced only one attack during the study period. The most frequent attacks occurred in 2016 (62 attacks), while the least (5 attacks) occurred in 2003 (Panel B in Table 5.1). Regarding the level of damage, the majority of attacks results in at least one person injured without fatalities (67.51%) (Panel C in Table 5.1). About one-third of the total number of terrorist attacks have at least one person killed (115 attacks), with only 14 attacks have at least 5 people killed.

Although GTD recorded both domestic and transnational attacks, it did not distinguish between them. This Chapter follows a five-step procedure of Enders et al. (2011) to distinguish between domestic and transnational terrorist incidents. Based on the information obtained from GTD, the attack is considered as transnational incident: first, if the nationality of the victims is different from the venue country; second, if attacks are against diplomatic targets; third, whether terrorist incidents direct at international entities (e.g. UN agencies or NATO infrastructure) and foreign businesses; fourth, if the attack occurs outside of the US and involves US fatalities or injuries[84]; finally, using information on the country where kidnappings or hijackings concluded, if the event involves the diversion of an airplane or resolution in

Colombia, Egypt, France, Germany, Greece, India, Indonesia, Ireland, Israel, Japan, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Russia, Spain, Thailand, Turkey, the UK and the US. Brounen and Derwall (2010) limit their study to 31 attacks that directly involve major economies of the world from 1990 to 2005. The sample includes 16 countries: Spain, US, Japan, UK, Saudi Arabia, Egypt, Kenya, Tanzania, Yemen, China, Pakistan, Peru, Indonesia, Tunisia, Morocco, and Italy.

[82] The number of severe terrorist events and the number of event dates are different because there are 39 dates with more than one severe events.

[83] For descriptive statistic, using a time window of less than 30 days would reduce the number of attacks.

[84] This step utilises GTD information on US victims, US hostages, and US specific demands

another country. Once an attack is identified as transnational at any step, it is dropped from the subsequent steps to avoid double counting. A breakdown of terrorism into domestic and transnational attacks is important because different types of attacks may affect government support differently. For example, economic growth is more influenced by transnational terrorism because it may dissuade foreign direct investment and require expensive border defences (Gaibulloev and Sandler, 2008; Enders et al., 2011). However, domestic terrorism is more likely to have direct consequences for the venue country, its institution, citizens, properties, and policies (Enders et al., 2011). Figure 5.1 displays the annual total number of domestic and transnational terrorist attacks that have polling results available within 30 days after the attack date. In this sample, peaks and troughs are evident. Domestic terrorism significantly constitutes the overwhelming component of total terrorism in the period from 2000 to 2003 and from 2011 to 2014. In contrast, the number of transnational attacks lends its shape to the surge of total terrorism since 2015.

5.5 Methodology

This Section describes empirical modelling approaches to investigate whether the terrorist attacks have a significant impact on government support. Two methods are used in this empirical analysis: (1) the FEM and (2) the PSM, which are discussed in Section 5.5.1 and Section 5.5.2, respectively.

5.5.1 Fixed-effects model

Inspired by Gassebner et al. (2011) and Dai et al. (2020), this Chapter uses the FEM to examine Hypothesis H_1 whether terrorist attacks affect public support for the incumbent party. The panel regression model is estimated, as follows:

$$Govsup_{it+s} = \alpha + \beta Attack_{it} + \delta_j \sum_{j=1}^{n} Controls_{it} + \xi Co_i + \gamma Year_t + \varepsilon_{it}$$

Eq. (5.1)

$Govsup_{it+s}$ is the level of support for the incumbent party of country i over the time windows $(t + s)$. Polling results for the incumbent party are aggregated by taking the average of polls in different time window *s*: [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] days where attack is observed on date *t = 0* (see Section 3.3 for details on the aggregating method).

The variable of interest is $Attack_{it}$, which is a time-variant indicator variable that sets to one if country *i* was attacked on date *t* which results in at least one person injured or killed. It takes the value zero for the non-attack dates. The sample includes treatment (attacked country-dates) and control (non-attacked country-dates) groups, in which a sample of clean non-attacked country-dates is obtained from the original sample excluding the terrorist event dates and the observations within a six-month window around each attack date in order to mitigate event contamination (Ferreira and Gama, 2007). Eight countries, which have not experienced terrorist attacks during the sample period, are kept in the sample to be part of the control group. The presence of terrorism is expected to affect government support, either negatively in the case of the public good effect or positively in the case of the rally effect (See Section 5.3).

The regression model also includes a set of control variables $Controls_{it}$ following the existing voting behaviour literature (e.g. Carlsen, 2000; Veiga and Veiga, 2004; Gassebner et al., 2011; Castro and Martins, 2013; Fauvelle-Aymar and Stegmaier, 2013) including: *GDP per capita, Inflation, Unemployment, Honeymoon, Independent party, CRS[0; 1].* Detailed definitions and expected signs of $Controls_{it}$ are described in Appendix 5.1. Panel A of Table 5.2 presents the summary statistics of the variables used in the empirical analysis for the full sample excluding Germany and France ("Full_EGF").[85]

GDP per capita, Inflation, and *Unemployment* are included to control for the effect of economic conditions (Fauvelle-Aymar and Stegmaier, 2013). It is expected that poor economic performance decreases government support (Gassebner et al., 2011; Castro and Martins, 2013). The first lag of these variables is used to mitigate the potential endogeneity problem, since the contemporaneous values of these macroeconomic variables might be affected by the incumbent's action (Bagues and Esteve-Volart, 2016). Also, it takes time for macroeconomic data to be released and for citizens to recognise changes in economic conditions (Veiga and Veiga, 2004).

In addition, political variables such as *Honeymoon* and *Independent Party* are added to the regression. *Honeymoon,* which measures the government's time in office, can influence government support because the incumbent is not responsible for the economic conditions that prevail during the first few months in office (Veiga and Veiga, 2004; Fauvelle-Aymar and

[85] The summary statistics for the full sample excluding Germany and France ("Full_EGF") is presented because the effects of *Attack* on the government support in these countries appear to be different from the remaining EU countries, which might be driven by variations in economic conditions and social and political reasons (see Section 5.6.1 for more details). Appendix 5.4 reports the summary statistics for full sample with Germany and France.

Stegmaier, 2013). Voters' intention also depends on the ideology of the incumbent (Veiga and Veiga, 2004). Following partisan theory of Hibbs (1977), left-wing parties tend to find support from the lower classes of the population that suffer the most with unemployment. On the other hand, centre and right-wing parties are more supported by the upper classes that dislike inflation. During their time in office, parties adopt policies that favour their interest and the core political constituencies. Thus, when the government is led by an independent candidate (*Independent party),* there is an uncertainty in the ideology or policies which in turn might negatively affect government support.

Finally, the cumulative return spread of the country's stock index within the two-day window *CRS[0; 1]* is added to the regression as a stock market indicator.[86] The stock market is an economic measure that captures both national economy's conditions and personal wealth (Fauvelle-Aymar and Stegmaier, 2013). At the national level, investors respond to all available information including government policies and economic conditions, hence the stock index is a measure of the national economy's conditions. At the individual level, stocks are one of the components of personal wealth. Thus, voters tend to provide more support for the government when the stock market is improving, suggesting greater personal wealth for those who own stocks and vice versa. Therefore, the performance of stock market has a significant impact on government support.

Co_i and $Year_t$ FE are employed to control for any country-specific effects and any time effects respectively. *Co* FE control for all time invariant variables that might affect *Govsup* (such as unobserved country characteristics). *Year* FE control for time variation in *Govsup* that is common for all countries in the sample.

ε_{it} is the error term. Robust Huber-white standard errors are used to account for heteroscedasticity.

Eq. (5.1) is estimated using various sub-samples to distinguish between different types of attacks and levels of damage. This Chapter distinguishes domestic and transnational terrorist

[86] $\mathrm{CRS}[0;1]_{it} = \ln(\frac{Idx_t^i}{Idx_{t-1}^i}) + \ln(\frac{Idx_{t+1}^i}{Idx_t^i}) - \ln(\frac{Idx_t^M}{Idx_{t-1}^M}) - \ln(\frac{Idx_{t+1}^M}{Idx_t^M})$.

Idx^i represents country stock index. The indices are collected from Thomson Reuters Eikon following the index list in the study of Afonso et al. (2012) and Abad et al. (2018).
Idx^M represents the benchmark market index. The Eurostoxx (collected from Thomson Reuters Eikon) is employed as a benchmark index because the empirical analysis in this Chapter uses a sample of European countries (Abad et al., 2018). Appendix *5.3* provides the summary statistics for the two-day cumulative event return spread over the benchmark *CRS[0; 1].*

incidents, as they may affect government support differently (see Section 5.4). Economic growth is more influenced by transnational terrorism because it may dissuade foreign direct investment and require expensive border defences (Enders et al., 2011). Domestic terrorism is more likely to have direct consequences for the venue country, its institution, citizens, properties, and policies (Enders et al., 2011).

The level of damage is also considered; hence this Chapter examines the effect of terrorist attacks with different level of fatalities (only injured, at least one, three, or five people killed). The impact of a single hostage on the public opinion is different from a big event (e.g. bombings in Madrid in 2004) (Gassebner et al., 2011). Accordingly, *Attack* is either *Attack-I, Attack-1K, Attack-3K,* or *Attack-5K* in the estimations Eq. (5.1) using terrorist attacks that result in only injured people, at least one, three, or five people killed respectively.

Furthermore, the rally effect might decrease if terrorist attacks occur repeatedly (Nowak, 2018). Hence, to capture the effect of repeated attacks, *Attack* in Eq. (5.1) is replaced by alternative terrorism indicators which measure repeated attacks within one month, three months, and one year. Accordingly, *Attack* is either *Attack_m*, *Attack_3m,* and *Attack_y* in the estimations of Eq. (5.1) to refer to repeated terrorist attacks within one month, three months, and one year, respectively.

Econometric techniques employed to investigate whether terrorist attacks affect voters' preferences are unlikely to suffer from the reverse causality bias. Terrorist attacks are exogenous events which are unlikely to be affected by changes in government support in short time periods measured by polls. Using frequent polling data also controls for the endogeneity bias caused by omitted variables since polls reflect immediate changes in government support in the aftermath of terrorist attacks. In addition, the FEM and PSM techniques further reduce the unobserved variable bias.

5.5.2 Propensity Score Matching

This Chapter aims to examine the impact of severe terrorist attacks $(Attack_{it})$ on government support in the venue country $(Govsup_{it+s})$. The treatment group includes countries exposed to terrorist attacks at time *t* (*Attack* = 1). The control group includes a sample of non-attacked country-dates *(Attack = 0)* (See Section 5.5.1).

Panel B of Table 5.2 compares variable means for the treatment and control group, using the Full_EGF sample.[87] The mean values of government support of countries in the treatment (control) group are 33.3% (24.5%), 34.2% (25.6%), 34.3% (26.2%), 34.6% (26.4%), and 34.8% (26.4%) over [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] time windows respectively. This implies that the government in countries that suffer attacks appear to receive more support from citizens than those do not suffer attacks. Countries in the treatment group have higher *GDP per capita* than those in control group in the [0; 7], [0; 14], and [0; 30] time windows, statistically significant at 1% level. The inflation rate is about 2% in the treatment group, which is statistically higher than those in control group in the [0; 1] and [0; 3] time window.[88] These suggest that terrorist attacks are more likely to happen in countries with better economic conditions. Consistent with the findings of Dai et al. (2020), terrorists are likely to attack larger and richer population centres rather than target random locations. This might be driven by the need to enhance recognition and attention which is the most basic reason of terrorism (Crenshaw, 1981). The mean value of *CRS[0; 1]* is negative for the treatment group, statistically lower than stock return of the control group across all time windows (except for [0; 3] time window). Only in the [0; 14] time window, the treatment group has statistically lower *Honeymoon*, indicating that incumbents in the treatment group are less likely to be in the honeymoon period. The differences in mean values of *Unemployment* and *Independent party* are insignificant.[89]

Ideally, both treatment and control groups should be very similar along these dimensions across time windows (Serfling, 2016), so that both groups only differ in the treatment received. Hence, the estimation of the treatment effects *(Attack)* for the outcome of interest *(Govsup)* is unbiased. However, as they are not that similar, the first part of the analysis includes these variables in Eq. (5.1) as controls for these differences following Serfling (2016). Then, the PSM is employed to construct treatment and matched groups. This method accounts for the potential differences in the observable characteristics of the treatment and control

[87] Appendix 5.4 compares variable means for treatment and control groups, using full sample.

[88] Appendix 5.4 provides summary statistics for full sample. In most cases, countries in treatment group have higher *GDP per capita* and lower *Unemployment* rate than those in control group, which are statistically significant at 5% level or better. Only in [0;30] time window, the treatment group has statistically lower *Inflation* rate.

[89] In full sample, *Honeymoon* and *Independent party* are lower for countries in treatment group compared to those in control group. It indicates that the incumbent in treatment group is less likely to be in the honeymoon period and less likely to be an independent candidate. The mean values of *CRS[0; 1]* for both treatment and control groups are consistent (see Appendix 5.4).

groups (Rosenbaum and Rubin, 1983). This matching approach is described in Section 4.5.2 in Chapter 4.

For each treated country (*Attack = 1)*, a matched country (*Attack = 0)* is selected from the control group with the closest propensity score (PS). Where the PS is a single index obtained by the probit model, which presents the probability of being attacked conditional on the observed pre-treatment characteristics. Hence, treated countries are matched with control countries that have similar characteristics. The probability that country i has experienced a terrorist attack at time t is estimated using a probit model, as follows:

$$P(Attack_{it} = 1) = F(X_{it-1}) \qquad \text{Eq. (5.2)}$$

The matching criteria consists of the pre-treatment country characteristics X_{it-1}: *GDP per capita, Inflation, Unemployment, Honeymoon, Independent party, GDP per capita growth, Inflation change, Unemployment change, Sovereign credit rating,* and *Polity IV* (See Appendix 5.2 for descriptions). The set of pre-treatment variables should include covariates that are partially correlated with both treatment and the potential outcomes (Steiner and Cook, 2013). Thus, the selection of these variables is based on prior studies which find that government support and terrorist attacks are determined by macroeconomic and political factors (e.g. Gassebner et al., 2011; Fauvelle-Aymar and Stegmaier, 2013; Choi, 2015).

After calculating the PS, one-to-one Nearest Neighbour Matching (NNM) with replacement is implemented to match countries with similar PS at time *t*, matching on the same day or in the same week (See Section 4.5.2.1 in Chapter 4). When matching with replacement, each country-date in the control group is allowed to be included in more than one matched set. Hu et al. (2019) argue that allowing replacement ensures better matches with less bias. If the closest neighbour of the treated observation is far away, there will be potential bad matches. Therefore, this analysis requires the maximum distance between two matched countries' PS (caliper) to be 1% (Chen et al., 2019).

After matching, different methods are employed to check matching quality, including the standardized bias to compare univariate mean, the t-statistics which tests the differences in covariate means, and the statistics evaluating the joint significance of the country characteristics in determining the treatment likelihood (see Section 4.5.2.2 in Chapter 4 for more details). Following Stuart and Rubin (2007), the absolute standardized bias of each covariate is imposed to be less than 25%. A threshold of 10% for the mean of absolute standardized bias of all covariates is required following Xia (2014). All covariates after

matching should be balanced, hence the t-test should not be statistically significant. In addition, the Pseudo-R^2 value should be fairly low, and the likelihood ratio test on the joint significance of all regressors is expected to be rejected, indicating no systematic differences in the distributions of covariates between both groups after matching.

The PSM operates in a way of inexact matches, whereby treated and control units are similar but not identical (Stuart, 2010). Matching countries with similar PS requires these observations to have similar distributions of the covariates that went into the PS, but it does not imply that they have similar covariate values. To correct for the residual bias of the inexact matches, the PSM can be combined with additional covariance adjustment in the outcome analysis by regressing the outcome on all or key covariates using the matched dataset (Steiner and Cook, 2013). The additional covariance adjustments are implemented by estimating Eq. (5.1) on the matched dataset.

5.6 Empirical results

This Section discusses the results of the empirical analysis on the impact of severe terrorist attacks on government support. Section 5.6.1 discusses the estimation results of the FEM (Eq. (5.1)) for the full sample and different sub-samples based on different country groups, type of attacks, and level of fatalities. Section 5.6.2 presents the results of the PSM. The presence of terrorism is expected to influence voters' preferences, either increasing government support in the case of the rally effect or leading to a punishment of the incumbent government in the case of the public good effect (See Section 5.3).

5.6.1 Fixed-effects model

Eq. (5.1) is estimated to examine the impact of severe terrorist attacks on government supports in EU countries. The main dependent variable "$Govsup_{it+s}$" is the polling results aggregated by taking the average of polls across different time windows [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30], where the attack is on date 0. All estimations include both country and year FE to control for the unobserved variables.

5.6.1.1 Full sample

Eq. (5.1) is estimated using the full sample with the results reported in Table 5.3. *Attack* coefficients are positive and statistically significant at the 1% level across all time windows, except for [0; 1] time window. Particularly, *Attack* is associated with a 1.3%, 2.1%, 2.6%, and 3.0% increase in government support over the [0; 3], [0; 7], [0; 14], and [0; 30] time windows, respectively. The longer the time window is, the bigger is the magnitude of the coefficient for *Attack*, since it may take some time for people to react to terrorism news and for polling firms to conduct surveys. The effects of terrorism on government support go beyond the effect of economic and political conditions, since Eq. (5.1) controls for several economic and political variables, which are commonly used in the existing voting behaviour literature. As *Attack* has an insignificant effect on government support in [0; 1] time window, it needs further investigations. Eq. (5.1) is then estimated for different sub-country groups.

It appears that *Attack* does not have a significant impact on government support in Germany and France (see Table 5.5, the estimation of Eq. (5.1) using a sub-sample of Germany and France). This effect might be driven by the better economic conditions in these two countries compared to the rest of European countries (Baum, 2002). Germany and France are the largest economies in Eurozone, and are considered as leaders of the EU economy (Eurostat, 2018).[90] Also, they were not under severe stress during the 2008 financial crisis (De Marco, 2019). Therefore, citizens in these countries might react to the terrorist attacks differently compared to the other remaining countries. Additionally, this different reaction might be driven by variations in the trust in governments and the media coverage of terrorist events (Lai and Reiter, 2005; Chowanietz, 2011; Chatagnier, 2012). Insignificant effects may also relate to the opposing effect of the rally effect and the public good effect. If both effects are in play, these may cancel out each other resulting in insignificant results.

To avoid potential bias, Germany and France are dropped from the full sample. This analysis, therefore, focuses on the full sample excluding Germany and France ("Full_EGF"). The results of Eq. (5.1) using the "Full_EGF" sample across different time windows are reported in Table 5.4. Overall, *Attack* causes 2.1%, 3.2%, 3.4%, 4.0%, and 4.6% increases in government support over the [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] time windows respectively.[91] The findings are strongly consistent with Hypothesis H1 (see Section 5.3). The

[90] Germany accounted for about a fifth of EU GDP (21.3%) in 2017, followed by France (14.9%) (Eurostat, 2018).
[91] The effect of *Attack* on the government support is slightly stronger when using Full_EGF sample than using the full sample (see Table 5.3).

sign of *Attack* coefficients is consistent with the rally effect, which implies that citizens gather together to provide more support for the government in the aftermath of terrorist attacks. Given the rally effects, citizens show their needs for the incumbents to solve problems rather than tending to replace them (Chowanietz, 2011). This reaction is either driven by patriotism or the desire of safety caused by the feeling of distress and anxiety in the aftermath of terrorist attacks (Mueller, 1970; Merolla et al., 2007; Lambert et al., 2010). Citizens believe that the government has powerful policy instruments to strengthen and defend the country against terrorism. This rally effect is similar to the reaction of citizens to the big terrorist events, such as the 7/7 bombings in London (Williams et al., 2013b). These findings also support the view that citizens react to the exogenous events outside the control of the government (Ashworth et al., 2018). Terrorist attacks provide citizens opportunities to assess the performance of the government and their policies on terrorism defence and emergency preparedness. When citizens feel that the government is fulfilling the task of protecting them, they reward the government.

5.6.1.2 Regions' sub-samples

The Full_EGF sample is divided into two groups: "GIIPS" and the remaining countries "REM_EGF". GIIPS countries were hit the hardest by the 2009-12 European debt crises (Beetsma et al., 2013).[92] During the crisis, they suffered from higher borrowing cost, increased government deficits and debt levels, and weak economic growth. A decade after the crisis, the slow growth is still hampering European governments' efforts to reduce their countries' public debt burdens (Moody's, 2019b). Hence, citizens in GIIPS countries might react to the terrorist attacks differently from those in the remaining countries.

The estimation results of Eq. (5.1) for country sub-groups are reported in Table 5.6. *Govsup* in both GIIPS and REM_EGF countries are positively affected by *Attack* across all time windows, which are statistically significant at the 10% level or above. *Attack* coefficients over the [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] time windows suggest that if there is an attack in GIIPS (REM_EGF), government supports increase by 2.5% (1.3%), 2.5% (2.2%), 2.6% (2.1%), 3.3% (2.0%), and 3.9% (2.5%), respectively. In GIIPS countries, despite the poor economic conditions, citizens seem to show slightly stronger support for governments in the aftermath of terrorist attacks compared to REM_EGF countries. This finding is consistent with

[92] GIIPS represent Greece, Ireland, Italy, Portugal, and Spain.

Merolla et al.'s (2007) argument that in the wake of disastrous terrorist events, people tend to overlook poor policy performance and provide more support for the incumbents in the hope that their leaders will improve security issues (See Section 5.3).[93]

5.6.1.3 Type of attacks, level of fatalities, and repeated attacks

Table 5.7 presents the estimation results of Eq. (5.1) using two sub-samples of the Full_EGF based on the type of attacks: transnational and domestic attacks. Both transnational and domestic attacks consistently have rally effects on citizens across time windows, which are statistically significant at the 1% level, except for the [0; 1] time window, whereby transnational *Attack* is significant at the 10% level (Column 1). However, the rally effects appear to be more pronounced in case of domestic attacks. Particularly, transnational (domestic) attacks increase government supports by 1.4% (3.7%), 2.8% (4.3%), 2.4% (4.7%), 2.7% (5.6%), and 3.3% (6.4%) in 1 day, 3 days, 7 days, 14 days, and 30 days after the attack. The findings are consistent with Enders et al.'s (2011) results, indicating that domestic terrorism is more likely to have a direct impact on the venue country, its institution, citizens, properties, and policies. On the other hand, transnational terrorism is more likely to affect economic growth.[94]

This study also considers the effect of terrorist attacks by the level of damage. Table 5.8 shows the results of Eq. (5.1) whereby the dummy variable *Attack* is replaced by alternative terrorism indicators: *Attack-I, Attack-1K, Attack-3K,* or *Attack-5K,* representing terror attacks where there are only injured people (no people killed), at least one, three, or five people killed, respectively. Overall, coefficients on *Attack* are positive across all time windows, statistically significant at the 5% level or better. For example, while *Attack-I* increases government support by 1.9% over the [0; 1] time window, *Attack-1K, Attack-3K,* or *Attack-5K* result in 2.9%, 12.3%, 12.3% increase in government support respectively (Columns 1 to 4).[95] The results

[93] The results of the effect of terrorist attacks on government support in the remaining countries' group "REM" (full sample excluding GIIPS) are mixed, likely driven by the insignificant impact of terrorist attacks on public support for governments in Germany and France (See Appendix 5.7)

[94] The results of Eq. (5.1) using sub-samples of the full sample including Germany and France, based on the type of attacks are consistent across all time windows, except for the [0;1] time window whereby the transnational *Attack* is insignificant (see Appendix 5.5)

[95] The results of Eq. (5.1) using sub-samples of the full sample including Germany and France, based on the level of fatalities are consistent across all time windows, except for [0; 1] and [0; 3] time windows whereby most of coefficients of *Attack* are insignificant (See Appendix 5.6).

suggest that terrorist attacks that result in the higher level of damage have a stronger rally effect on citizens.

Regarding the effect of repeated attacks, Table 5.9 presents the estimation results of Eq. (5.1) whereby the dummy variable *Attack* is replaced by: *Attack_m, Attack_3m,* and *Attack_y,* indicating terrorist attacks that occurred repeatedly in one month, three months, and one year, respectively.[96] Their coefficients are consistently positive across all time windows, statistically significant at 5% level or better, except for [0; 1] time window. Attacks repeated in a shorter time period seem to have a more profound effect on government support. For example, *Attack_m*, *Attack_3m*¸ and *Attack_y* increase government support in [0; 3] time window by 1.5%, 1.4%, and 1.0%, respectively.

5.6.1.4 Control variables

All control variables have the expected sign, and most of them are significant (see Table 5.4, Table 5.6, Table 5.7, Table 5.8). Consistent with previous studies that find poor economic performance decreases government support (e.g. Veiga and Veiga, 2004; Gassebner et al., 2011; Castro and Martins, 2013), *GDP per capita* has a significant positive impact, while *Unemployment* has a negative effect on polling results for the incumbent party. For example, Table 5.4 shows that if *GDP per capita* increases by 1,000 USD, citizens will give the government 0.1% higher support across time windows, except for the [0; 1] time window (Column 1). If the unemployment rate increases by 1%, government support decreases by 0.51% to 0.57% across time windows (see Table 5.4).

While *Inflation* has a significant negative impact on government supports in the REM_EGF group over the [0; 1] and [0; 3] time windows (Columns 1 and 2 of Table 5.6), it has a significant positive impact on government support in GIIPS countries across all time windows, except [0; 1] and [0; 14] (Columns 1 and 7 of Table 5.6). The findings are consistent with prior studies indicating that inflation has mixed and inconsistent effects on government support which operates in ways consistent with the priorities of the party in office (e.g. Carlsen, 2000). Voters usually expect right-wing (left-wing) governments to deal better with inflation (unemployment) (Powell and Whitten, 1993). Therefore, they punish (reward) the right-wing

[96] The results of Eq. (5.1) using sub-samples of the full sample including Germany and France, based on the repeated attacks are consistent (See Appendix 5.8).

incumbents for high (low) inflation. The impact of inflation on the support for left-wing governments is mixed (Carlsen, 2000).

Table 5.4 shows that political factors, *Honeymoon* and *Independent party*, have a significant impact on polling results for the incumbent party. A new incumbent in the office can benefit from a strong positive honeymoon effect, which is approximately 3.4% to 3.8% higher support than those who are not in the honeymoon period across all time windows. However, if the government is led by an independent candidate, citizens might punish them by 6.1% to 12.8% less support. Finally, the coefficient on *CRS[0; 1]* indicates that the government can benefit from 0.07% to 0.13% higher support for a 1% increase in stock return spread (Table 5.4).[97]

5.6.1.5 Robustness tests

Appendix 5.8 and Appendix 5.9 show the estimation results of the models in which more political control variables are added to Eq. (5.1) using the full sample and Full_EGF sub-sample respectively. The political indicators include a variable measuring number of opposing parties (*Op_parties*), a dummy variable indicating whether the coalition government is in office (*Coalition*), and a dummy variable for the incumbent's ideology (e.g. left, centre left, centre, centre right, and right wing party) (*Ideology*). Panels A, B, and C in Appendix 5.8 and Appendix 5.9 show that all the estimations are robust across time windows. Regarding the control variables, *Ideology* has a mixed effect, while *Op_parties* and *Coalition* have significant negative effects on government support. Particularly, an increase in the number of opposing parties reduces the government support by 0.05% - 0.08%. If the coalition government is in office, it is less supported by 1% - 3%.[98]

In order to check for robustness, the full sample is divided into two sub-groups based on the level of government support: high and low government support. Countries that have low average of government support (less than 20%) are: Czech, France, Latvia, Lithuania, Netherlands, and Slovenia (see Section 3.2), while the remain countries have high average of government support. Appendix 5.10 shows that citizens in countries with high average of

[97] *Stock Return* on event date *t* and *Cumulative Abnormal Return* within the two-day window *(CAR[0;1])* are used instead of *CRS[0;1]*, however they have insignificant effects on the *GovSup*. Regarding the benchmark index, using Eurostoxx provides more significant results than using alternative benchmarks, such as MSCI and FTSE index.

[98] The results are available upon requested.

government support tend to provide more support for the government in the aftermath of terrorist attacks as expected by the rally effect, while there seems to be no significant effect in countries with low government support. This insignificant effect might be driven by the two opposing effects of terrorist attacks on voters' preferences (see Section 5.3).

5.6.2 Propensity Score Matching

In this Section, the robustness of the rally effect of terrorist attacks on government support is examined using the PSM. This approach controls for potential differences in country characteristics between the treatment and control countries. For the Full_EGF sample, PS is estimated using the pre-treatment country characteristics, see Section 5.5.2 and Appendix 5.2 for the list of variables.[99, 100] The estimation uses one-to-one NNM with replacement and imposes caliper matching at 1% level (Chen et al., 2019).

After calculating the PS, each treated country-date is matched with the control country-date with the closest PS: (i) on the same event date, and (ii) in the same event week.[101] When matching on the same event date, the analysis focuses only on the [0; 14] and [0; 30] windows as reported in Table 5.10 and Table 5.11 respectively. For shorter time windows ([0; 1], [0; 3], and [0; 7]), the overlap between poll availability and terrorist events is smaller leading to a decrease in the robustness of the results. Panels A and B report the results of balancing tests performed after the PSM. Particularly, Panels A report the standardized bias and the t-statistics, testing the differences in covariate means before and after matching. Panels B report the mean bias and joint significance test for overall covariates using Pseudo-R^2 and the likelihood ratio test. Panels C present ATT, which is the difference in government support between the treated and the matched group. Finally, the results for the matched sample using Eq. (5.1) are reported in Panels D.

Balancing tests for each covariate and overall covariates within [0; 14] and [0; 30] time windows are satisfied as required in Section 5.5.2. Particularly, the pre-treatment control variables are not statistically different across treatment and control groups at the 10% level (Panels A in Table 5.10 and Table 5.11). The absolute standardized bias for each covariate is

[99] For Full_EGF sample, *GDP per capita* is excluded because it does not satisfy the balancing tests (see Table 5.10 to Table 5.12).
[100] For full sample, *Polity IV* is excluded because it does not satisfy the balancing tests (Appendix 5.11 and Appendix 5.12).
[101] Serfling (2016) matches are based on the same year; Xia (2014) matches are based on the same quarter.

below the required threshold of 25%. For most covariates, the absolute standardized bias is below 15% except for *Independent party* with 17.2% bias in the [0; 14] time window and *Sovereign credit rating* with 15.2% bias in the [0; 30] time window. Panel B in Table 5.10 (Table 5.11) shows that the mean bias for all covariates is 7.5% (4.8%) in [0; 14] ([0; 30]) time window, which is below the required threshold of 10%. The Pseudo-R^2 is fairly low (0.02) and the likelihood ratio test is insignificant after matching, implying that the treatment and control groups have the same covariate distribution after matching.

After checking matching quality, Panel C in Table 5.10 (Table 5.11) shows the result of ATT, highlighting the impact of terrorist attacks on the treated country's government support. ATT is calculated by taking the difference in *Govsup* between the treated and matched group within 14 (30) days after attacks. Panel C in Table 5.10 (Table 5.11) shows that ATT is 9.6% (10.9%) in the [0; 14] ([0; 30]) time windows, statistically significant at the 1% level. It suggests that terrorist attacks result in an increase of government support of treated countries compared to the matched countries by 9.6% (10.9%) in 14 (30) days after attacks. Using the treatment and the PSM matched control group, Eq. (5.1) is estimated, and the results for the [0; 14] and [0; 30] time windows are reported in Panels D in Table 5.10 and Table 5.11, respectively. The coefficient of *Attack* is 7.2% (1.9%) in the [0; 14] ([0; 30]) time windows, statistically significant at the 5% level or better.[102]

Under the matching conditions where the treated and the control are matched on the same event date, 147 (173) out of 249 (283) treated country-dates are matched in the [0; 14] ([0; 30]) time windows (Panels C in Table 5.10 and Table 5.11). The remaining 102 (110) treated country-dates are off support in the [0; 14] ([0; 30]) time windows, i.e. excluding approximate 40% of the observations from the sample, which might be driven by the data availability.

To increase the number of matched pairs, this Chapter matches the treated and control group in the same event week. Accordingly, each treated country-date is matched with control country-date with closest PS in the same week that the attack occurs. The results are reported in Table 5.12 for the [0; 30] time window.[103] The same set of pre-treatment variables is employed and the three balancing tests are matched with the requirement (Panels A and B in

[102] For the full sample including Germany and France, the results of the PSM and FEM for the matched sample in the [0; 14] and [0; 30] time windows are reported Appendix 5.11 and Appendix 5.12 respectively. Balancing tests are matched with the requirement. All the results are robust.

[103] When matching in the same week, the result in the [0; 14] time window was not reported since balancing tests are not satisfied.

Table 5.12), matching an overall of 247 out of 283 treated country-dates. Panel C in Table 5.12 shows that the terrorist attacks are associated with an increase in government support of the treated countries by 11.3% (ATT is 11.3%) in 30 days after the attack compared to the matched group. The coefficient on *Attack* in the FEM for the matched samples is 1.5% (Panel D in Table 5.12).[104]

In short, the results of ATT and the coefficient on *Attack* in the FEM for the matched samples are positive and statistically significant. These findings confirm the results of the FEM (See Section 5.6.1), implying that terrorist attacks increase government support. This supports rally effects in the aftermath of terrorist attacks, which might be driven by patriotism or the safety desire of citizens.

5.7 Conclusion

The aim of this Chapter is to investigate the impact of terrorist attacks on government support across time in European countries. The findings support the rally effect theory, indicating that government support significantly increases in the aftermath of severe terrorist attacks in most European countries, except in Germany and France. Even though terrorist attacks have negative impacts on national economies and financial markets, the shocks after terrorist attacks are likely to draw citizens to rally behind their leaders whom they believe are capable to guarantee their safety.

To answer the research question on whether terrorist attacks have a significant impact on government support, this Chapter uses a rich dataset of polling results for the incumbent party and terrorist attacks in 27 European countries during the period from September 2000 to July 2017. Polling results are manually collected for several countries from online news articles and publicly available polling datasets (see Chapter 3). Opinion polls are not always conducted with daily frequency, hence raw polling data is combined by aggregating the polling data of each country within different time windows: [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] days where attacks are observed on date t = 0. The dataset of terrorist attacks is collected from GTD during the sample period. In comparison to other sources (e.g. ITERATE and RAND), GTD database is up to date and provides both domestic and transnational terrorist attacks (Sandler, 2015). Given the large number of attacks and not all attacks are serious in terms of fatalities and

[104] For full sample, balancing tests across all time windows are not satisfied as required when matching in the same week.

economic consequences, this Chapter only focuses on 354 severe terror attacks which result in at least one person killed or injured. Both FEM and PSM approaches are employed to control for the effect of unobservable variables (Dai et al., 2020).

The results of the FEM show that terrorist attacks cause an increase in government support in European countries as predicted by the rally effect theory, except for Germany and France. Terrorist attacks in Germany and France do not have a significant impact on the public support for governments. Given variations in economic conditions, social and political reasons, the reaction of citizens to terrorist attacks in these countries are different from those in the remaining countries (Baum, 2002; Lai and Reiter, 2005; Chowanietz, 2011; Chatagnier, 2012). For that reason, the remain of the empirical analysis is conducted using the full sample excluding Germany and France ("Full_EGF") to avoid any potential bias that these countries may introduce.

The rally effects are consistent for various sub-sample groups: different regions (GIIPS and the remaining countries REM_EGF), type of attacks (transnational and domestic attacks), and level of fatalities (only injured, at least one/three/five people killed). Despite having poorer economic conditions, governments in GIIPS countries seem to be more supported after terrorist attacks compared to REM_EGF countries. In crisis, people tend to overlook the poor policy performance and provide more support for the incumbent who could improve critical conditions (Merolla et al., 2007). Regarding the type of attacks, domestic attacks seem to have a stronger impact on government support than transnational attacks. This is consistent with Enders et al.'s (2011) results, showing that domestic terrorism is more likely to have a direct impact on the venue country, its institution, citizens, properties, and policies. Further, this Chapter reveals that the magnitude of the rally effect on citizens increases with the severity of a terrorist attack measured by level of fatalities increasingly from attacks with only injured people to at least one/three/five people killed. Moreover, the rally effect is more profound when terrorist attacks are repeated within one month compared to three months or one year.

To test for the robustness of results, the PSM is employed to control for the potential differences in the observable characteristics of the treatment (attacked country-date observations) and control groups (non-attacked country-date observations). By using the PSM, these groups are matched by similarity along the pre-treatment country characteristics, so that they only differ in the treatment received *(Attack)*, thus providing unbiased estimation of the attacks' effects. The results of the PSM suggest that governments in countries affected by

terrorist attacks receive more support from their citizens by approximately 10% to 11% compared to their matched countries. These findings are consistent with the rally effect theory.

This Chapter contributes to the literature on the political consequences of terrorism (e.g. Gassebner et al., 2008; Dreher and Fischer, 2010; Gassebner et al., 2011; Williams et al., 2013b; Nowak, 2018). Prior studies find evidence supporting the impact of terrorism on electoral outcomes and government duration, but they are unable to examine the effect on government support over time and across countries. To the best of my knowledge, this Chapter is the first to examine changes in polling results measuring the direction of government support in the immediate aftermath of terrorist attacks at a multi-country level. Looking at polling results for the incumbent party helps to identify in which circumstances the rally effect (increase in government support) or the public good effect (decrease in government support) is the dominant factor in determining the impact of terrorism on the stability of the government. Changes in government support outside of election periods signal electoral prospects of incumbents, hence potentially affect future policies and political stability. In addition, the results, combined with the findings of prior studies, for example Healy and Malhotra, 2010, Cole et al., 2012, and Ashworth et al., 2018, indicate that exogenous shocks beyond the control of the government could affect voters' preferences, which supports the rational voter hypothesis discussed by Ashworth et al. (2018). Furthermore, using a multi-country scale, this Chapter overcomes the commonly used single-country and single event approach in prior studies (e.g. Hetherington and Nelson, 2003; Lai and Reiter, 2005; Montalvo, 2011). The results of the econometric analysis suggest that citizens in different countries react to terrorism in various ways. While the effect of terrorism on government support seems to be limited in Germany and France, governments in the remaining countries gain more support after severe attacks.

These findings enhance the understanding of how exogenous events (e.g. terrorist attacks) affect the political stability in European countries. Despite the destruction of human and physical capital, this Chapter finds that citizens tend to provide more support for eaders at least at the early stage after terrorist attacks. Psychological factors along with new information about the quality of the government in terms of terrorism prevention and investigation, and emergency preparedness policies might shift voters' preferences. Since incumbents seek to maintain public support in order to be re-elected, they need to show that counterterrorism is a prime political issue, which is carefully planned and executed. Even though citizens tend to rally behind the government in the aftermath of terrorist attacks in order to fulfil their needs for

protections, this rally effect might be short lived (Park and Bali, 2017) and might decrease when terrorist attacks occur repeatedly and even reverse when a certain level of terror is reached (Nowak, 2018). Therefore, improving counter-terrorism system should be one of the top priorities for the government, regulators, and policy makers. Incumbents may ensure the likelihood of their remaining in office by carrying out less provocative foreign policies (Park and Bali, 2017). This helps in reducing transnational terrorist attacks. Additionally, the results of this Chapter may explain why voters' preferences for radical right parties increase in various European countries contemporarily. Such parties profit from terrorism because this could be exploited to radicalise public opinion on issues connected to refugees and immigration, safety, culture, and religion, which are the core issues of extremist right parties (Golder, 2016; Rooduijn et al., 2017). The findings should be of interest to governments, political parties, regulators, and policy makers, who aim to adopt the most appropriate way to keep the political environment stable under the threats of terrorism.

The question about how terrorist attacks influence voters' preferences could be explored in further research at an individual level, subject to data availability, such as comparing the impact of terrorism across different types of voters, including those who live in attacked areas versus those who live in non-attacked areas, victims versus non-victims. The attitudes of people from different groups might vary due to the loss they have had suffered. In addition, future research can examine the interaction between changes in government support induced by terrorist attacks and both government actions and implemented policies in order to further understand the long-lasting political effect of terrorism.

Tables

Table 5.1 Severe terrorist attack description

Panel A: Distribution by country			**Panel B: Distribution by year**			**Panel C: Distribution by level of killed/ injured**		
Country	**Frequency**	**Proportion of total (%)**	**Year**	**Frequency**	**Proportion of total (%)**	**No. of killed/injured**	**Frequency**	**Proportion of total (%)**
Austria	2	0.56	2000	13	3.67	**- Full sample:**		
Belgium	3	0.85	2001	28	7.91			
Croatia	2	0.56	2002	15	4.24	At least 1 person injured, no killed	239	67.51
Czech	3	0.85	2003	5	1.41	At least 1 person killed	115	32.49
Denmark	3	0.85	2004	9	2.54	*in which:*		
Estonia	1	0.28	2005	12	3.39	*At least 3 people killed*	*19*	*5.37*
Finland	3	0.85	2006	7	1.98	*At least 5 people killed*	*14*	*3.95*
France	30	8.47	2007	14	3.95	Total	354	100
Germany	41	11.58	2008	17	4.8			
Greece	25	7.06	2009	11	3.11			
Hungary	1	0.28	2010	25	7.06			
Ireland	6	1.69	2011	12	3.39	**- Full sample excluding Germany**		
Italy	16	4.52	2012	11	3.11	**and France (Full_EGF):**		
Netherlands	1	0.28	2013	25	7.06			
Poland	3	0.85	2014	12	3.39	At least 1 person injured, no killed	199	70.32
Slovakia	1	0.28	2015	41	11.58	At least 1 person killed	84	29.68
Spain	82	23.16	2016	62	17.51	*in which:*		
Sweden	9	2.54	2017	35	9.89	*At least 3 people killed*	*11*	*3.89*
UK	122	34.46				*At least 5 people killed*	*9*	*3.18*
Total	354	100	Total	354	100	Total	283	100

This table presents descriptive statistics of attacks from 21/09/2000 to 28/07/2017 for 19 EU countries that have polling data available within 30 days after event date. Panel A presents the distribution of attacks by country. Panel B presents the frequency of attacks by year. Panel C presents the frequency of attacks by level of killed/injured.

Table 5.2 Summary statistics. Full sample excluding Germany and France.

Panel A: Summary statistics for Full_EGF within different time window										
	[0; 1] (Obs. =4586)		**[0; 3]** (Obs. =8917)		**[0; 7]** (Obs. =15024)		**[0; 14]** (Obs. = 21741)		**[0; 30]** (Obs. =29985)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Dependent variables										
Govsup	0.246	0.094	0.257	0.096	0.263	0.099	0.265	0.100	0.265	0.100
Control variables										
GDP per capita	37.115	9.216	34.923	9.558	33.106	9.788	32.157	9.692	31.485	9.412
Inflation	0.016	0.014	0.016	0.016	0.017	0.018	0.018	0.018	0.019	0.019
Unemployment	0.087	0.047	0.094	0.050	0.098	0.050	0.098	0.049	0.097	0.047
Honeymoon	0.060	0.237	0.067	0.250	0.072	0.259	0.076	0.265	0.080	0.271
Independent party	0.032	0.177	0.033	0.179	0.034	0.182	0.035	0.184	0.034	0.182
CRS [0; 1]	0.000	0.012	0.000	0.013	0.000	0.014	0.000	0.015	0.000	0.015
Panel B: Comparing sample means for treatment and control groups within different time window										
	[0; 1]		**[0; 3]**		**[0; 7]**		**[0; 14]**		**[0; 30]**	
	Treatment (Obs.=72)	Control (Obs.=4514)	Treatment (Obs.=130)	Control (Obs.=8787)	Treatment (Obs.= 203)	Control (Obs.=14821)	Treatment (Obs. =249)	Control (Obs.=21492)	Treatment (Obs.=283)	Control (Obs. =29702)
Dependent variables										
Govsup	0.333***	0.245	0.342***	0.256	0.343***	0.262	0.346***	0.264	0.348***	0.264
Control variables										
GDP per capita	35.941	37.134	35.701	34.912	35.554***	33.072	35.211***	32.122	34.942***	31.452
Inflation	0.020**	0.016	0.019*	0.016	0.018	0.017	0.019	0.018	0.019	0.019
Unemployment	0.094	0.087	0.090	0.094	0.092	0.098	0.094	0.098	0.096	0.097
Honeymoon	0.042	0.06	0.038	0.067	0.044	0.073	0.048*	0.076	0.057	0.080
Independent party	0.028	0.032	0.023	0.033	0.020	0.034	0.016	0.035	0.018	0.035
CRS [0; 1]	-0.003**	-0.000	-0.002	-0.000	-0.002**	-0.001	-0.002**	-0.000	-0.002**	-0.000

This table presents summary statistics for the main variables in the regression models using full sample excluding Germany and France (Full_EGF). *Govsup* is the level of support for the incumbent party which is aggregated by taking average of polls within different time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30]. All control variables are defined in Appendix 5.1. Panel A reports the summary statistic for Full_EGF. Panel B reports univariate results comparing the mean values of variables in treatment and control groups across time window. In each time window, the column labelled Treatment presents the mean values of variables for countries affected by attacks and the column labelled Control presents those of countries not affected by attack. *, **, and *** in the column labelled Treatment indicate significance at the 10%, 5%, and 1% levels respectively for a *t-test* of whether two samples have equal means.

Table 5.3 FEM. Full sample

VARIABLES	[0; 1]	[0; 3]	[0; 7]	[0; 14]	[0; 30]
	(1)	(2)	(3)	(4)	(5)
Attack	0.003	0.013***	0.021***	0.026***	0.030***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
GDP per capita	0.002***	0.003***	0.002***	0.002***	0.002***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.197	-0.115	-0.040	-0.043	-0.032
	(0.124)	(0.078)	(0.055)	(0.045)	(0.038)
Unemployment	-0.690***	-0.660***	-0.597***	-0.594***	-0.564***
	(0.052)	(0.034)	(0.024)	(0.020)	(0.016)
Honeymoon	0.036***	0.034***	0.037***	0.037***	0.034***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)
Independent party	-0.129***	-0.103***	-0.080***	-0.067***	-0.060***
	(0.009)	(0.007)	(0.005)	(0.004)	(0.004)
CRS [0; 1]	0.052	0.140***	0.089***	0.074***	0.038*
	(0.063)	(0.044)	(0.034)	(0.028)	(0.022)
Constant	0.258***	0.201***	0.170***	0.168***	0.155***
	(0.029)	(0.023)	(0.018)	(0.014)	(0.013)
Observations	5,790	11,214	17,518	24,285	32,617
R-squared	0.830	0.796	0.768	0.760	0.753
Country FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (5.1) using full sample during September 2000 to July 2017. $Govsup_{it+s}$: the dependent variable is the level of support for government of country *i* aggregated by taking average of polling results for the incumbent partyin the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where *Attack* is observed on date t = 0. *Attack* takes value of 1 if country *i* was attacked on the attack day *t* which results in at least one person injured or killed, and 0 on non-attacked days. All control variables are defined in Appendix 5.1. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level respectively.

Table 5.4 FEM. Full sample excluding Germany and France

VARIABLES	[0; 1]	[0; 3]	[0; 7]	[0; 14]	[0; 30]
	(1)	(2)	(3)	(4)	(5)
Attack	0.021***	0.032***	0.034***	0.040***	0.046***
	(0.007)	(0.006)	(0.005)	(0.005)	(0.004)
GDP per capita	0.001	0.001***	0.001***	0.001***	0.001***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.262**	-0.156**	-0.037	-0.013	0.008
	(0.119)	(0.077)	(0.058)	(0.047)	(0.039)
Unemployment	-0.508***	-0.542***	-0.567***	-0.568***	-0.540***
	(0.065)	(0.036)	(0.026)	(0.020)	(0.017)
Honeymoon	0.037***	0.036***	0.038***	0.038***	0.034***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.001)
Independent party	-0.128***	-0.104***	-0.080***	-0.067***	-0.061***
	(0.009)	(0.007)	(0.005)	(0.004)	(0.004)
CRS [0; 1]	0.043	0.131***	0.082**	0.069**	0.033
	(0.066)	(0.044)	(0.034)	(0.028)	(0.022)
Constant	0.316***	0.195***	0.160***	0.156***	0.144***
	(0.031)	(0.028)	(0.018)	(0.014)	(0.012)
Observations	4,586	8,917	15,024	21,741	29,985
R-squared	0.808	0.780	0.764	0.758	0.752
Country FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (5.1) using Full_EGF sample during September 2000 to July 2017. $Govsup_{it+s}$: the dependent variable is the level of support for government of country *i* aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where *Attack* is observed on date t = 0. *Attack* takes value of 1 if country *i* was attacked on the attack day *t* which results in at least one person injured or killed, and 0 on non-attacked days. All control variables are defined in Appendix 5.1. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level respectively.

Table 5.5 FEM. Germany and France

	[0; 1]	[0; 3]	[0; 7]	[0; 14]	[0; 30]
VARIABLES	(1)	(2)	(3)	(4)	(5)
Attack	-0.001	0.005	0.004	0.006	0.010
	(0.013)	(0.009)	(0.008)	(0.008)	(0.008)
GDP per capita	0.003	0.009	0.011	0.021***	0.028***
	(0.028)	(0.015)	(0.011)	(0.006)	(0.003)
Inflation	6.936**	3.537*	5.233***	5.175***	5.895***
	(2.848)	(2.033)	(1.575)	(1.073)	(0.664)
Unemployment	-2.358	-2.891**	-2.426***	-1.806***	-1.254***
	(1.560)	(1.276)	(0.893)	(0.550)	(0.296)
Honeymoon	0.032***	0.032***	0.035***	0.038***	0.045***
	(0.004)	(0.003)	(0.002)	(0.002)	(0.003)
Independent party	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
CRS [0; 1]	0.116	-0.003	0.054	0.041	0.069
	(0.087)	(0.067)	(0.061)	(0.059)	(0.055)
Constant	0.469	0.295	0.205	-0.210	-0.508***
	(1.139)	(0.651)	(0.445)	(0.264)	(0.141)
Observations	1,204	2,297	2,494	2,544	2,632
R-squared	0.850	0.852	0.884	0.902	0.921
Country FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (5.1) using a sample of Germany and France during September 2000 to July 2017. $Govsup_{it+s}$: the dependent variable is the level of support for government of country *i* aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where *Attack* is observed on date t = 0. *Attack* takes value of 1 if country *i* was attacked on the attack day *t* which results in at least one person injured or killed, and 0 on non-attacked days. All control variables are defined in Appendix 5.1. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level respectively.

Table 5.6 FEM. Full sample excluding Germany and France - by country groups

	[0; 1]		[0; 3]		[0; 7]		[0; 14]		[0; 30]	
VARIABLES	GIIPS (1)	REM_EGF (2)	GIIPS (3)	REM_EGF (4)	GIIPS (5)	REM_EGF (6)	GIIPS (7)	REM_EGF (8)	GIIPS (9)	REM_EGF (10)
Attack	0.025**	0.013*	0.025***	0.022***	0.026***	0.021***	0.033***	0.020***	0.039***	0.025***
	(0.011)	(0.007)	(0.009)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)
GDP per capita	0.001	-0.002	0.001	0.001	0.000	0.005***	-0.000	0.007***	0.000**	0.008***
	(0.001)	(0.003)	(0.000)	(0.002)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Inflation	0.382	-0.291*	0.448**	-0.222**	0.295*	-0.071	0.129	-0.023	0.195*	-0.019
	(0.325)	(0.168)	(0.220)	(0.103)	(0.156)	(0.078)	(0.127)	(0.064)	(0.105)	(0.053)
Unemployment	-0.518***	-0.361***	-0.424***	-0.303***	-0.402***	-0.251***	-0.380***	-0.179***	-0.277***	-0.109***
	(0.135)	(0.113)	(0.079)	(0.074)	(0.057)	(0.055)	(0.046)	(0.044)	(0.038)	(0.035)
Honeymoon	0.045***	0.036***	0.049***	0.030***	0.049***	0.034***	0.048***	0.036***	0.044***	0.032***
	(0.008)	(0.004)	(0.005)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.001)
Independent party	-0.176***	-0.035**	-0.175***	-0.030***	-0.168***	-0.035***	-0.161***	-0.036***	-0.152***	-0.041***
	(0.008)	(0.017)	(0.006)	(0.010)	(0.005)	(0.007)	(0.004)	(0.005)	(0.004)	(0.004)
CRS [0; 1]	-0.052	0.044	0.063	0.140***	0.003	0.083**	0.062	0.059*	-0.002	0.037
	(0.114)	(0.075)	(0.075)	(0.049)	(0.054)	(0.039)	(0.043)	(0.031)	(0.035)	(0.025)
Constant	0.324***	0.290**	0.318***	0.122*	0.329***	-0.027	0.323***	-0.102***	0.302***	-0.150***
	(0.040)	(0.137)	(0.027)	(0.064)	(0.020)	(0.045)	(0.016)	(0.036)	(0.014)	(0.030)
Observations	1,047	3,539	2,230	6,687	3,728	11,296	5,379	16,362	7,222	22,763
R-squared	0.724	0.818	0.723	0.795	0.718	0.772	0.721	0.762	0.721	0.749
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (5.1) using Full_EGF sample during September 2000 to July 2017, which is divided into GIIPS and REM_EGF country sub-samples. $Govsup_{it+s}$: the dependent variable is the level of support for government of country *i* aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where *Attack* is observed on date t = 0. *Attack* takes value of 1 if country *i* was attacked on the attack day *t* which results in at least one person injured or killed, and 0 on non-attacked days. All control variables are defined in Appendix 5.1. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level respectively.

Table 5.7 FEM. Full sample excluding Germany and France – by type of attacks

	[0; 1]		[0; 3]		[0; 7]		[0; 14]		[0; 30]	
VARIABLES	Trans-national attacks (1)	Domestic attacks (2)	Trans-national attacks (3)	Domestic attacks (4)	Trans-national attacks (5)	Domestic attacks (6)	Trans-national attacks (7)	Domestic attacks (8)	Trans-national attacks (9)	Domestic attacks (10)
Attack	0.014*	0.037***	0.028***	0.043***	0.024***	0.047***	0.027***	0.056***	0.033***	0.064***
	(0.008)	(0.013)	(0.007)	(0.010)	(0.006)	(0.008)	(0.006)	(0.008)	(0.006)	(0.007)
GDP per capita	0.001*	0.001*	0.001**	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.220*	-0.275**	-0.049	-0.145*	0.081	-0.022	0.081*	0.008	0.079**	0.031
	(0.116)	(0.118)	(0.076)	(0.077)	(0.057)	(0.058)	(0.047)	(0.046)	(0.038)	(0.038)
Unemployment	-0.495***	-0.485***	-0.539***	-0.524***	-0.573***	-0.555***	-0.571***	-0.557***	-0.540***	-0.531***
	(0.065)	(0.065)	(0.037)	(0.037)	(0.026)	(0.026)	(0.020)	(0.020)	(0.017)	(0.017)
Honeymoon	0.038***	0.037***	0.036***	0.036***	0.039***	0.038***	0.039***	0.038***	0.035***	0.034***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Independent party	-0.127***	-0.128***	-0.103***	-0.104***	-0.078***	-0.080***	-0.065***	-0.067***	-0.060***	-0.061***
	(0.009)	(0.009)	(0.007)	(0.007)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
CRS [0; 1]	0.047	0.049	0.135***	0.130***	0.088***	0.080**	0.072***	0.067**	0.036*	0.032
	(0.066)	(0.066)	(0.044)	(0.045)	(0.034)	(0.035)	(0.028)	(0.028)	(0.022)	(0.022)
Constant	0.203***	0.304***	0.135***	0.179***	0.123***	0.149***	0.125***	0.145***	0.117***	0.133***
	(0.061)	(0.034)	(0.020)	(0.027)	(0.014)	(0.017)	(0.012)	(0.013)	(0.010)	(0.011)
Observations	4,558	4,536	8,864	8,830	14,931	14,899	21,621	21,594	29,843	29,823
R-squared	0.808	0.808	0.782	0.781	0.766	0.765	0.760	0.759	0.753	0.752
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (5.1) using Full_EGF sample during September 2000 to July 2017. $Govsup_{it+s}$: the dependent variable is the level of support for government of country *i* aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where *Attack* is observed on date t = 0. *Attack* takes value of 1 if country *i* was attacked on the attack day *t* which results in at least one person injured or killed, and 0 on non-attacked days. All control variables are defined in Appendix 5.1. In each time window, Eq. (5.1) is run separately for the sample of transnational and domestic attacks. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level respectively.

Table 5.8 FEM. Full sample excluding Germany and France – by level of fatalities

	[0; 1]				[0; 3]				[0; 7]			
VARIABLES	Only injured (1)	At least 1 person killed (2)	At least 3 people killed (3)	At least 5 people killed (4)	Only injured (5)	At least 1 person killed (6)	At least 3 people killed (7)	At least 5 people killed (8)	Only injured (9)	At least 1 person killed (10)	At least 3 people killed (11)	At least 5 people killed (12)
Attack	0.019**	0.029**	0.123***	0.123***	0.032***	0.038***	0.079**	0.074**	0.030***	0.050***	0.086***	0.081***
	(0.008)	(0.013)	(0.014)	(0.014)	(0.007)	(0.011)	(0.034)	(0.036)	(0.006)	(0.009)	(0.024)	(0.019)
GDP per capita	0.001	0.001*	0.001*	0.001*	0.001***	0.001***	0.001**	0.001**	0.001***	0.001***	0.001***	0.001***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.264**	-0.241**	-0.234**	-0.234**	-0.128*	-0.096	-0.067	-0.057	0.014	0.019	0.069	0.075
	(0.118)	(0.118)	(0.117)	(0.117)	(0.077)	(0.076)	(0.076)	(0.076)	(0.058)	(0.058)	(0.057)	(0.057)
Unemployment	-0.488***	-0.498***	-0.478***	-0.478***	-0.535***	-0.537***	-0.534***	-0.534***	-0.568***	-0.567***	-0.570***	-0.569***
	(0.065)	(0.065)	(0.065)	(0.065)	(0.037)	(0.038)	(0.038)	(0.038)	(0.026)	(0.026)	(0.026)	(0.026)
Honeymoon	0.038***	0.037***	0.038***	0.038***	0.036***	0.036***	0.037***	0.037***	0.038***	0.038***	0.039***	0.039***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Independent party	-0.128***	-0.127***	-0.126***	-0.126***	-0.104***	-0.103***	-0.102***	-0.102***	-0.080***	-0.079***	-0.078***	-0.078***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.007)	(0.007)	(0.007)	(0.007)	(0.005)	(0.005)	(0.005)	(0.005)
CRS [0; 1]	0.044	0.052	0.051	0.051	0.132***	0.135***	0.134***	0.135***	0.083**	0.089**	0.087**	0.088**
	(0.066)	(0.066)	(0.066)	(0.066)	(0.044)	(0.045)	(0.045)	(0.045)	(0.034)	(0.034)	(0.035)	(0.035)
Constant	0.300***	0.313***	0.212***	0.201***	0.166***	0.174***	0.146***	0.134***	0.136***	0.147***	0.126***	0.122***
	(0.032)	(0.032)	(0.034)	(0.061)	(0.026)	(0.027)	(0.023)	(0.020)	(0.016)	(0.017)	(0.015)	(0.014)
Observations	4,566	4,534	4,517	4,516	8,885	8,819	8,793	8,791	14,966	14,879	14,829	14,827
R-squared	0.808	0.808	0.809	0.809	0.781	0.781	0.781	0.782	0.765	0.765	0.766	0.766
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 5.8 (continued)

	[0; 14]				[0; 30]			
VARIABLES	Only injured (13)	At least 1 person killed (14)	At least 3 people killed (15)	At least 5 people killed (16)	Only injured (17)	At least 1 person killed (18)	At least 3 people killed (19)	At least 5 people killed (20)
Attack	0.035***	0.058***	0.079***	0.073***	0.041***	0.063***	0.075***	0.070***
	(0.006)	(0.009)	(0.022)	(0.018)	(0.005)	(0.008)	(0.021)	(0.018)
GDP per capita	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	0.034	0.036	0.083*	0.087*	0.043	0.052	0.087**	0.090**
	(0.047)	(0.046)	(0.046)	(0.046)	(0.039)	(0.038)	(0.038)	(0.038)
Unemployment	-0.568***	-0.567***	-0.568***	-0.568***	-0.539***	-0.538***	-0.538***	-0.537***
	(0.020)	(0.020)	(0.020)	(0.020)	(0.017)	(0.017)	(0.017)	(0.017)
Honeymoon	0.038***	0.039***	0.039***	0.039***	0.034***	0.035***	0.035***	0.035***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Independent party	-0.067***	-0.066***	-0.065***	-0.065***	-0.061***	-0.060***	-0.059***	-0.059***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
CRS [0; 1]	0.069**	0.073***	0.071**	0.071**	0.034	0.037*	0.036	0.036
	(0.028)	(0.028)	(0.028)	(0.028)	(0.022)	(0.022)	(0.022)	(0.022)
Constant	0.136***	0.142***	0.123***	0.121***	0.128***	0.130***	0.115***	0.113***
	(0.013)	(0.013)	(0.011)	(0.011)	(0.011)	(0.011)	(0.010)	(0.010)
Observations	21,669	21,564	21,501	21,499	29,901	29,786	29,713	29,711
R-squared	0.759	0.760	0.760	0.761	0.752	0.753	0.753	0.753
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (5.1) using Full_EGF sample during September 2000 to July 2017. $Govsup_{it+s}$: the dependent variable is the level of support for government of country *i* aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where *Attack* is observed on date t = 0. *Attack* is either *Attack-I, Attack-1K, Attack-3K, or Attack-5K* for estimations on terrorist attacks that results in only injured people, at least one, three, or five people killed respectively. All control variables are defined in Appendix 5.1. In each time window, Eq. (5.1) is run separately for sub-samples by level of fatalities. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level respectively.

Table 5.9 FEM. Full sample excluding Germany and France – repeated attacks

Time window	[0; 1]	[0; 3]	[0; 7]	[0; 14]	[0; 30]
	(1)	(2)	(3)	(4)	(5)
Panel A: controlling for repeated attack within a month					
Attack_m	0.006	0.015***	0.020***	0.020***	0.024***
	(0.007)	(0.005)	(0.004)	(0.004)	(0.004)
Panel B: controlling for repeated attack within 3 months					
Attack_3m	0.005	0.014***	0.015***	0.016***	0.020***
	(0.006)	(0.004)	(0.004)	(0.003)	(0.003)
Panel C: controlling for repeated attack within a year					
Attack_y	0.002	0.010**	0.010***	0.012***	0.016***
	(0.005)	(0.004)	(0.003)	(0.003)	(0.003)
Controls	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (5.1) using full sample excluding Germany and France during September 2000 to July 2017. $Govsup_{it+s}$: the dependent variable is the level of support for government of country *i* aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where *Attack* is observed on date t = 0. *Attack* takes value of 1 if country *i* was attacked on the attack day *t* which results in at least one person injured or killed, and 0 on non-attacked days. Panels A, B, and C present estimations on the sample using attacks that are repeated within a month, 3 months, and a year (*Attack_m*, *Attack_3m*, and *Attack_y*). All control variables are defined in Appendix 5.1. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level respectively.

Table 5.10 PSM. Full sample excluding Germany and France. [0; 14] time window. Match on the same event date.

Panel A:	**Covariate balance test between the treated and the matched sample**						
Variable	Sample	Mean		%bias	%reduct |bias|	t-test	
		Treated	Control			t	p>|t|
Inflation	Unmatched	0.02	0.02	5.40		0.78	0.43
	Matched	0.02	0.02	5.30	2.30	0.47	0.64
Unemployment	Unmatched	0.09	0.10	-10.30		-1.63	0.10
	Matched	0.09	0.09	1.40	86.70	0.13	0.90
Honeymoon	Unmatched	0.05	0.08	-11.80		-1.68	0.09
	Matched	0.06	0.10	-14.10	-19.30	-1.08	0.28
Independent party	Unmatched	0.02	0.04	-12.30		-1.65	0.10
	Matched	0.03	0.05	-17.20	-39.90	-1.18	0.24
GDP per capita growth	Unmatched	0.01	0.01	-6.80		-1.03	0.30
	Matched	0.00	0.01	-6.40	6.20	-0.57	0.57
Unemployment change	Unmatched	-0.01	0.04	-26.90		-4.03	0.00
	Matched	0.01	0.02	-2.70	90.10	-0.23	0.82
Inflation change	Unmatched	0.35	8.59	-8.80		-0.98	0.33
	Matched	0.39	-0.06	0.50	94.50	1.06	0.29
Sovereign credit rating	Unmatched	44.65	38.85	49.20		8.04	0.00
	Matched	43.79	42.48	11.20	77.30	1.00	0.32
Polity IV	Unmatched	9.80	9.79	3.50		0.63	0.53
	Matched	9.75	9.80	-9.30	-167.00	-0.75	0.46
Panel B:	**Overall covariance balance test**						
Sample	Pseudo R^2	LR chi^2	$p>chi^2$	Mean Bias			
Unmatched	0.06	166.17	0.00	15.00			
Matched	0.02	8.86	0.45	7.50			
Panel C:	**ATT**						
	Treated	Controls	Difference	S.E.	T-stat		
Unmatched	0.346	0.263	0.083	0.006	13.31***		
ATT	0.327	0.231	0.096	0.010	9.93***		
	No. of obs.						
	Off support	On support	Total				
Untreated	0	21368	21368				
Treated	102	147	249				
Total	102	21515	21617				

Table 5.10 (continued)

Panel D: FEM	
VARIABLES	[0; 14]
Attack	0.072***
	(0.013)
GDP per capita	0.005**
	(0.002)
Inflation	-1.012***
	(0.289)
Unemployment	-0.690***
	(0.160)
Honeymoon	0.007
	(0.013)
Independent party	-0.086**
	(0.035)
CRS[0; 1]	-0.081
	(0.172)
Constant	0.142
	(0.095)
Observations	294
R-squared	0.787
Country FE	YES
Year FE	YES

The table presents results of three balancing tests performed directly after the PSM, ATT, and FEM results using Full_EGF sample during September 2000 to July 2017. Match on the same event date and the pre-treatment country characteristics as described in Appendix 5.2 using one-to-one NNM with replacement. Caliper does not exceed 1% in absolute value. Panel A presents the balance test results for the treated and the matched sample on all the covariates. Panel B presents the overall covariates balance tests results. Panel C reports the average treatment effect on the treated country's government support by ATT 14 days after attacks. Panel D reports the result of Eq. (5.1) for the matched sample. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Table 5.11 PSM. Full sample excluding Germany and France. [0; 30] time window. Match on the same event date.

Panel A:	**Covariate balance test between the treated and the matched sample**						
Variable	Sample	Mean		%bias	%reduct |bias|	t-test	
		Treated	Control			t	p>|t|
Inflation	Unmatched	0.02	0.02	0.60		0.10	0.92
	Matched	0.02	0.02	4.00	-530.00	0.36	0.72
Unemployment	Unmatched	0.10	0.10	-3.90		-0.67	0.50
	Matched	0.09	0.09	-1.40	64.70	-0.13	0.90
Honeymoon	Unmatched	0.06	0.08	-9.50		-1.47	0.14
	Matched	0.06	0.09	-9.20	3.30	-0.81	0.42
Independent party	Unmatched	0.02	0.03	-10.80		-1.58	0.12
	Matched	0.02	0.02	0.00	100.00	0.00	1.00
GDP per capita growth	Unmatched	0.01	0.01	-3.40		-0.54	0.59
	Matched	0.01	0.01	-3.30	1.80	-0.31	0.75
Unemployment change	Unmatched	-0.01	0.04	-24.80		-3.81	0.00
	Matched	0.01	0.03	-7.50	69.90	-0.70	0.49
Inflation change	Unmatched	0.20	13.39	-11.40		-1.35	0.18
	Matched	0.18	-0.49	0.60	94.90	1.30	0.20
Sovereign credit rating	Unmatched	44.46	38.77	48.70		8.60	0.00
	Matched	43.87	42.10	15.20	68.70	1.50	0.14
Polity IV	Unmatched	9.82	9.74	14.60		2.65	0.01
	Matched	9.78	9.79	-2.20	84.70	-0.21	0.84
Panel B:	**Overall covariance balance test**						
Sample	Pseudo R^2	LR chi^2	$p>chi^2$	Mean Bias			
Unmatched	0.06	175.63	0.00	14.20			
Matched	0.02	11.16	0.27	4.80			
Panel C:	**ATT**						
	Treated	Controls	Difference	S.E.	T-stat		
Unmatched	0.348	0.262	0.086	0.006	14.72***		
ATT	0.334	0.226	0.109	0.009	12.47***		
	No. of obs.						
	Off support	On support	Total				
Untreated	0	29461	29461				
Treated	110	173	283				
Total	110	29634	29744				

Table 5.11 (continued)

Panel D: FEM	
VARIABLES	[0; 30]
Attack	0.019**
	(0.010)
GDP per capita	0.004***
	(0.001)
Inflation	-1.286***
	(0.227)
Unemployment	-0.815***
	(0.120)
Honeymoon	0.012
	(0.012)
Independent party	-0.078***
	(0.026)
CRS[0; 1]	-0.186
	(0.137)
Constant	0.141***
	(0.042)
Observations	346
R-squared	0.836
Country FE	YES
Year FE	YES

The table presents results of three balancing tests performed directly after the PSM, ATT, and FEM results using Full_EGF sample during September 2000 to July 2017. Match on the same event date and the pre-treatment country characteristics as described in Appendix 5.2 using one-to-one NNM with replacement. Caliper does not exceed 1% in absolute value. Panel A presents the balance test results for the treated and the matched sample on all the covariates. Panel B presents the overall covariates balance tests results. Panel C reports the average treatment effect on the treated country's government support by ATT 30 days after attacks. Panel D reports the result of Eq. (5.1) for the matched sample. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Table 5.12 PSM. Full sample excluding Germany and France. [0; 30] time window. Match in the same event week

Panel A:	**Covariate balance test between the treated and the matched sample**						
Variable	Sample	Mean		%bias	%reduct |bias|	t-test	
		Treated	Control			t	p>|t|
Inflation	Unmatched	0.02	0.02	0.60		0.10	0.92
	Matched	0.02	0.02	2.40	-274.40	0.26	0.79
Unemployment	Unmatched	0.10	0.10	-3.90		-0.67	0.50
	Matched	0.09	0.09	-3.70	5.70	-0.41	0.68
Honeymoon	Unmatched	0.06	0.08	-9.50		-1.47	0.14
	Matched	0.06	0.07	-1.60	83.10	-0.18	0.86
Independent party	Unmatched	0.02	0.03	-10.80		-1.58	0.12
	Matched	0.02	0.03	-5.10	53.00	-0.58	0.56
GDP per capita growth	Unmatched	0.01	0.01	-3.40		-0.54	0.59
	Matched	0.01	0.01	-9.20	-173.00	-1.03	0.30
Unemployment change	Unmatched	-0.01	0.04	-24.80		-3.81	0.00
	Matched	0.01	0.03	-6.60	73.40	-0.75	0.45
Inflation change	Unmatched	0.20	13.39	-11.40		-1.35	0.18
	Matched	0.19	7.64	-6.40	43.50	-0.94	0.35
Sovereign credit rating	Unmatched	44.46	38.77	48.70		8.60	0.00
	Matched	43.90	42.38	13.00	73.40	1.51	0.13
Polity IV	Unmatched	9.82	9.74	14.60		2.65	0.01
	Matched	9.80	9.82	-4.70	67.80	-0.54	0.59
Panel B:	**Overall covariance balance test**						
Sample	Pseudo R^2	LR chi^2	$p>chi^2$	Mean Bias			
Unmatched	0.06	175.63	0.00	14.20			
Matched	0.02	14.27	0.11	5.80			
Panel C:	**ATT**						
	Treated	Controls	Difference	S.E.	T-stat		
Unmatched	0.348	0.262	0.086	0.006	14.72***		
ATT	0.337	0.224	0.113	0.008	14.04***		
	No. of obs.						
	Off support	On support	Total				
Untreated	0	29461	29461				
Treated	36	247	283				
Total	36	29708	29744				

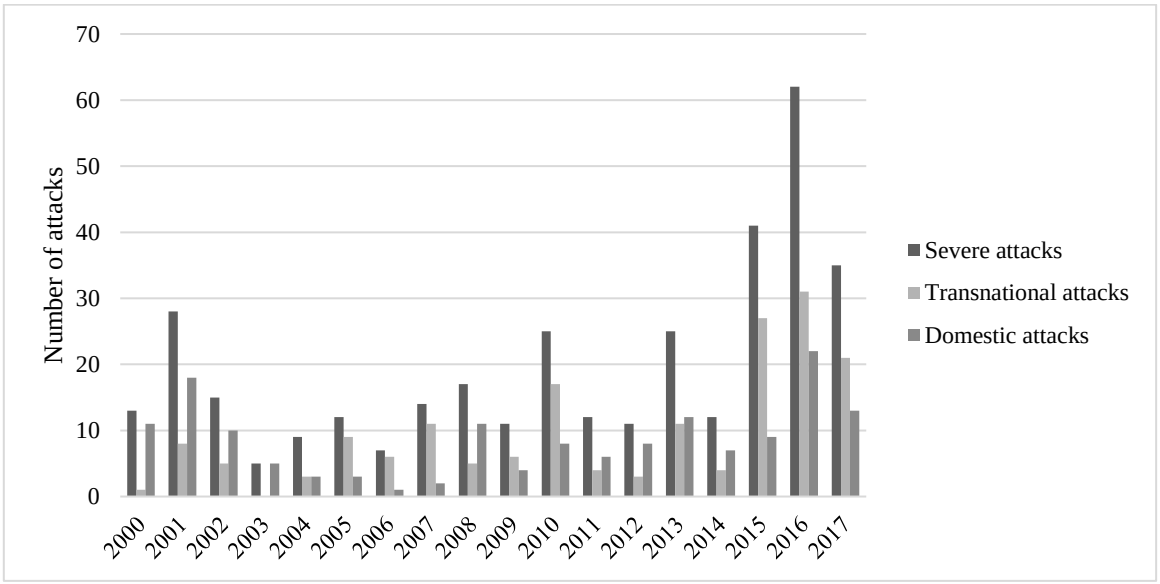
Table 5.12 (continued)

Panel D: FEM	
VARIABLES	[0; 30]
Attack	0.015**
	(0.007)
GDP per capita	0.000
	(0.001)
Inflation	-1.452***
	(0.206)
Unemployment	-1.020***
	(0.102)
Honeymoon	0.005
	(0.009)
Independent party	-0.079***
	(0.025)
CRS[0; 1]	-0.013
	(0.144)
Constant	0.361***
	(0.048)
Observations	494
R-squared	0.844
Country FE	YES
Year FE	YES

The table presents results of three balancing tests performed directly after the PSM, ATT, and FEM results using Full_EGF sample during September 2000 to July 2017. Match in the same event week and the pre-treatment country characteristics as described in Appendix 5.2 using one-to-one NNM with replacement. Caliper does not exceed 1% in absolute value. Panel A presents the balance test results for the treated and the matched sample on all the covariates. Panel B presents the overall covariates balance tests results. Panel C reports the average treatment effect on the treated country's government support by ATT 30 days after attacks. Panel D reports the result of Eq. (5.1) for the matched sample. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Figures

Figure 5.1 Terrorist attacks per year from 2000 to 2017



This figure presents number of severe attacks from 21/09/2000 to 28/07/2017 for 19 EU countries that have polling data available within 30 days after event date. The attacks are divided into two types: transnational and domestic attacks.

Appendices

Appendix 5.1 FEM. Control variables

Variables	Expected sign	Definition (Source)
GDP per capita	+	Yearly GDP per capita scaled by 1,000 in year t-1 (World Bank)
Inflation	+/-	Yearly inflation, consumer prices in year t-1 (World Bank)
Unemployment	-	Yearly national unemployment rate (% of total labour force) in year t-1 (World Bank)
Honeymoon	+	Time in office at time t. A dummy variable equals to 1 in the quarter when a new president/ prime minister first sitting in the office, and 0 otherwise (Multiple sources, including https://www.parlament.gv.at/WWER/PAD_02941/index.shtml https://www.gov.uk/government/ministers/prime-minister https://www.government.se/government-of-sweden/prime-ministers-office/stefan-lofven/cv-stefan-lofven/ , etc)
Independent party	-	A dummy variable equals to 1 if the government is led by independent candidate and 0 otherwise at time t (Multiple sources, including https://www.britannica.com/biography/Mario-Monti and https://howlingpixel.com/i-en/Tihomir_Orešković, etc.)
CRS [0; 1]	+	Cumulative returns spread of country *i* for the event day *t=0* within two-day window [0; 1] and employing Eurostoxx benchmark index (Abad et al., 2018) (Thomson Reuters Eikon). $CRS_{it} = \ln(\frac{Idx_t^i}{Idx_{t-1}^i}) + \ln(\frac{Idx_{t+1}^i}{Idx_t^i}) - \ln(\frac{Idx_t^M}{Idx_{t-1}^M}) - \ln(\frac{Idx_{t+1}^M}{Idx_t^M})$

Appendix 5.2 PSM. Pre-treatment variables

Variables	Definition (Source)
GDP per capita	Yearly GDP per capita scaled by 1,000 in year t-1 (World Bank)
Inflation	Yearly inflation, consumer prices in year t-1 (World Bank)
Unemployment	Yearly national unemployment rate (% of total labour force) in year t-1 (World Bank)
Honeymoon	Time in office at time t. A dummy variable equals to 1 in the quarter when a new president/ prime minister first sitting in the office, and 0 otherwise (Multiple sources, including https://www.parlament.gv.at/WWER/PAD_02941/index.shtml https://www.gov.uk/government/ministers/prime-minister https://www.government.se/government-of-sweden/prime-ministers-office/stefan-lofven/cv-stefan-lofven/ , etc)
Independent party	A dummy variable equals to 1 if the government is led by independent candidate and 0 otherwise at time t (Multiple sources, including https://www.britannica.com/biography/Mario-Monti and https://howlingpixel.com/i-en/Tihomir_Orešković, etc.)
GDP per capita growth	Yearly GDP per capita growth at time t-1 (World Bank)
Unemployment change	One-year percentage change of unemployment rate in year t-1 (Calculate)
Inflation change	One-year percentage change of inflation rate in year t-1 (Calculate)
Sovereign credit rating	Average sovereign credit rating at time t-1 of three CRAs: S&P, Moody's, and Fitch based on 52-point scale (S&P, Moody's, and Fitch)
Polity IV	Yearly democracy variable, which is a 21-point indicator ranging from least democracy (–10) to most democracy (+10) (Centre for Systemic Peace)

Appendix 5.3 Summary statistics for national stock market indices

Country	Index	Mean	SD	Min	Max
Austria	ATX	-0.0005	0.0100	-0.0415	0.0524
Belgium	BFX	0.0001	0.0054	-0.0157	0.0210
Bulgaria	SOFIX	0.0013	0.0161	-0.0591	0.0721
Croatia	CRBEX	-0.0008	0.0169	-0.0748	0.0964
Cyprus	CYMAIN	-0.0031	0.0241	-0.0832	0.0517
Czech	PX	-0.0006	0.0129	-0.0523	0.0554
Denmark	OMXC20	0.0010	0.0126	-0.0701	0.0494
Estonia	OMXTGI	0.0003	0.0199	-0.0920	0.1258
Finland	OMXH25	0.0002	0.0091	-0.0623	0.0520
France	FCHI	-0.0002	0.0034	-0.0124	0.0101
Germany	GDAXI	0.0005	0.0062	-0.0354	0.0412
Greece	ATG	-0.0052	0.0342	-0.1251	0.1105
Hungary	BUX	0.0003	0.0159	-0.0741	0.0567
Ireland	ISEQ	0.0004	0.0163	-0.0899	0.0859
Italy	FTMIB	-0.0001	0.0106	-0.0678	0.0371
Latvia	OMXRGI	0.0004	0.0180	-0.0464	0.0499
Lithuania	OMXVGI	0.0007	0.0179	-0.0561	0.0483
Malta	MSE	-0.0001	0.0177	-0.0477	0.0649
Netherlands	AEX	0.0001	0.0056	-0.0263	0.0256
Poland	WIG	0.0006	0.0163	-0.0997	0.0765
Portugal	PSI20	-0.0004	0.0136	-0.0631	0.0587
Romania	BETI	-0.0016	0.0205	-0.1046	0.0844
Slovakia	SAX	-0.0007	0.0221	-0.0648	0.0839
Slovenia	SBITOP	-0.0002	0.0214	-0.0900	0.1043
Spain	IBEX	-0.0004	0.0097	-0.0501	0.0554
Sweden	OMXS30	-0.0001	0.0084	-0.0662	0.0428
UK	FTSE	-0.0001	0.0231	-0.0758	0.0993

This Table presents the country stock market indices along with descriptive statistics of the 2-day event cumulative log return spread during September 2000 to July 2017 for each country that have polling data available within 30 days after event date *t*.

Appendix 5.4 Summary statistics. Full sample.

Panel A: Summary statistics for full sample within different time window										
	[0; 1] (Obs. =5790)		**[0; 3]** (Obs. =11214)		**[0; 7]** (Obs. =17518)		**[0; 14]** (Obs. = 24285)		**[0; 30]** (Obs. =32617)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Dependent variables										
Govsup	0.269	0.096	0.277	0.097	0.276	0.098	0.274	0.099	0.271	0.099
Control variables										
GDP per capita	37.761	8.374	36.016	8.859	34.113	9.440	32.993	9.523	32.175	9.347
Inflation	0.016	0.013	0.016	0.015	0.017	0.016	0.018	0.018	0.019	0.019
Unemployment	0.084	0.043	0.090	0.046	0.094	0.047	0.096	0.047	0.095	0.046
Honeymoon	0.050	0.218	0.055	0.229	0.064	0.244	0.069	0.254	0.074	0.262
Independent party	0.026	0.158	0.026	0.160	0.029	0.169	0.031	0.174	0.032	0.175
CRS [0; 1]	0.000	0.011	0.000	0.012	0.000	0.013	0.000	0.014	0.000	0.015
Panel B: Comparing sample means for treatment and control groups within different time window										
	[0; 1]		**[0; 3]**		**[0; 7]**		**[0; 14]**		**[0; 30]**	
	Treatment (Obs.=98)	Control (Obs.=5692)	Treatment (Obs.=175)	Control (Obs.=11039)	Treatment (Obs.= 256)	Control (Obs. = 17262)	Treatment (Obs. =307)	Control (Obs.=23978)	Treatment (Obs.=354)	Control (Obs. =32263)
Dependent variables										
Govsup	0.329***	0.268	0.339***	0.276	0.338***	0.275	0.339***	0.273	0.335***	0.271
Control variables										
GDP per capita	37.009	37.774	36.999	36.000	36.551***	34.077	36.137***	32.953	35.888***	32.134
Inflation	0.017	0.016	0.017	0.016	0.016	0.017	0.017	0.018	0.017*	0.020
Unemployment	0.089	0.084	0.085	0.090	0.088**	0.094	0.090**	0.096	0.093	0.095
Honeymoon	0.031	0.051	0.029	0.056	0.035*	0.064	0.039**	0.070	0.045**	0.074
Independent party	0.02	0.026	0.017	0.026	0.016	0.029	0.013*	0.032	0.014*	0.032
CRS [0; 1]	-0.002**	0.001	-0.001	0.000	-0.002*	0.000	-0.002*	0.000	-0.002**	0.000

This table presents summary statistics for the main variables in the regression models using full sample. *Govsup* is the level of support for the incumbent party which is aggregated by taking average of polls within different time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30]. All control variables are defined in Appendix 5.1. Panel A reports the summary statistic for full sample. Panel B reports univariate results comparing the mean values of variables in treatment and control groups across time window. In each time window, the column labelled Treatment presents the mean values of variables for countries affected by attacks and the column labelled Control presents those of countries not affected by attack. *, **, and *** in the column labelled Treatment indicate significance at the 10%, 5%, and 1% levels respectively for a *t-test* of whether two samples have equal means.

Appendix 5.5 FEM. Full sample – by type of attacks

	[0; 1]		[0; 3]		[0; 7]		[0; 14]		[0; 30]	
VARIABLES	Trans-national attacks (1)	Domestic attacks (2)	Trans-national attacks (3)	Domestic attacks (4)	Trans-national attacks (5)	Domestic attacks (6)	Trans-national attacks (7)	Domestic attacks (8)	Trans-national attacks (9)	Domestic attacks (10)
Attack	-0.003	0.016*	0.015**	0.015**	0.016***	0.028***	0.018***	0.037***	0.023***	0.042***
	(0.007)	(0.009)	(0.006)	(0.008)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
GDP per capita	0.003***	0.003***	0.003***	0.003***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.163	-0.199	-0.064	-0.093	0.033	-0.017	0.026	-0.018	0.029	-0.007
	(0.124)	(0.122)	(0.077)	(0.077)	(0.055)	(0.055)	(0.045)	(0.045)	(0.038)	(0.037)
Unemployment	-0.688***	-0.679***	-0.655***	-0.651***	-0.595***	-0.590***	-0.590***	-0.586***	-0.557***	-0.555***
	(0.054)	(0.054)	(0.035)	(0.035)	(0.025)	(0.025)	(0.020)	(0.020)	(0.017)	(0.017)
Honeymoon	0.036***	0.036***	0.035***	0.035***	0.038***	0.037***	0.038***	0.037***	0.034***	0.034***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Independent party	-0.127***	-0.128***	-0.101***	-0.103***	-0.077***	-0.079***	-0.065***	-0.066***	-0.059***	-0.060***
	(0.009)	(0.009)	(0.007)	(0.007)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
CRS [0; 1]	0.058	0.065	0.146***	0.143***	0.096***	0.088**	0.076***	0.072***	0.041*	0.037*
	(0.063)	(0.064)	(0.044)	(0.044)	(0.034)	(0.034)	(0.027)	(0.028)	(0.022)	(0.022)
Constant	0.245***	0.250***	0.185***	0.196***	0.152***	0.163***	0.149***	0.160***	0.135***	0.146***
	(0.030)	(0.029)	(0.025)	(0.024)	(0.018)	(0.018)	(0.015)	(0.014)	(0.013)	(0.012)
Observations	5,752	5,722	11,141	11,099	17,398	17,362	24,135	24,104	32,435	32,416
R-squared	0.831	0.831	0.797	0.797	0.769	0.769	0.761	0.761	0.755	0.754
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (5.1) using full sample during September 2000 to July 2017. $Govsup_{it+s}$: the dependent variable is the level of support for government of country *i* aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where *Attack* is observed on date t = 0. *Attack* takes value of 1 one if country *i* was attacked on the attack day *t* which results in at least one person injured or killed, and 0 on non-attacked days. All control variables are defined in Appendix 5.1. In each time window, Eq. (5.1) is run separately for the sample of transnational and domestic attacks. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level respectively.

Appendix 5.6 FEM. Full sample – by level of fatalities

	[0; 1]				[0; 3]				[0; 7]			
VARIABLES	Only injured (1)	At least 1 person killed (2)	At least 3 people killed (3)	At least 5 people killed (4)	Only injured (5)	At least 1 person killed (6)	At least 3 people killed (7)	At least 5 people killed (8)	Only injured (9)	At least 1 person killed (10)	At least 3 people killed (11)	At least 5 people killed (12)
Attack	0.007	-0.001	0.036	0.037	0.017***	0.008	0.025	0.019	0.020***	0.026***	0.039**	0.045**
	(0.007)	(0.009)	(0.030)	(0.039)	(0.006)	(0.007)	(0.021)	(0.028)	(0.005)	(0.007)	(0.017)	(0.021)
GDP per capita	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.002***	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.186	-0.169	-0.158	-0.158	-0.095	-0.066	-0.048	-0.046	-0.006	0.008	0.042	0.044
	(0.123)	(0.124)	(0.123)	(0.123)	(0.077)	(0.077)	(0.076)	(0.076)	(0.055)	(0.055)	(0.055)	(0.055)
Unemployment	-0.677***	-0.696***	-0.685***	-0.685***	-0.652***	-0.658***	-0.654***	-0.653***	-0.593***	-0.595***	-0.592***	-0.592***
	(0.053)	(0.054)	(0.055)	(0.055)	(0.034)	(0.035)	(0.035)	(0.035)	(0.025)	(0.025)	(0.025)	(0.025)
Honeymoon	0.036***	0.036***	0.036***	0.036***	0.035***	0.035***	0.035***	0.035***	0.037***	0.038***	0.038***	0.038***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Independent party	-0.128***	-0.127***	-0.126***	-0.126***	-0.103***	-0.102***	-0.101***	-0.101***	-0.079***	-0.078***	-0.077***	-0.077***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.007)	(0.007)	(0.007)	(0.007)	(0.005)	(0.005)	(0.005)	(0.005)
CRS [0; 1]	0.056	0.064	0.069	0.069	0.142***	0.147***	0.150***	0.150***	0.089***	0.096***	0.097***	0.097***
	(0.064)	(0.064)	(0.064)	(0.064)	(0.044)	(0.044)	(0.044)	(0.044)	(0.034)	(0.034)	(0.034)	(0.034)
Constant	0.248***	0.254***	0.245***	0.245***	0.192***	0.194***	0.188***	0.185***	0.158***	0.162***	0.153***	0.151***
	(0.029)	(0.029)	(0.030)	(0.030)	(0.024)	(0.024)	(0.024)	(0.025)	(0.018)	(0.018)	(0.018)	(0.018)
Observations	5,754	5,728	5,696	5,695	11,161	11,092	11,048	11,045	17,437	17,343	17,275	17,270
R-squared	0.831	0.831	0.832	0.832	0.796	0.798	0.798	0.798	0.768	0.769	0.770	0.770
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Appendix 5.6 (continued)

	[0; 14]				[0; 30]			
VARIABLES	Only injured (13)	At least 1 person killed (14)	At least 3 people killed (15)	At least 5 people killed (16)	Only injured (17)	At least 1 person killed (18)	At least 3 people killed (19)	At least 5 people killed (20)
Attack	0.024***	0.034***	0.039**	0.042**	0.029***	0.037***	0.037**	0.038**
	(0.005)	(0.007)	(0.016)	(0.018)	(0.005)	(0.006)	(0.015)	(0.015)
GDP per capita	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.006	0.002	0.039	0.041	0.000	0.010	0.043	0.045
	(0.045)	(0.045)	(0.045)	(0.045)	(0.038)	(0.038)	(0.038)	(0.038)
Unemployment	-0.590***	-0.592***	-0.588***	-0.588***	-0.559***	-0.559***	-0.555***	-0.554***
	(0.020)	(0.020)	(0.020)	(0.020)	(0.017)	(0.017)	(0.017)	(0.017)
Honeymoon	0.037***	0.038***	0.038***	0.038***	0.034***	0.034***	0.034***	0.034***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Independent party	-0.066***	-0.065***	-0.064***	-0.064***	-0.060***	-0.059***	-0.059***	-0.059***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
CRS [0; 1]	0.073***	0.077***	0.077***	0.077***	0.039*	0.041*	0.041*	0.042*
	(0.028)	(0.028)	(0.028)	(0.028)	(0.022)	(0.022)	(0.022)	(0.022)
Constant	0.155***	0.159***	0.147***	0.146***	0.143***	0.144***	0.134***	0.132***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.013)	(0.013)	(0.012)	(0.012)
Observations	24,188	24,075	23,993	23,988	32,502	32,378	32,282	32,277
R-squared	0.761	0.761	0.762	0.762	0.754	0.755	0.755	0.755
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (5.1) using full sample during September 2000 to July 2017. $Govsup_{it+s}$: the dependent variable is the level of support for government of country *i* aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where *Attack* is observed on date t = 0. *Attack* is either *Attack-I, Attack-1K, Attack-3K, or Attack-5K* for estimations on terrorist attacks that results in only injured people, at least one, three, or five people killed respectively. All control variables are defined in Appendix 5.1. In each time window, Eq. (5.1) is run separately for sub-samples by level of fatalities. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level respectively.

Appendix 5.7 FEM. Full sample excluding GIIPS

VARIABLES	[0; 1]	[0; 3]	[0; 7]	[0; 14]	[0; 30]
	(1)	(2)	(3)	(4)	(5)
Attack	-0.007	0.005	0.009**	0.009**	0.011**
	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)
GDP per capita	0.007***	0.009***	0.010***	0.010***	0.010***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Inflation	-0.108	-0.098	-0.040	-0.030	-0.028
	(0.154)	(0.087)	(0.063)	(0.053)	(0.046)
Unemployment	-0.600***	-0.406***	-0.198***	-0.138***	-0.076**
	(0.130)	(0.081)	(0.055)	(0.043)	(0.034)
Honeymoon	0.034***	0.030***	0.035***	0.036***	0.032***
	(0.004)	(0.003)	(0.002)	(0.002)	(0.001)
Independent party	-0.031*	-0.027***	-0.034***	-0.036***	-0.041***
	(0.017)	(0.010)	(0.007)	(0.005)	(0.004)
CRS [0; 1]	0.049	0.162***	0.102***	0.071**	0.045*
	(0.071)	(0.049)	(0.038)	(0.031)	(0.025)
Constant	0.088	-0.063	-0.146***	-0.180***	-0.206***
	(0.083)	(0.057)	(0.039)	(0.032)	(0.027)
Observations	4,743	8,984	13,790	18,906	25,395
R-squared	0.852	0.815	0.778	0.764	0.752
Country FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (5.1) using full sample excluding GIIPS during September 2000 to July 2017. $Govsup_{it+s}$: the dependent variable is the level of support for government of country *i* aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where *Attack* is observed on date t = 0. *Attack* takes value of 1 if country *i* was attacked on the attack day *t* which results in at least one person injured or killed, and 0 on non-attacked days. All control variables are defined in Appendix 5.1. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level respectively.

Appendix 5.8 FEM. Robustness test – Full sample

Time window	[0; 1]	[0; 3]	[0; 7]	[0; 14]	[0; 30]
	(1)	(2)	(3)	(4)	(5)
Panel A: controlling for the number of opposing parties					
Attack	0.003	0.013***	0.021***	0.027***	0.030***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
Panel B: controlling for coalition government					
Attack	0.003	0.013***	0.021***	0.027***	0.032***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
Panel C: controlling for ideology					
Attack	0.003	0.013***	0.021***	0.027***	0.030***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
Panel D: controlling for repeated attack within a month					
Attack_m	-0.003	0.008*	0.013***	0.014***	0.016***
	(0.006)	(0.004)	(0.004)	(0.003)	(0.003)
Panel E: controlling for repeated attack within 3 months					
Attack_3m	-0.006	0.004	0.007**	0.009***	0.010***
	(0.005)	(0.004)	(0.003)	(0.003)	(0.003)
Panel F: controlling for repeated attack within a year					
Attack_y	-0.004	0.005	0.005*	0.007**	0.009***
	(0.005)	(0.004)	(0.003)	(0.003)	(0.003)
Controls	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (5.1) using full sample during September 2000 to July 2017. $Govsup_{it+s}$: the dependent variable is the level of support for government of country *i* aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where *Attack* is observed on date t = 0. *Attack* takes value of 1 if country *i* was attacked on the attack day *t* which results in at least one person injured or killed, and 0 on non-attacked days. Panel A, B, and C presents estimations controlling for different political variables, including the number of opposing parties, coalition government, and ideology, respectively. Panel D, E, and F presents estimations on the sample using attacks that are repeated within a month, 3 months, and a year (*Attack_m*, *Attack_3m*, and *Attack_y*). All control variables are defined in Appendix 5.1. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level respectively.

Appendix 5.9 FEM. Robustness test – Full sample excluding Germany and France

Time window	[0; 1]	[0; 3]	[0; 7]	[0; 14]	[0; 30]
	(1)	(2)	(3)	(4)	(5)
Panel A: controlling for the number of opposing parties					
Attack	0.022***	0.032***	0.035***	0.041***	0.046***
	(0.007)	(0.006)	(0.005)	(0.005)	(0.004)
Panel B: controlling for coalition government					
Attack	0.021***	0.031***	0.034***	0.041***	0.048***
	(0.007)	(0.006)	(0.005)	(0.005)	(0.005)
Panel C: controlling for ideology					
Attack	0.021***	0.032***	0.035***	0.041***	0.047***
	(0.007)	(0.006)	(0.005)	(0.005)	(0.004)
Controls	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (5.1) using full sample excluding Germany and France during September 2000 to July 2017. $Govsup_{it+s}$: the dependent variable is the level of support for government of country *i* aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where *Attack* is observed on date t = 0. *Attack* takes value of 1 if country *i* was attacked on the attack day *t* which results in at least one person injured or killed, and 0 on non-attacked days. Panels A, B, and C present estimations controlling for different. All control variables are defined in Appendix 5.1. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level respectively.

Appendix 5.10 FEM. Robustness test. Sub-samples by level of support.

Time window	[0; 1]	[0; 3]	[0; 7]	[0; 14]	[0; 30]
	(1)	(2)	(3)	(4)	(5)
Panel A: High government support					
Attack	0.001	0.012***	0.021***	0.028***	0.035***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
Panel B: Low government support					
Attack	-0.008	0.009	0.001	0.002	0.003
	(0.022)	(0.027)	(0.021)	(0.017)	(0.011)
Controls	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (5.1) using full sample during September 2000 to July 2017, which is divided into High and Low government support groups. $Govsup_{it+s}$: the dependent variable is the level of support for government of country *i* aggregated by taking average of polling results for the incumbent party in the following time window [0; 1], [0; 3], [0; 7], [0; 14], and [0; 30] where *Attack* is observed on date t = 0. *Attack* takes value of 1 if country *i* was attacked on the attack day *t* which results in at least one person injured or killed, and 0 on non-attacked days. Panels A and B presents estimations for the countries with high and low average government support, respectively. All control variables are defined in Appendix 5.1. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level respectively.

Note: Countries that have low average of government support (less than 20%): Czech, France, Latvia, Lithuania, Netherlands, and Slovenia. Countries that have high average of government support consists of the remaining countries.

Appendix 5.11 PSM. Full sample. [0; 14] time window. Match on the same event date.

Panel A:	**Covariate balance test between the treated and the matched sample**						
Variable	Sample	Mean		%bias	%reduct |bias|	t-test	
		Treated	Control			t	p>|t|
GDP per capita	Unmatched	36.14	32.95	40.70		5.82	0.00
	Matched	36.82	36.30	6.70	83.50	0.67	0.51
Inflation	Unmatched	0.02	0.02	-4.20		-0.67	0.50
	Matched	0.02	0.01	9.20	-122.10	1.02	0.31
Unemployment	Unmatched	0.09	0.10	-12.20		-2.11	0.04
	Matched	0.09	0.08	7.60	37.70	0.82	0.41
Honeymoon	Unmatched	0.04	0.07	-13.50		-2.09	0.04
	Matched	0.05	0.06	-7.00	48.00	-0.67	0.50
Independent party	Unmatched	0.01	0.03	-12.60		-1.86	0.06
	Matched	0.02	0.04	-10.80	14.80	-0.92	0.36
GDP per capita growth	Unmatched	0.01	0.01	-5.20		-0.85	0.40
	Matched	0.01	0.01	-1.90	64.40	-0.20	0.84
Unemployment change	Unmatched	-0.02	0.03	-25.80		-4.20	0.00
	Matched	0.00	0.01	-3.80	85.40	-0.40	0.69
Inflation change	Unmatched	0.37	7.71	-8.30		-1.02	0.31
	Matched	0.34	0.10	0.30	96.70	0.71	0.48
Sovereign credit rating	Unmatched	45.78	40.18	49.30		8.56	0.00
	Matched	45.23	44.85	3.30	93.30	0.34	0.73
Panel B:	**Overall covariance balance test**						
Sample	Pseudo R^2	LR chi^2	p>chi^2	Mean Bias			
Unmatched	0.05	159.17	0.00	19.10			
Matched	0.02	8.92	0.45	5.60			
Panel C:	**ATT**						
	Treated	Controls	Difference	S.E.	T-stat		
Unmatched	0.339	0.273	0.065	0.006	11.47***		
ATT	0.326	0.266	0.060	0.010	6.25***		
	No. of obs.						
	Off support	On support	Total				
Untreated	0	23978	23978				
Treated	118	189	307				
Total	118	24167	24285				

Appendix 5.11 (continued)

Panel D: FEM	
VARIABLES	[0; 14]
Attack	0.038***
	(0.009)
GDP per capita	0.006**
	(0.002)
Inflation	-0.734
	(0.460)
Unemployment	-0.497***
	(0.165)
Honeymoon	-0.006
	(0.015)
Independent party	-0.056*
	(0.032)
CRS[0; 1]	0.255
	(0.194)
Constant	0.199**
	(0.093)
Observations	378
R-squared	0.761
Country FE	YES
Year FE	YES

The table presents results of three balancing tests performed directly after the PSM, ATT, and FEM results using full sample during September 2000 to July 2017. Match on the same event date and the pre-treatment country characteristics as described in Appendix 5.2 using one-to-one NNM with replacement. Caliper does not exceed 1% in absolute value. Panel A presents the balance test results for the treated and the matched sample on all the covariates. Panel B presents the overall covariates balance tests results. Panel C reports the average treatment effect on the treated country's government support by ATT 14 days after attacks. Panel D reports the result of Eq. (5.1) for the matched sample. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Appendix 5.12 PSM. Full sample. [0; 30] time window. Match on the same event date.

Panel A:	**Covariate balance test between the treated and the matched sample**						
Variable	Sample	Mean		%bias	%reduct |bias|	t-test	
		Treated	Control			t	p>|t|
GDP per capita	Unmatched	35.89	32.13	48.40		7.52	0.00
	Matched	36.38	35.53	11.00	77.30	1.18	0.24
Inflation	Unmatched	0.02	0.02	-10.60		-1.79	0.07
	Matched	0.02	0.01	11.10	-5.50	1.37	0.17
Unemployment	Unmatched	0.09	0.10	-6.10		-1.15	0.25
	Matched	0.09	0.09	7.80	-27.40	0.84	0.40
Honeymoon	Unmatched	0.05	0.07	-12.30		-2.09	0.04
	Matched	0.05	0.05	1.90	84.60	0.22	0.82
Independent party	Unmatched	0.01	0.03	-11.90		-1.90	0.06
	Matched	0.02	0.01	6.00	49.20	0.82	0.41
GDP per capita growth	Unmatched	0.01	0.01	-3.40		-0.60	0.55
	Matched	0.01	0.01	1.00	72.20	0.11	0.92
Unemployment change	Unmatched	-0.01	0.03	-23.80		-3.99	0.00
	Matched	0.00	0.01	-6.00	74.70	-0.60	0.55
Inflation change	Unmatched	0.21	12.29	-10.90		-1.45	0.15
	Matched	0.12	8.81	-7.80	28.00	-0.98	0.33
Sovereign credit rating	Unmatched	45.54	39.78	51.40		9.66	0.00
	Matched	45.13	44.83	2.70	94.80	0.30	0.77
Panel B:	**Overall covariance balance test**						
Sample	Pseudo R^2	LR chi^2	$p>chi^2$	Mean Bias			
Unmatched	0.05	200.99	0.00	19.90			
Matched	0.02	14.80	0.10	6.10			
Panel C:	**ATT**						
	Treated	Controls	Difference	S.E.	T-stat		
Unmatched	0.335	0.271	0.064	0.005	12.07***		
ATT	0.322	0.255	0.067	0.009	7.43***		
	No. of obs.						
	Off support	On support	Total				
Untreated	0	32263	32263				
Treated	132	222	354				
Total	132	32485	32617				

Appendix 5.12 (continued)

Panel D: FEM	
VARIABLES	[0; 30]
Attack	0.053***
	(0.007)
GDP per capita	0.009***
	(0.002)
Inflation	-1.257***
	(0.443)
Unemployment	-0.410***
	(0.128)
Honeymoon	0.005
	(0.015)
Independent party	-0.085**
	(0.036)
CRS[0; 1]	-0.009
	(0.188)
Constant	0.073
	(0.054)
Observations	444
R-squared	0.777
Country FE	YES
Year FE	YES

The table presents results of three balancing tests performed directly after the PSM, ATT, and FEM results using full sample during September 2000 to July 2017. Match on the same event date and the pre-treatment country characteristics as described in Appendix 5.2 using one-to-one NNM with replacement. Caliper does not exceed 1% in absolute value. Panel A presents the balance test results for the treated and the matched sample on all the covariates. Panel B presents the overall covariates balance tests results. Panel C reports the average treatment effect on the treated country's government support by ATT 30 days after attacks. Panel D reports the result of Eq. (5.1) for the matched sample. ***, **, and * indicate significance at the 1%, 5% and 10% respectively.

Chapter 6 Stock markets' reactions to elections

6.1 Introduction

Political uncertainty derived from political events is a major influence on stock performance (e.g. Pástor and Veronesi, 2013; Kelly et al., 2016; Goodell et al., 2020). This link often arises because investors tend to respond to the policy uncertainty associated with the outcome of these events. Among political events, this chapter focuses on national election as the election day is known in advance and its process disseminates the policy-related information to market participants. Therefore, this Chapter investigates how election uncertainty, measured directly from opinion polls, affects stock markets in the run up to elections. In addition, this Chapter applies a new measure of 'election shock', which is the difference between the actual and expected electoral outcomes, and then examines stock markets' reactions to the 'election shock' in the post-election period.

Pástor and Veronesi (2013) argue that political uncertainty affects market uncertainty, in which political uncertainty is the uncertainty about government's future actions. Elections fit this political uncertainty notion as voters and investors are uncertain about who will be elected, and which policy will be adopted. Election uncertainty can affect market uncertainty via its impact on policy uncertainty (Goodell et al., 2020). An example of how markets react to the uncertainty around elections is the considerable increase in the CBOE Volatility index (VIX) as we are approaching the 2020 US presidential election.[105] Ablan and Wigglesworth (2020) argue that, beyond the coronavirus pandemic, the forthcoming US election presents another potential source of market uncertainty. Particularly, investors are worried about the prospect of higher taxes under a Joe Biden presidency as opinion polls in July 2020 pointing to the potential victory of Joe Biden over Donald Trump (Hodgson, 2020). Given such market uncertainty, options trading has boomed to hedge against potential shake-ups in US stock markets (Smith and Platt, 2020). Activities in put options linked to US stock markets, which offer investors protection against falling market prices, have significantly increased. As investors might have different views about what happens next, the trading volume of call options, which allow traders to benefit from a spike in turbulence, has also increased.

According to Pantzalis et al. (2000), markets should absorb election-related news and trends into stock prices in anticipation of electoral outcomes as required by informational

[105] VIX, known as the market's "fear gauge", measures market's expected volatility over the subsequent 30 days. On July 8, 2020, VIX value was nearly 28%, which is 41% above its historic average (Smith and Platt, 2020).

efficiency. If the uncertainty about forthcoming election results is reduced, stock returns and stock volatility are expected to decrease (Goodell and Vähämaa, 2013). However, despite the lower election uncertainty, stock volatility might increase if the uncertainty about the future policy increases.

Following prior studies (e.g. Goodell and Vähämaa, 2013; Kelly et al., 2016; Goodell et al., 2020), various election uncertainty indicators are used in this study. This includes: (i) the difference between the poll shares for the eventual largest party and the eventual runner up party; (ii) the success likelihood of the eventual largest party; and (iii) the likelihood of re-electing the incumbent party. The latter controls for the partisan effect of election uncertainty which assumes that investors favour the incumbent party (Goodell et al., 2020), while the two formers control for the non-partisan effect of election uncertainty (Goodell and Vähämaa, 2013) (See Section 6.3 for details). These election uncertainty indicators are calculated using polling data. Polls gauge voting intention, indicating the changes in the success likelihood of political parties prior to elections. This allows to investigate the reaction of stock markets to the potential changes in electoral prospect of political parties across time (not only on campaign period).

This Chapter not only focuses on how stock markets respond to the ex-ante uncertainty about electoral outcomes, but also examines the ex-post reaction of stock markets to electoral outcomes. Bialkowski et al. (2008) provide insights into the political, institutional, and socio-economic factors which could influence the magnitude of election shocks. However, they are unable to capture the accuracy of prediction markets prior to elections. Opinion polls as well as betting markets (e.g. Iowa Electronic Markets (IEM)) provide pre-election forecasts which proxy the market expectation of electoral outcomes. Therefore, this study uses opinion polls and expects that the difference between the actual and expected electoral outcomes might contribute to election shocks which surprise investors.

Various datasets are used in this study which cover 91 elections in 26 European countries (excluding Luxembourg and Lithuania) from January 2005 to September 2019.[106] First, polling results for the eventual largest party, the eventual runner up party, and the incumbent party of each country are hand-collected from countries' online articles and publicly available polling datasets, which provides a daily frequency for the dataset. In comparison to previous studies using vote shares at elections to measure government support, having frequent polling data facilitates the estimation of stock markets' reaction to changes in voters'

[106] Polling data is not available for Luxembourg. High and low stock prices data is not available for Lithuania. See Section 6.4.3 for more details.

preferences across time (not only on or around election period). This largely reduces endogeneity bias caused by confounding variables. While prior studies mainly use data from betting markets for a single country (e.g. Goodell and Vähämaa, 2013), this study employs a unique dataset of polling results at a multi-country level. Although betting markets seem to be a possible alternative measure of political support which also aggregate information provided by opinion polls (see Section 3.1), the data of betting markets is only available for 5 EU countries in the sample (France, Germany, Ireland, Netherlands, and the UK). Hence, it is unable to test the robustness of this study's results against prediction markets. Second, election dates and electoral outcomes are manually collected from the European Election Database, government websites, and newspapers. Third, daily stock prices are obtained from Thomson Eikon. High and low stock prices are also collected from Thomson Eikon to estimate Parkinson's (1980) intraday volatility.

The fixed-effects model (FEM) and the event study approach are employed to investigate the impact of election uncertainty and election shock on the stock markets. Using country and time FE controls for the potential confounding variables that can affect both elections and stock performance. In the empirical analysis of the election uncertainty's effect, this Chapter constructs different country sub-groups ("CORE", "GIIPS", and the remaining countries "REM")[107] to take into account the possibility that stock markets in different regions might react to the election uncertainty in various ways.

This study connects to several strands of literature. First, it contributes to the literature about the relationships among political uncertainty, policy uncertainty, and financial markets (see Bialkowski et al., 2008; Goodell and Vähämaa, 2013; Pástor and Veronesi, 2013; Kelly et al., 2016; Goodell et al., 2020). For example, Pástor and Veronesi (2013) find that both stock price volatility and the risk premium increase before a change in policy regimes. Kelly et al. (2016) find a significant relationship between policy uncertainty and financial market valuation and price volatility. Contributing to this strand of literature, the results of this Chapter show that the election uncertainty and election shock tend to move stock volatility, but not stock return (except for CORE group). The results are broadly consistent with the findings of Gemmill (1992), Li and Born (2006), Bialkowski et al. (2008), Goodell and Vähämaa (2013), and Kelly et al. (2016), who reveal that elections are associated with periods of increased volatility. In addition, Li and Born (2006) find that stock returns tend to increase when there is a higher uncertainty about electoral outcomes. This study also extends the work of Goodell and

[107] "GIIPS" represents Greece, Ireland, Italy, Portugal, and Spain, which are the most affected countries during the sovereign debt crisis. "CORE" represents core eurozone economies including Austria, Belgium, Finland, France, Germany, and Netherlands. "REM" includes the remaining countries.

Vähämaa (2013) and Goodell et al. (2020), by examining the relationship between the election uncertainty and market uncertainty. They use data from betting markets to calculate the election uncertainty for a single country (US). In comparison, this study measures the election uncertainty directly from polling results for European countries which have different political systems. Second, this study contributes to the strand of literature on the determinants of election shocks (see Pantzalis et al., 2000; Bialkowski et al., 2008). Pantzalis et al. (2000) find that low rankings of political, economic and press freedom are associated with more uncertainty, because of limited information available to the electorates. This study provides a new indicator of election shocks which is measured by the accuracy of pre-election polling results.

The findings of this study should be of interest to a wide range of market participants, such as participants in options markets and volatility traders. During periods of increased volatility induced by election uncertainty, option prices could increase as options provide protection against an unfavourable policy decision or an undesirable election outcome (Kelly et al., 2016). The investigation into stock return and stock volatility around elections has important implications for risk-averse investors (see Section 6.7 for more details). Regulators and policy makers should be aware of the impact of pre-election polls on stock markets, so that they could stabilise markets by proposing reforms of pollsters' activities in formulating more accurate surveys for practical applications.

The remainder of this Chapter is organised as follows. Section 6.2 reviews the related studies, Section 6.3 provides the hypothesis of the study, Section 6.4 describes the dataset and main variables used in the study, Section 6.5 presents the methodology, Section 6.6 discusses empirical results, and Section 6.7 concludes.

6.2 Literature review

Prior studies have shown that the uncertainty derived from political events has a significant impact on stock performance (e.g. Boutchkova et al., 2012; Pástor and Veronesi, 2013; Kelly et al., 2016; Goodell et al., 2020) (see Section 2.4). This Chapter focuses on the impact of election-induced uncertainty on stock return and stock volatility. However, it is different from previous studies (e.g. Goodell et al., 2020) as opinion polls (not betting markets) are used to proxy election uncertainty and election shock. Given the rich dataset of opinion polls of EU countries (see Section 6.4 for more details), this Chapter provides a unique analysis in comparison with other studies that used data from a single country (e.g. Goodell and

Vähämaa, 2013). Using a multi-country dataset also offers insights on the uncertainty associated with different political systems across countries.

Pástor and Veronesi (2013) identify political uncertainty as uncertainty about government's future actions. They propose a general equilibrium model of government policy choice to explain how political uncertainty affects stock prices. In the model, political costs associated with adopting any given policy are the source of political uncertainty that investors cannot fully anticipate. Therefore, investors digest related news and learn about the impact by observing the realised profitability in a Bayesian learning process. This learning process about political costs/benefits occurs before the important change in policy regimes which generates a risk premium for political uncertainty. Hence, the model implies that such uncertainty about future government actions commands a risk premium as well as increasing volatilities and correlations of stock returns (Pástor and Veronesi (2013, pp.523-530)). To evaluate the prediction about the effect of political uncertainty on stock volatility, they use the economic policy uncertainty (EPU) index, developed by Baker et al. (2016), to proxy for political uncertainty.[108] Applying OLS regressions on US data from January 1985 to December 2010, they find that stocks are more volatile when there is more political uncertainty.

Hill et al. (2019) argue that the Brexit Referendum, the political event which influences the UK's future legal and regulatory framework, fits the political uncertainty notion introduced by Pástor and Veronesi (2013). Therefore, an increasing (decreasing) probability of a Brexit vote is associated with increasing (decreasing) political uncertainty. Using the FEM, Hill et al. (2019) examine the sensitivity of UK firms' stock returns to changes in the probability of the Brexit vote during the referendum campaign from February 20, 2016 (the day the referendum was announced) to June 22, 2016 (the day before the referendum). They find that the increase in the probability of a vote in favour of Brexit, which results in higher political uncertainty, has a negative impact on stock returns. In addition, they use the standard event study approach to measure stock prices' reactions to the referendum result. They show that when the referendum result was announced, the average firm lost 13% of its value during the day of the referendum result (Day 0, June 24, 2016) and the following trading day (Day 1, June 27, 2016). They also find that more internationally oriented firms are less affected by the uncertainty associated with Brexit because of their ability to diversify domestic policy risks.

[108]According to Pástor and Veronesi (2013), the EPU index is constructed as a weighted average of three components. Firstly, it captures news coverage of policy-related uncertainty obtained from Google News. Secondly, it provides the number of federal tax code provisions set to expire in coming years, obtained from the congressional Joint Committee on Taxation. Finally, it captures elements of uncertainty about future US monetary and fiscal policies measured by the extent of disagreement among forecasters of future inflation and government spending.

Kelly et al. (2016) argue that political uncertainty might depend on macroeconomic uncertainty. Hence, they isolate political uncertainty by exploiting its variation around major political events such as national elections and global summits. They examine the impact of uncertainty associated with these events on option markets. Their analysis follows Pástor and Veronesi's (2013) model because during such political events the government decides which policy to adopt, hence investors are uncertain about the future policy. Using a dataset of 20 countries from 1990 to 2012[109], they find that options with maturities covering the dates of political events tend to be more expensive as they provide protection against the price, variance, and tail risks resulting from political events.[110] This protection is more valuable when there is higher uncertainty about the election outcome. The political uncertainty is measured by the difference between the percentage shares of the eventual winner and runner up in the recent opinion poll before the election.

In addition to Kelly et al. (2016), there have been a number of studies that examine whether and how stock markets react to elections (e.g. Pantzalis et al., 2000; Knight, 2006; Boutchkova et al., 2012; Goodell and Vähämaa, 2013; Goodell et al., 2020). Using elections across 33 countries[111] from 1974 to 1995 and the event study approach, Pantzalis et al. (2000) find a positive market reaction in the two-week period ahead of election dates, and the abnormal return is strongest for elections with the highest degree of uncertainty. Such uncertainty is measured by the degree of political, economic and press freedom, as well as the success of the incumbent in being re-elected.

Focusing on the 2000 US Presidential Election, Knight (2006) investigates the partisan effect of electoral outcome probabilities on stock prices, as candidate policies are expected to benefit individual companies in different ways. The candidate electoral prospects are measured by the prices of political future contracts from the IEM. Knight (2006) finds that following the Presidential election of George W. Bush in 2000, stock prices of tobacco firms rose by 13%, while stock prices of Microsoft's main competitors fell by 15%. This is due to the differences in Bush and Gore campaign platforms. In the tobacco industry, Gore favoured FDA regulation of nicotine as an addictive drug, while Bush did not commit to a specific platform on this issue. In the Microsoft case, no candidates committed to a specific policy regarding Microsoft, but Bush seems to be more pro-Microsoft than Gore. In the same vein, using a sample of Russell

[109] The sample includes Australia, Belgium, Brazil, Canada, Finland, France, Germany, Italy, Japan, Korea, Mexico, Netherlands, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, UK, and US.
[110] According to Kelly et al. (2016), stock prices might drop (price risk), the price drop might be large (tail risk), and return volatility might rise (variance risk) in response to a political event. The value of option is measured by the protection against these three aspects of risk associated with political event.
[111] The sample includes 20 major OECD countries and 13 developing countries.

3000 firms around 2016 the US Presidential Election, Wagner et al. (2018) argue that high-tax firms can benefit from the victory of Trump as corporate taxes are expected to be lower.

Snowberg et al. (2007) analyse changes in stock prices caused by exogenous changes in re-election probability of the incumbent during the election day following the release of exit poll and the vote count of the 2004 US Presidential election. They use high frequency data obtained from Tradesports political prediction markets, with ten-minute frequency instead of using traditional daily pre-election data (e.g. betting markets or opinion polls). They find that the probability of President Bush's re-election led to an increase in stock prices. This reflects expectations of stronger output growth or of policy changes that are expected to favour returns to stock-holders under the Bush presidency.

Other studies focus on the impact of election uncertainty on stock volatility. For example, using a sample of 27 OECD countries from the 1980s to 2004 and an event study approach, Bialkowski et al. (2008) show that stocks tend to be more volatile around national elections. They also reveal that investors are surprised by the electoral outcome. Such election-induced volatility is determined by several factors, such as a narrow margin of victory, lack of compulsory voting laws, changes in the political orientation of the government, or the failure to form a government with parliamentary majority. Furthermore, using the FEM and the dataset of 50 countries[112] from 1990 to 2006, Boutchkova et al. (2012) show that industries which are sensitive to politics, such as industries that are more dependent on trade, contract enforcement and labour experience, are more volatile during periods of higher political uncertainty for example when elections are held.[113] During the election campaign, trade, business, or labour-related issues often appear on parties' electoral agendas. When new politicians come to office, exporters might face additional regulatory obstacles (e.g. acquiring subsidies, licensing, or standardisation) which disrupt export flows. The environments where contracts are enforced, and labour regulations are also affected by political forces.

Instead of looking at the partisan effect or rely on the assumption that markets, or particular industries, prefer one political party than another, Goodell and Vähämaa (2013) focus on the impact of public opinion toward presidential candidates on the monthly stock volatility, using a sample of five US Presidential elections from 1992 to 2008. They propose two hypotheses to explain the relationship between elections and stock markets: election uncertainty hypothesis (EUH) and political uncertainty hypothesis (PUH). The EUH predicts

[112] The sample consists of 57 Standard Industry Classification (SIC) industries from 50 countries that are covered by the Datastream and Worldscope databases.
[113] Boutchkova et al. (2012) look at various sources of local and global political risks such as elections, strength of democratic institutions, ruling party orientation, and overall political risk index.

that stock market return and volatility might decrease when the uncertainty related to the forthcoming election results is reduced, and the other way around. The eventual electoral outcome is uncertain up to the date of actual voting, hence such uncertainty raises the unpredictability of future political governance during the pre-election period (Li and Born, 2006). In contrast, the PUH predicts that the volatility might increase when the election outcome becomes more certain. Goodell and Vähämaa (2013) argue that although the election uncertainty may be lessened, the uncertainty regarding future policy may increase. The PUH presumes that information regarding the likelihood of a particular party winning the election reflects information regarding future macroeconomic policy. Macroeconomic uncertainty, in turn, positively affects stock volatility (Diebold and Yilmaz, 2008). Finally, Goodell and Vähämaa (2013) find that the increase of stock market uncertainty measured by VIX is associated with the positive changes in the probability of the eventual winner's success as predicted by the PUH. On the other hand, using a dataset of polling results of US presidential elections from 1964 to 2000, Li and Born (2006) find that stock volatility and stock return are positively associated with the election uncertainty as predicted by the EUH. In their study, election induces uncertainty when it does not have a candidate with a dominant lead.

Goodell et al. (2020) also focus on seven US presidential elections (1992, 1996, 2000, 2004, 2008, 2012 and 2016), to investigate the impact of election uncertainty on economic policy uncertainty and financial market uncertainty. They argue that causality between pairs of these uncertainty variables could be in both directions. Using Granger causation analysis, they find that changes in the probability of the incumbent party getting re-elected drive policy uncertainty and financial uncertainty during the final stages of election campaigns. In contrast, Granger causality test shows that financial uncertainty significantly drives policy uncertainty. Election uncertainty in both studies of Goodell and Vähämaa (2013) and Goodell et al. (2020) is measured by daily futures prices around US elections obtained from US presidential election prediction markets (IEM).

The purpose of this study is to examine the relationship between election uncertainty and stock return as well as stock volatility in the run up to elections. Given that stock market volatility incorporates all the available information that is relevant for forming expectations about the future volatility and option prices, prior studies estimate different measures of volatility to capture market uncertainty. While Li and Born (2006) use the GARCH model to examine volatility dynamics around the US presidential elections, Gemmill (1992), Bialkowski et al. (2008), and Goodell and Vähämaa (2013) focus on the effect of elections on implied volatility. Goodell et al. (2020) examine the changes of future realized volatility in response to

changes in election uncertainty. To the best of my knowledge, this study is the first attempt to address the effects of election uncertainty on Parkinson's (1980) daily intraday volatility measured by the spread between the highest and lowest points of a daily stock prices (see Section 6.4.1). According to Engle and Gallo (2006), this measure of stock volatility has a predictive power in forecasting models for realized volatility, hence it improves volatility estimates. They also reveal that the model-based realized volatility forecasts have a significant explanatory power in tracking the value of the market-based implied volatility measure VIX.

To examine the effect of election uncertainty on stock markets, this analysis follows prior studies in employing different election uncertainty indicators, such as the difference between poll shares for the eventual largest party and the eventual runner up party (Kelly et al., 2016); the success likelihood of the eventual largest party (Goodell and Vähämaa, 2013); and the likelihood of the incumbent party to get re-elected (Goodell et al., 2020). Furthermore, while most of the prior studies have examined how markets respond to the ex-ante uncertainty about electoral outcomes (Gemmill, 1992; ap Gwilym and Buckle, 1994; Herron, 2000; Li and Born, 2006; Goodell and Vähämaa, 2013; Kelly et al., 2016), this study extends the studies of Pantzalis et al. (2000) and Bialkowski et al. (2008), to analyse the ex-post effects of electoral outcomes on stock markets. Their studies on the determinants of election shocks are insightful, however they are unable to capture the effect of the accuracy of pre-election polls. In examining the effect of elections on stock markets, this Chapter controls for the level of the electoral outcome shock which is measured by the difference between the electoral outcome and the expectation of voters before the election. This helps in overcoming the reverse-causality bias between changes in financial markets and changes in the expectations about the re-election of the incumbent (e.g. Herron, 2000).

6.3 Hypothesis

This Chapter posits two hypotheses regarding the relationship between elections and stock markets. The Chapter examines the effect of election uncertainty and election shock on stock return as well as stock volatility. The first hypothesis is:

H_1: *Election uncertainty has a significant impact on stock return and stock volatility in pre-election periods.*

As the election process disseminates future policy-related information to markets, it is expected that the uncertainty about the electoral outcome might drive stock markets. Investors are expected to respond to changes in expected electoral outcomes incrementally. If investors

are sensitive to the likelihoods of various electoral outcomes, they are more likely to hold different positions to hedge against alternative election outcomes (e.g. option trading) rather than hold static positions or wait until after the election to hedge or adjust their respective positions (Goodell et al., 2020). For example, given the forthcoming 2020 US presidential election, the trading volume of call and put options with maturities covering the election period and aftermath has significantly increased in response to the higher implied volatility prior to the election (Smith and Platt, 2020).[114]

This Chapter draws from the theoretical model of Pástor and Veronesi (2013). According to their model, investors cannot fully anticipate which policy the government is going to choose, and the political costs/benefits associated with adopting any given policy. Regarding national elections, political uncertainty is interpreted as the uncertainty about who will be elected. Hence, investors face the uncertainty about the electoral outcome. Following Pástor and Veronesi's (2013) model, changes in stock prices are driven by three factors: economic shocks, firm-specific shocks, and shocks to political uncertainty. The uncertainty around elections affects future policy choice, hence in turn drives political uncertainty. Therefore, election uncertainty should affect stock market uncertainty via its impact on policy uncertainty (Goodell et al., 2020). The uncertainty around the political cost of implementing a given policy may vary across political parties. Hence, the information regarding the likelihood of a particular party winning the election may reflect the election uncertainty and the policy uncertainty.

Regardless of the partisan effect which assumes that markets prefer one political party (e.g. the incumbent party) to another, the relationship between elections and stock markets can be explained under two hypotheses: EUH and PUH, which are proposed by Goodell and Vähämaa (2013) (see Section 6.2). Given the EUH, it is expected that stock market return and volatility decrease when the uncertainty related to forthcoming election results is reduced and the other way around. The EUH is broadly consistent with the uncertain information hypothesis (UIH) developed by Brown et al. (1988), who argue that asset valuations will rise with decreasing uncertainty and that a rise in asset values is associated with a decrease in required return and a consequent lessening of volatility. In the same vein, Bialkowski et al. (2008) argue that any market-wide fluctuations in response to election shocks might drive up the systematic volatility of all stocks listed, resulting in higher option prices prior to elections.

[114] There were 6,836 open October contracts on 31st January 2020 and 9,399 by mid-February 2020 compared to zero open October contracts on 31st January 2016 and 50 contracts by mid-February 2016 in relation to the previous US election in 2016 (Stafford, 2020). October contracts are important as they cover the election period (in November) and aftermath.

In contrast, the PUH predicts that volatility might increase when the election outcome becomes more certain (Goodell and Vähämaa, 2013). Even though the election uncertainty may be lessened with the increase in the likelihood of the election victory of the eventual largest party, the uncertainty regarding future policy may increase. Changes in election likelihoods reflect changes in information regarding future policy. Such changes are unanticipated by market participants, hence should be reflected by the market through increased volatility (Ederington and Lee, 1993). Therefore, it is expected that the policy uncertainty is positively associated with stock volatility in the run up to the election. The EUH and PUH imply opposing signs on the coefficients for stock volatility, whereby election uncertainty is expected to have a positive sign as expected by EUH, and a negative sign as expected by PUH. Particularly, when the electoral outcome is more certain, stock volatility is expected to decrease as predicted by EUH and increase as predicted by PUH. This different effect is driven by the uncertainty regarding future policies. EUH assumes that the decrease in election uncertainty may reflect less policy uncertainty. Specifically, the information regarding the likelihood of a particular winning party provides more certain information regarding future macroeconomic policy, which is disseminated during campaign period. On the other hand, the policy uncertainty may increase in this case as expected by PUH. The increase in policy uncertainty might be attributed to changes in proposed policies and the effects of those policies due to unanticipated changes in election likelihoods (Goodell and Vähämaa, 2013). However, this Chapter does not aim to provide a direct test of EUH and PUH, since it would require data on policies and policy uncertainty, which is beyond the scope of this study. The hypotheses are inferred from the signs of the estimated coefficients.

Under Pástor and Veronesi's (2013) model, political uncertainty is defined as the uncertainty about government actions, hence the probability of re-election of the incumbent party could be an important driver of policy uncertainty which in turn affects stock return and volatility. With regards to the incumbent party, investors have had an opportunity to learn its political costs over the period while the party in power. Therefore, it is expected that there is less uncertainty about the political costs if there is an increase in the re-election probability of the incumbent party when all else is equal (Goodell et al., 2020), hence resulting in less stock return and volatility. This is referred to the partisan election uncertainty.

The second hypothesis is:

H_2: *Election shock has a significant impact on stock return and volatility in post-election periods.*

Stock markets are expected to react to the election uncertainty. Therefore, after election days, if the electoral outcome does not meet voters' expectation, it would be an election shock to markets. An analysis is conducted to examine the effect of the election shock on the stock markets. The election shock is measured by the difference between the actual and expected electoral outcomes (see Section 6.4.2). It is expected that the higher polling difference the less uncertainty, which would result in less stock return and volatility. A good prediction of the electoral outcome (when the vote share for the eventual largest party is equal or higher than voters' expectation) helps in reducing the surprise and keeps investors informed and prepared. In contrast, a bad prediction (when the vote share for the eventual largest party is smaller than voters' expectation) will result in a political shock for market participants. According to Pantzalis et al. (2000), as the uncertainty over the eventual electoral outcome is resolved, subsequent price changes tend to be positive on average. Observed abnormal return and volatility associated with uncertainty resolution should be higher (lower) for the higher (lower) uncertainty event.

6.4 Data

This Section describes the main variables and the dataset used in the empirical analysis. Section 6.4.1 discusses the measure of stock volatility and stock return. Section 6.4.2 describes the election uncertainty and election shock indicators. Section 6.4.3 provides summary statistics of the dataset used in the empirical analysis.

6.4.1 Stock indicators

To examine Hypothesis 1 (H_1) and Hypothesis 2 (H_2), this Chapter uses two measures of volatility: daily volatility (*Vol*) and abnormal volatility (*Ab_vol*) following (Fan et al., 2020b).

First, *Vol* is calculated based on intraday high and low stock prices (Parkinson, 1980) as follows:

$$Vol_{it} = \frac{\ln(S_{it,high}/S_{it,low})}{2\sqrt{\ln 2}} \quad \text{Eq. (6.1)}$$

Where Vol_{it} is the daily stock volatility of country i at time t. $S_{it,high}$ and $S_{it,low}$ are the intraday high and low stock prices respectively.

Second, Ab_vol_{it} is the difference between the daily volatility and the average volatility. Following the previous literature, a 200-day estimation period starting 230 days before the relevant date is used (e.g. Hill and Faff, 2010; Williams et al., 2015). Hence, the average volatility (*Avg_vol)* for each country is calculated using 200 trading days for the period from t = -230 to t = -30.[115] Daily Ab_vol_{it} are calculated for each day as follows:

$$Ab\_vol_{it} = Vol_{it} - Avg\_vol[-230; -30] \quad \text{Eq. (6.2)}$$

Where Ab_vol_{it} is abnormal volatility of country *i* at time *t.* Vol_{it} is the daily stock volatility of country *i* at time *t*. *Avg_vol[-230;-30]* is the average volatility during 200 trading days period from t = -230 to t = -30.

To examine how stock volatility reacts during post-election periods in Hypothesis 2 (H_2), cumulative abnormal volatility (CAV) is used. Abnormal volatilities are cumulated over consecutive days to give CAV. Hence, CAV is defined over different event windows [0; 1], [0; 2], [0; 3], [0; 4], [0; 5], [0; 6], and [0; 7], where the election day is on date 0. Gande and Parsley (2005) suggest that a short time window, for example the two-day [0, 1] event window, reduces other events contamination. However, longer time windows are used for robustness checks. Following Pantzalis et al. (2000), the t-test and Wilcoxon test are used to examine whether the average and median CAVs are significantly different from zero, respectively (see Section 6.6.2).

This Chapter also examines the effect of election uncertainty and prediction on the abnormal return (*Ab_ret*) and cumulative abnormal return (*CAR*). *Ab_ret* is calculated using the mean-adjusted returns method (Williams et al., 2015). The mean daily return for each country is calculated using 200 trading days for the period from t = -230 to t = -30.[116] This represents the expected daily return. *Ab_ret* is measured as the difference between the daily log return and the expected return. *CAR* is calculated by cumulating *Ab_ret* over consecutive days in different event windows [0; 1], [0; 2], [0; 3], [0; 4], [0; 5], [0; 6], and [0; 7], where the election day is on date 0. This study uses the t-test and Wilcoxon test to examine whether the average and median CARs are significantly different from zero (see Section 6.6.2).

[115] In the event of market closures, such as national holidays, the time period is extended as necessary.
[116] In the event of market closures, such as national holidays, the time period is extended as necessary.

6.4.2 Election uncertainty and election shock indicators

Following Goodell and Vähämaa (2013) and Kelly et al. (2016), this Chapter uses two variables to measure the non-partisan election uncertainty in the run up to the election: (i) *Pol_unc* which is the negative poll spread between the support for the eventual largest party (LP) and the eventual runner up party (RUP) and (ii) *Elect_poll_chg* which is a change within 30 days in the success likelihood of the eventual largest party.[117] From this point, LP and RUP represent the eventual largest party and the eventual runner up party, respectively.

$$Poll\_unc_{it} = Support\ for\ RUP_{it} - Support\ for\ LP_{it} \quad \text{Eq. (6.3)}$$

$$Elect\_poll\_chg_{it} = \Delta\ Support\ for\ LP_{it} \quad \text{Eq. (6.4)}$$

Poll_unc is positive (negative) when the RUP (LP) leads over the LP (RUP), indicating that RUP (LP) is more favoured than LP (RUP) in pre-election polls. An increase in *Pol_unc* implies more election uncertainty since the LP is less certain to win. *Elect_poll_chg* is positive (negative) when there is more (less) support for the LP, hence an increase in *Elect_poll_chg* implies less election uncertainty. It should be noted that *Pol_unc* and *Elect_poll_chg* capture different effects of election uncertainty. While *Pol_unc* captures whether LP leads over RUP in opinion polls, *Elect_poll_chg* measures changes in the success likelihood of LP. For example, if the probability of LP changes from 30% to 35% and the probability of RUP changes from 30% to 37% on date *t*, *Elect_poll_chg* equals 5% representing the increase in support for LP (less election uncertainty), however *Pol_unc* equals 2% representing RUP lead over LP by 2% (more election uncertainty). When both LP and RUP have an equal probability to become elected, *Pol_unc* equals zero. These two variables are used separately and simultaneously in the regressions to examine Hypothesis 1 – H_1 on whether the election uncertainty affects stock return and volatility.

These election uncertainty variables in Eq. (6.3) and Eq. (6.4) are non-partisan measures as they do not indicate whether changes in probability are toward or away from the incumbent party. To control for the partisan election uncertainty, this Chapter examines whether changes in the incumbent party re-election probability correlate with stock return as well as stock volatility. A measure of an absolute value of changes within 30 days in the support for the incumbent party (*Govsup_chg*) is used following Goodell et al. (2020). In the case of positive (negative) changes in the re-election probability of the incumbent party, a higher value

[117] The eventual largest party is sometimes different from the winning party. For example, in the 2013 Italian general election, the grand coalition of Democratic Party, the People of Freedom, Civic Choice, the Union of the Centre and the Radicals led by Enrico Letta takes the office albeit M5S leads the vote share in the election.

of *Govsup_chg* indicates an increase (a decrease) in support for the incumbent, which implies less (more) election uncertainty due to less (more) policy uncertainty (see Section 6.3). However, testing the effects of policy uncertainty directly is out of the scope of this study. This test would require other data relating to implemented policies and policy uncertainty, which is left for future research.

In line with Hypothesis 2 (H_2) about whether the election shock influences stock return and volatility in post-election periods, this Chapter follows Bélanger and Soroka (2012) to measure the election shock by calculating the difference between the electoral outcome and the most recent polling result within the 30 days prior to the election of LP (*Poll_diff*).[118] This measure captures the error of polling results indicating the deviations between voters' expectation and the actual electoral outcome. *Poll_diff* is positive (negative) when the vote share of LP in the electoral outcome is higher (lower) than the support for LP before election day. The higher the value of *Poll_diff* is, the less surprising the electoral outcome is and vice versa. When electoral outcome meets the voters' expectation, *Poll_diff* equals zero.

6.4.3 Summary statistics

This Chapter considers elections for the top offices in each country such as presidential (e.g. in France) and parliamentary (e.g. in UK) elections. Therefore, polling results for LP, RUP, and the incumbent party are used.[119] This Chapter uses polling data for 27 European countries (no data available for Luxembourg) from 01/01/2005 to 03/09/2019. As this Chapter only focuses on elections with polling data available within the 30 days ahead of elections, it does not use data before 2005 due to the lack in the data availability. The sample period covers 95 elections that have polling data available within the 30 days prior to election days.[120]

The election dataset including election dates and electoral outcomes is collected from the European Election Database[121], government websites, and newspapers.[122] Given the rich dataset of opinion polls, for election outcomes that report the vote share for a coalition of

[118] Bélanger and Soroka (2012) use the difference between the predicted vote share and the actual share received by the incumbent to measure the error of the election prediction model.
[119] This Chapter uses polling results for the incumbent party to calculate *Govsup_chg*. In comparison to the polling dataset in Chapter 3, polling data in this Chapter is updated until 03/09/2019 to include recent elections, and only started from 01/01/2005.
[120] From 01/01/2005 to 03/09/2019, there is a total of 113 elections held in 27 EU countries (excluding Luxembourg). Out of 113 elections, this Chapter only focuses on 95 elections which have polling data available within the 30 days prior to elections.
[121] The election data is collected from original sources, prepared and made available by the Norwegian Centre for Research Data (NSD). Available at: http://www.nsd.uib.no/european_election_database/about/.
[122] Data of recent elections, which are not updated on NSD, is obtained from government websites or newspapers.

multiple parties, the analysis in this study uses polling results for the coalition if available, if not the sum of polling results of all party members in the coalition is used. In other words, coalitions are viewed as stand-alone entities for the purpose of calculating the vote share. This is a common approach used in the literature (Kelly et al., 2016).

The stock data is collected from Thomson Eikon, the stock index for each country is selected following Afonso et al. (2012) and Abad et al. (2018) (see Appendix 5.3 in Chapter 5 for the list of country stock indices).[123] For countries with more than one index, the headline index is selected (e.g. Cyprus, Denmark, Finland, France, Germany, Greece, Luxembourg, Sweden, and UK). Almost all country stock indices are available for the sample period, except for Czech Republic stock index which is available from 2006 and Lithuanian stock index which does not have daily high and low prices. When matching the stock dataset and election dataset, the final sample includes 91 elections of 26 EU countries (excluding Luxembourg and Lithuania) reported in Table 6.2.

Table 6.1 reports the descriptive statistics of the support for LP and RUP by country. The starting dates are not the same for all countries due to the availability of the data (Column 2 of Table 6.1). The end date included corresponds to the most recent election that took place before 03/09/2019 (Column 3 of Table 6.1). The dataset includes 9341 (9225) observations of the support for LP (RUP).[124] In general, the mean value of the support for LP is higher than RUP except for 4 countries including Denmark, Italy, Slovenia, and UK (Columns 5 and 8 of Table 6.1). Regarding the standard deviation, it could be noted that there are two countries with more than 10% standard deviation of the support for LP: France and Slovakia. Such countries might have eventful times through the sample period.

Table 6.2 summarises the election data by country. France and Greece held elections more frequently than others (6 elections) during the sample period (Column 2 of Table 6.2). The two-round system is used in French presidential elections, and hence this Chapter considers two election rounds as two separate election dates (Kelly et al., 2016). France therefore has 6 election dates in 3 years (2007, 2012, and 2017). In the case of Greece, there are 2 elections in 2012 and 2 elections in 2015. Such high frequency of elections might be

[123] This analysis follows the list of national stock indices used in the studies of Afonso et al. (2012) and Abad et al. (2018). They use national stock indices of EU countries to examine the impact of sovereign credit ratings on stock returns.

[124] There is a slight difference between the number of observations between LP and RUP in 6 countries (Belgium, Czech, Italy, Slovakia, Slovenia, and Spain). Such difference is attributed to the fact that RUP starts getting support when it gets close to the election day (e.g. in 2018 Slovenian election, the opinion poll of LMS party is available since 16/11/2017). Another explanation is that some polling sources only report the support for LP, hence the support for RUP is missing.

driven by poor economic conditions as the result of the sovereign debt crisis. Due to limited polling data availability, the sample only includes 1 election in Malta and 1 election in Cyprus.

Column 4 of Table 6.2 reports the average of the difference between electoral outcome and the most recent voters' expectation within 30 days prior to the election (*Poll_diff*). This is the difference between the vote share for LP in the electoral outcome and pre-election polling result. Out of 27 EU countries, 8 countries including Belgium, Cyprus, Finland, France, Germany, Hungary, Ireland, and Poland, have negative *Poll_diff*, which means the vote share for LP is lower than expected. Therefore, there is more election-induced uncertainty in these countries. However, in all countries, the support for LP is higher than the support for RUP in the recent poll ahead of the election (Column 5 of Table 6.2), thus suggesting that the success likelihood of LP is more certain.

Panel A in Table 6.3 presents the summary statistics for the variables used in the empirical analysis (see Appendix 6.1 for the description of the variables). The mean value of *Pol_unc* is -3.273% indicating LP lead over RUP by 3.273% on average. The standard deviation of *Pol_unc* is 10.163% showing the possibility of certain eventful times during the sample period , such as the 2013 Italian election. The highest *Pol_unc* is 29.500% (on 04/02/2011 in Italy) while the lowest is -53.000% (on 17/11/2009 in Hungary).[125] The mean (standard deviation) value of *Elect_poll_chg* is 0.027% (2.373%). The mean (standard deviation) value of *Govsup_chg* is 1.541% (1.732%). *Poll_diff* is 0.813% on average, indicating that the support for LP in the election is slightly higher than expected by 0.813%. *Poll_diff* ranges from -9.540% in the 2014 Belgian election to 14.630% in the 2013 Maltese election.

Panel A in Table 6.3 also presents the descriptive statistics of *Vol, Ab_vol,* and *Ab_ret.* The mean (standard deviation) value of *Vol* and *Ab_vol* are 0.896% (0.605%) and -0.014% (0.559%) respectively. It is highlighted that the maximum value of *Vol* and *Ab_vol* is 10.04% and 8.371% on 24/06/2016 in Greece. The mean (standard deviation) value of *Ab_ret* is -0.005% (1.323%). *Ab_ret* widely ranges from -14.358% on 24/06/2016 in Greece to 13.413% on 10/05/2010 in Spain. The low level of *Ab_ret* in Greece, along with the high level of *Vol* and *Ab_vol* on the same day (24/06/2016), are considered as a result of the spillover effect of Brexit referendum took place on 23/06/2016 (Aristeidis and Elias, 2018).

[125] In the 2013 Italian general election, the M5S won the most votes of all parties despite the support for M5S on 04/02/2011 is only 0.9% (less than the support for the incumbent party PDL by 29.5%). Prior to the 2010 Hungarian parliamentary election, there was a significant fall in the popularity of the Socialist party (the incumbent party) which helped Viktor Orbán lead Fidesz to the victory in 2010.

Panel B in Table 6.3 presents the Pearson correlation coefficients between the variables used in the empirical analysis. It could be noted that *Vol* is positively correlated with *Pol_unc* as expected by the EUH (see Section 6.3). Regarding the correlations among control variables, there is a weak negative correlation between two pairs of variables: *Elect_poll_chg* and *Pol_unc* (-0.098); *Govsup_chg* and *Avg_rat* (-0.293). Hence, there is no collinearity concerns when adding these variables into the same regression.

6.5 Methodology

To answer the research questions presented in Section 6.3, the study employs the FEM and the event study approach. Section 6.5.1 and Section 6.5.2 present the models used to examine the impact of election uncertainty and election shock on stock volatility and stock return, respectively.

6.5.1 The impact on stock volatility

This Chapter conducts panel data estimations with country and time FE to examine the stock market behaviour in different countries around political election dates. Country FE control for all time invariant variables (e.g. unobserved country characteristics) that might affect stock markets. Time FE control for time variant variables that are common for all countries in the sample. The full set of country and time FE control for the endogeneity bias caused by the omitted variables. The FEM is commonly used in prior studies (e.g. Fan et al., 2020b). In addition, the omitted variable bias is reduced as election uncertainty indicators are measured by changes in frequent polling results. This allows to examine the reaction of stock markets to election uncertainty across time (not only on or around election days). In line with Hypothesis H_1, the first regression tests whether election uncertainty affects stock volatility over the period prior to elections for country *i* at time *t*, as follows:

$$Vol_{it} = \alpha + \beta Pol\_unc_{it} + \gamma Elect\_poll\_chg_{it} + \delta Avg\_rat_{it} + \theta Vix\_chg_{it} + \varphi Co_i + \omega Year_t + \varepsilon_{it} \quad \text{Eq. (6.5)}$$

$$Ab\_vol_{it} = \alpha + \beta Pol\_unc_{it} + \gamma Elect\_poll\_chg_{it} + \delta Avg\_rat_{it} + \theta Vix\_chg_{it} + \varphi Co_i + \omega Year_t + \varepsilon_{it} \quad \text{Eq. (6.6)}$$

In Eq. (6.5), Vol_{it} is the daily stock volatility. Volatility is the Parkinson's (1980) intraday volatility using daily high and low prices. In Eq. (6.6), another measure of volatility, abnormal volatility (Ab_vol_{it}), is used. Abnormal volatility is the daily volatility minus the

average volatility from a 200-day estimation period starting 230 days before the relevant date (see Section 6.4.1).

The main variable of interest is Pol_unc_{it} defined using Eq. (6.3) to measure the election uncertainty (see Section 6.4.2). According to the EUH, stock volatility is expected to decrease when the election outcome is less uncertain, as measured by lower *Pol_unc* and vice versa. Although lower *Pol_unc* may lessen the election uncertainty, it may increase the policy uncertainty predicted by the PUH, hence resulting in higher stock volatility (see Section 6.3).

The second test variable of interest is *Elect_poll_chg* defined using Eq. (6.4). An increase (decrease) in the *Elect_poll_chg* means less (more) election uncertainty, hence results in a decrease (increase) in stock volatility as predicted by the EUH. However, according to the PUH when policy uncertainty increases following the increase of *Elect_poll_chg*, stock volatility might increase. In order to test for robustness, *Pol_unc* and *Elect_poll_chg* are used separately as well as simultaneously both in Eq. (6.5) and Eq. (6.6).

Avg_rat_{it} is the average of the comprehensive credit rating assigned to country *i* at time *t* by the three main Credit Rating Agencies (CRAs): S&P, Moody's, and Fitch, based on the 52-point scale (see Section 4.4.1). It controls for the economic fundamentals, political and financial conditions of country *i* at time *t* (Vu et al., 2015).

Vix_chg_{it} is the contemporaneous logarithmic changes of CBOE VIX index (from Thomson Reuters Eikon) to control for the global risk (as used in the previous literature e.g. Abad et al., 2018).

Co_i and $Year_t$ are country and year FE respectively. ε_{it} is the error term. Robust Huber-White standard errors are used to account for heteroscedasticity.

Regarding the partisan election uncertainty, this Chapter uses *Govsup_chg* defined in Section 6.4.2 to measure the absolute changes in the re-election probability of the incumbent. It should be noticed that different expectations about the economy can influence the re-election probability of the incumbent (Snowberg et al., 2007). For example, the incumbent may be punished for poor economic performance. Concerning this reverse causality problem, this Chapter does not claim the causality between the re-election probability of the incumbent and stock markets.[126] Instead, it only examines the correlation between them using the following model, which are run separately for positive and negative changes in *Govsup_chg*:

[126] The non-partisan election uncertainty measure used in Eq. (6.5) and Eq. (6.6) does not indicate whether changes in probability are toward or away from the incumbent party (Goodell et al., 2020), hence the reverse causality is less likely to occur.

$$Vol_{it} = \alpha + \beta Govsup\_chg_{it} + \delta Avg\_rat_{it} + \theta Vix\_chg_{it} + \varphi Co_i + \omega Year_t + \varepsilon_{it}$$

Eq. (6.7)

$$Ab\_Vol_{it} = \alpha + \beta Govsup\_chg_{it} + \delta Avg\_rat_{it} + \theta Vix\_chg_{it} + \varphi Co_i + \omega Year_t + \varepsilon_{it}$$

Eq. (6.8)

Control variables in Eq. (6.7) and Eq. (6.8) are the same as in Eq. (6.5) and Eq. (6.6). Eq. (6.5) to Eq. (6.8) are also estimated for country sub-groups. The full sample is divided into three groups: "GIIPS", "CORE", and the remaining countries ("REM") groups. In Eurozone, "GIIPS" represents distressed peripheral economies (Greece, Ireland, Italy, Portugal, and Spain), while "CORE" represents core eurozone economies (Austria, Belgium, Finland, France, Germany, and Netherlands). "GIIPS" countries were most affected during the sovereign debt crisis and characterised by high level of debt (Armingeon and Guthmann, 2014). Given variations in economic conditions, stock volatility in these country sub-samples might react differently to the election uncertainty.

To examine Hypothesis H_2, whether election shock affects the stock volatility, the following model is used:

$$CAV_{it+s} = \alpha + \beta Poll\_diff_{it} + \delta Avg\_rat_{it} + \theta Vix\_chg_{it} + \gamma Y\_crisis_t + \varphi Co_i + \varepsilon_{it}$$

Eq. (6.9)

CAV_{it+s} is the cumulative abnormal volatility which is a sum of abnormal volatility over the [0; 1], [0; 2] , [0; 3] , [0; 4] , [0; 5] , [0; 6] , and [0; 7] time windows, where $t=0$ is the election day. Although the short time window (e.g. [0, 1] time window) reduces other events contamination, this Chapter uses different time windows for robustness checks.

$Poll\_diff_{it}$ is defined in Section 6.4.2 which measures the polling error. Higher $Poll\_diff_{it}$ results in less election-induced uncertainty which in turn decreases the stock volatility in the post-election period and vice versa (see Section 6.3).

Avg_rat_{it} and Vix_chg_{it} are defined as in Eq. (6.5). Co_i is country FE. ε_{it} is the error term. Robust Huber-White standard errors are used to account for heteroscedasticity.

Eq. (6.9) is conducted using the sample of stock volatility in days after the elections. Given the small number of observations (91 elections), this Chapter does not control for all the year dummies as they would saturate the model while not being statistically significant.[127]

[127] Previous studies (e.g. Danbolt et al., 2015) which employ the event study approach only control for the country FE, and do not control for the time FE.

Instead this Chapter employs *Y_crisis*$_t$ as a dummy variable which equals to 1 during European debt crisis (2008-2013) and 0 otherwise to control for the crisis period in the sample. For robustness checks, Eq. (6.9) is estimated with/without year FE instead of using *Y_crisis* or replacing *Y_crisis* by *Y_criris2*, which is a dummy variable equaling to 0 for the pre-crisis period (before 2008), 1 for the crisis period (2008-2013), and 2 for the post-crisis period (2013-2019).

6.5.2 The impact on stock returns

In line with Hypothesis H_1, this Chapter also examines the relationship between election uncertainty and stock returns during the run up to elections. Referring to Section 6.5.1, the baseline models are as follows:

$$Ab\_ret_{\text{it}} = \alpha + \beta Pol\_unc_{it} + \gamma Elect\_poll\_chg_{it} + \delta Avg\_rat_{it} + \theta Vix\_chg_{it} + \varphi Co_i + \omega Year_t + \varepsilon_{it} \quad \text{Eq. (6.10)}$$

$$Ab\_ret_{it} = \alpha + \beta Govsup\_chg_{it} + \delta Avg\_rat_{it} + \theta Vix\_chg_{it} + \varphi Co_i + \omega Year_t + \varepsilon_{it} \quad \text{Eq. (6.11)}$$

Eq. (6.10) is estimated to capture the non-partisan effect of election uncertainty on stock return. Eq. (6.11) is estimated to examine the correlation between the partisan election uncertainty and stock return.

Ab_ret$_{it}$ is the abnormal stock return of country *i* at time *t*. *Ab_ret* is calculated by taking the difference between the daily log return and the expected return. Expected return is calculated using mean-adjusted returns method. Following Williams et al. (2015), a 200-day estimation period starting 230 days before the relevant date is used (See Section 6.4.1).

Two main variables of interest in Eq. (6.10), *Pol_unc* and *Elect_poll_chg*, are defined as in Eq. (6.5). These variables capture the non-partisan effect of election uncertainty. Lower election uncertainty as measured by either lower *Pol_unc* or higher *Elect_poll_chg* is expected to result in lower *Ab_ret* as predicted by the EUH (See Section 6.3). For robustness checks, *Pol_unc* and *Elect_poll_chg* are used separately as well as simultaneously both in Eq. (6.10).

Regarding the partisan election uncertainty, the correlation between *Govsup_chg* and *Ab_ret* is examined in Eq. (6.11), separately for positive and negative changes in *Govsup_chg* (see Section 6.5.1). Control variables in Eq. (6.10) and Eq. (6.11) are the same as in Eq. (6.5).

In line with Hypothesis H_2, the following model is used to examine whether election shock has a significant impact on stock returns:

$$CAR_{it+s} = \alpha + \beta Poll\_diff_{it} + \delta Avg\_rat_{it} + \theta Vix\_chg_{it} + \gamma Y\_crisis_t + \varphi Co_i + \varepsilon_{it}$$

Eq. (6.12)

CAR_{it+s} is the cumulative abnormal return which is the sum of abnormal return over the [0; 1], [0; 2] , [0; 3] , [0; 4] , [0; 5] , [0; 6] , and [0; 7] time windows, where *t=0* is the election day.

The variable of interest, *Poll_diff*, is defined as in Eq. (6.9). It is expected that higher $Poll\_diff_{it}$ results in less election-induced uncertainty which in turn decreases the stock return in the post-election period and vice versa (see Section 6.3). Control variables in Eq. (6.12) are the same as in Eq. (6.9).

6.6 Empirical results

This Section reports the results of the empirical analysis on the reaction of stock markets to elections. Section 6.6.1 analyses the impact of the election uncertainty on stock volatility and return in pre-election periods. Section 6.6.2 presents the response of stock markets to elections and how the difference between the actual and expected electoral outcomes affects stock markets in post-election periods.

6.6.1 Election uncertainty and stock markets

Eq. (6.5) and Eq. (6.6) are estimated to examine the impact of election uncertainty on stock volatility (*Vol*) and abnormal volatility (*Ab_vol*) in EU countries (see Section 6.5.1). The key independent variables are the two election uncertainty indicators: *Pol_unc* and *Elect_poll_chg* (See Section 6.4).

Table 6.4 reports the results of the FEM for the full sample. The effect of election uncertainty on two volatility measures, *Vol* and *Ab_vol*, are reported in Panel A and Panel B respectively. The estimation results for several alternative versions of Eq. (6.5) and Eq. (6.6) are reported, with *Pol_unc* and *Elect_poll_chg* added separately and simultaneously to the regressions in order to capture different effects of election uncertainty. The results show that *Pol_unc* is positive and significant at 10% level in all estimations without and with *Elect_poll_chg* (Columns 1, 3, 4, and 6 of Table 6.4), with the coefficient ranging from 0.001 to 0.002. The relative magnitude of the effect of *Pol_unc* is calculated by multiplying the

marginal effect with the average value of *Pol_unc*. This refers to the "average effect" of *Pol_unc* and will be used later in the interpretation of the results. The marginal effect of *Pol_unc*, which provides the percentage impact of *Pol_unc*, is calculated by taking the median ratio of the coefficient on *Pol_unc* to the fitted absolute value of *Vol (Ab_vol)*, with *Pol_unc* set to zero.[128] Accordingly, the average effect of *Pol_unc* on *Vol* is -0.655% , while it is bigger for *Ab_vol* at -3.928%. It means that when the *Pol_unc* is at its mean level (-3.273%), it reduces 0.655% of the fitted absolute value of *Vol* and 3.928% of the fitted absolute value of *Ab_vol*, with the *Pol_unc* set to zero. The findings suggest that stock volatility increases (decreases) ahead of the elections due to the higher (lower) election uncertainty measured by higher (lower) *Pol_unc*. The effects of election uncertainty on stock volatility go beyond the effect of global risk and the national economy since Eq. (6.5) and Eq. (6.6) control for changes in CBOE VIX index (*Vix_chg*) and sovereign credit rating (*Avg_rat*) which are widely used in the literature (e.g. Abad et al., 2018). The findings are consistent with Hypothesis 1 – H_1 (see Section 6.3). *Pol_unc* has the expected sign as predicted by the EUH, which implies that stock volatility appears to be higher when the election uncertainty increases. The uncertainty related to the forthcoming election result should affect market uncertainty via its impact on the future policy choice. Prior studies (e.g. Li and Born, 2006) also reveal that the higher the election uncertainty is, the higher the stock volatility is in pre-election periods.

On the other hand, the second variable of interest *Elect_poll_chg* is not statistically significant in any of the regressions without and with *Pol_unc* (Columns 2, 3, 5, and 6 of Table 6.4). The results are consistent when simply regressing *Elect_poll_chg* on stock volatility. It indicates that *Elect_poll_chg* is not the dominant political determinant of changes in stock volatility, but rather *Pol_unc*. As can be seen from Table 6.3, the standard deviation of *Elect_poll_chg* (2.373%) is much smaller than the standard deviation of *Pol_unc* (10.163%). Such smaller variation makes it harder to identify the effect of *Elect_poll_chg* compared to *Pol_unc* because if the variable does not vary or only varies a little, it is less likely to have an effect. The findings show that the updating of the success probabilities of the political party is not the determinant of market anxiety, but rather the distance between the two competitive parties in opinion polls matters.

Regarding control variables, *Vix_chg* has a consistent positive effect on *Vol* and *Ab_vol* in all the regressions using the full sample, statistically significant at 1% level (Table 6.4). It indicates that the higher the global risk, the more volatilite country stock markets. This is consistent with the findings of Abad et al. (2018) that VIX has a significant impact on stock

[128] The average effect of *Elect_poll_chg* and *Poll_diff* is calculated in the same way.

markets. *Avg_rat* has a statistically negative effect on *Vol* (Panel A in Table 6.4). It indicates that stock markets are less volatile in countries with higher sovereign credit rating. However, *Avg_rat* is not statistically significant in the regressions for *Ab_vol* (except for the results in Column 5 of Table 6.4). This might be attributed to the asymmetric pattern in markets' reactions to the negative and positive rating news across CRAs (Tran et al., 2014).

Eq. (6.5) and Eq. (6.6) are also estimated using country sub-groups. The results for *Vol* and *Ab_vol* are reported in Table 6.5 and Table 6.6 respectively. There are three country sub-groups including: "GIIPS", "CORE", and the remaining countries ("REM") groups, defined in Section 6.5. It could be noticed that the number of observations of CORE group is approximately double of this for GIIPS and REM groups, which is driven by the availability of polling data. Opinion polls might be more popular in CORE countries (see Table 6.1).[129]

Table 6.5 shows that *Pol_unc* appears to have different effect on *Vol* in the GIIPS group from the other two country groups. While *Pol_unc* has an insignificant effect on *Vol* in the GIIPS group, the coefficient on *Pol_unc* has a positive sign as expected by the EUH in the CORE and REM groups, statistically significant at the 10% level. In the CORE sub-sample, the coefficient on *Pol_unc* is 0.007 (average effect equals -5.378%) (Columns 4 and 6 of Table 6.5). In the REM sub-sample, the coefficient of *Pol_unc* is 0.003 (average effect equals -1.370%) (Columns 7 and 9 of Table 6.5).[130] *Vol* seems to react more strongly to changes in *Pol_unc* in the CORE group compared to REM group.

Table 6.6 shows the consistent effect of *Pol_unc* on *Ab_vol* in the CORE and REM groups. In the CORE sub-sample, the coefficient on *Pol_unc* is 0.003 (average effect equals -14.266%) (Columns 4 and 6 of Table 6.6). In the REM sub-sample, the coefficient on *Pol_unc* is 0.004 (average effect equals -12.138%) (Columns 7 and 9 of Table 6.6). In contrast, *Ab_vol* is negatively affected by *Pol_unc* in the GIIPS group with the coefficient on *Pol_unc* equaling to -0.003, statistically significant at the 10% level (average effect equals -3.582%) (Column 1 of Table 6.6). This difference in stock reactions in GIIPS group might be driven by the policy uncertainty as predicted by the PUH (See Section 6.3). Although the election uncertainty might increase as the *Pol_unc* increases, the uncertainty regarding future policy may decrease. Investors may favour the proposed policy hence stock markets are less volatile. More importantly, since the GIIPS group shows more troubling conditions during the European debt crisis, thus needing new policies and reforms to boost their national economy.

[129] For example, opinion polls are conducted mostly daily in Germany.
[130] The average of *Pol_unc* in the GIIPS (CORE or REM) sub-sample equals 2.054% (-6.464% or -3.156%).

Table 6.5 and Table 6.6 also report that the effect of *Elect_poll_chg* is not statistically significant, which could be driven by the smaller variations of *Elect_poll_chg* compared to those of *Pol_unc* in country sub-groups. As *Elect_poll_chg* in country sub-groups has a small variation, with the standard deviation ranging from 1.403% to 3.183%, it is less likely to influence stock volatility.[131] This finding consistently shows that the market anxiety appears to be unaffected by changes in the support for LP. *Vix_chg* coefficients are largely consistent with the models for the full sample in Table 6.4, however those of *Avg_rat* are statistically positive in the regressions on *Vol* for the CORE and REM groups. The effect of *Avg_rat* is mixed as markets might react to rating events in anticipation (Norden and Weber, 2004) and in an asymmetric way (Tran et al., 2014).

As the *Pol_unc* and *Elect_poll_chg* do not control for the partisan effect of election uncertainty, this Chapter considers the correlation between the partisan election uncertainty measured by *Govsup_chg* and both *Vol* and *Ab_vol*, using Eq. (6.7) and Eq. (6.8) respectively. This analysis tests the assumption that investors favour the incumbent party. In this case, investors know about the political costs of this party over the period while it is in power. The main variable of interest is *Govsup_chg* defined in Section 6.4.2. The analysis is run separately for the positive and negative changes of *Govsup_chg*. Results are reported in Table 6.7. In the case of positive changes, *Govsup_chg* and *Vol (Ab_vol)* are, as expected, negatively correlated for the full sample, the GIIPS, and the REM groups (Panel A in Table 6.7). In the case of negative changes, *Govsup_chg* and *Vol (Ab_vol)* are, as expected, positively correlated in the CORE group (Panel B in Table 6.7). The findings indicate that the stock markets are less (more) volatile when the support for the incumbent increases (decreases) resulting in less (more) policy uncertainty. It appears that investors in the CORE group are more sensitive to the negative news.

Regarding the non-partisan effect of election uncertainty on stock abnormal returns (*Ab_ret*), Eq. (6.10) is estimated with *Pol_unc* and *Elect_poll_chg* added separately and simultaneously. The results are reported in Appendix 6.2 for the full sample and country sub-samples. *Pol_unc* and *Elect_poll_chg* appear to have an insignificant impact on *Ab_ret* in almost all estimations, except for the CORE group. In the CORE group, *Elect_poll_chg* has a negative effect on *Ab_ret* in the estimations with and without *Pol_unc* (average effect equals -0.232%), statistically significant at 5% level (Columns 8 and 9 of Appendix 6.2). Given a large number of opinion polls in countries in the CORE group, stock returns might be more sensitive

[131] The standard deviation of *Elect_poll_chg* in the GIIPS, CORE, and REM groups are 2.607%, 1.403%, and 3.183% respectively. The standard deviation of *Pol_unc* in the GIIPS, CORE, and REM groups are 11.639%, 6.710%, and 11.070% respectively.

to changes in polling results compared to those in other countries. This finding is consistent with the EUH, highlighting that the stock market return decreases when the uncertainty about forthcoming election results (as measured by higher *Elect_poll_chg*) is reduced. Eq. (6.11) is estimated to examine the correlation between the partisan election uncertainty *(Govsup_chg)* and *Ab_ret*. The results show an insignificant relationship between *Govsup_chg* and *Ab_ret* (Appendix 6.3). While there is a statistically significant relationship between election uncertainty and stock volatility, the relationship between election uncertainty and stock return is not significant across the entire sample. These findings reveal heterogeneous effects of the election uncertainty on stock markets. For example, in response to lower *Pol_unc*, some investors may find less election uncertainty, however others might feel uncertain about future policy changes. This shows that market participants may react differently to the information provided by opinion polls, hence this may result in more discrepancy in stock valuation rather than the actual change in stock return (Enikolopov et al., 2018). The results are broadly consistent with the findings of Fan et al. (2020a). They show that social media information, which jointly mentioned firms and political figures (e.g. politicians, policy keywords, and policy-sensitive industries), affects the same firms' stock volatility, but does not affect stock return as investors have diverse reactions to social media information flows.

6.6.2 Stock markets around election days

This sub-section presents the results of the event study that examines the impact of elections on stock volatility and the FEM that calculates the effect of election shock on stock volatility. The dependent variable is cumulative abnormal volatility CAV, which is the sum of abnormal volatility over different event windows [0; 1], [0; 2], [0; 3], [0; 4], [0; 5], [0; 6], and [0; 7] where the election day is on date 0. Using short time windows controls for event contamination. However, different time windows are used to check for robustness.

Table 6.8 reports changes in volatility following the election day. The t-test and Wilcoxon test are used to examine whether the average and median CAVs are significantly different from zero (Pantzalis et al., 2000). Mean and median values of CAVs in the [0; 1] time window are 0.296% and 0.068% respectively, statistically significant at 5% level, implying that stock markets appear to be more volatile on election days and one day after. This rise continues for a number of days thereafter. Particularly, the mean CAVs increases from 0.296% in [0; 1] time window to 0.341% (0.352%) in the [0; 2] ([0; 3]) time windows, significant at the 10% level and above. This implies that within 3 days after the election days, the ex post disagreement among market participants increases significantly. These findings are consistent

with Bialkowski et al. (2008), who show that markets tend to settle down after the increase of abnormal volatility in 15 trading days following the elections. The prolonged reaction might be attributed to the fact that in some countries the official announcement about the government formation may not be released until several days after the elections due to the need to form coalitions. After elections, the political parties, usually led by the prime ministerial candidate from the largest party, enter negotiations over the partisan composition of the cabinet (Mattila and Raunio, 2004). Unless a single party wins a huge majority, governments tend to emerge through a process of inter-party bargaining in which electoral outcomes provide only the initial bargaining weights to form a new government.

Next, Eq. (6.9) is estimated to examine whether election prediction determines changes in CAVs. The main variable of interest is *Poll_diff* defined in Section 6.4.2. Table 6.9 reports the estimations of Eq. (6.9). It is shown that the *Poll_diff* has a negative effect on the CAV across all time windows except for the [0; 1] time window, statistically significant at the 10% level. Particularly, a 1% increase in *Poll_diff* is associated with a 0.058% decrease in CAV within the [0; 2] time window (average effect equals -9.825%). This effect lasts until day 7 after the election. This finding is consistent with Hypothesis 2 – H_2, indicating that stock markets are less volatile when there is less election induced-uncertainty measured by higher *Poll_diff*. This is due to investors being less surprised and more informed about the electoral outcome following the polling result of LP. Therefore, the accuracy of polling results can be added as the determinant of election shocks which influence the stock markets. Although prediction markets have failed to predict some of the recent political events such as the Brexit referendum or the victory of Donald Trump in the 2016 US election, their role as a proxy for market expectation of the election outcomes cannot be negated (Goodell et al., 2020). Regarding the control variables, *Vix_chg* has a statistically positive effect on CAV in the [0; 1] and [0; 2] time windows, while *Avg_rat* has a statistically negative effect on CAV in the [0; 1] time window.

For robustness checks, Eq. (6.9) is estimated with/without year FE instead of using *Y_crisis* or replacing *Y_crisis* by *Y_crisis2* as defined in Section 6.5. The results are reported in Appendix 6.6. For regressions using year FE, there are consistent results in the [0; 5] and [0; 6] time window (Panel A in Appendix 6.6). The results of estimations without year FE provide robust results across all time windows except for the [0; 1] time window (Panel B in Appendix 6.6). When replacing *Y_crisis* by *Y_crisis2*, the levels of significance are similar as before (Panel C in Appendix 6.6).

Next, this section presents the results of the event study that examines how stock returns react following election days (Appendix 6.4); and the results of the FEM that evaluates the effect of the election shock on stock return (Appendix 6.5). The dependent variable is the cumulative abnormal return CAR, which is the sum of abnormal return over different event windows [0; 1], [0; 2], [0; 3], [0; 4], [0; 5], [0; 6], and [0; 7], where the election day is on date 0. The results in Appendix 6.4 show that CAR coefficients are not significant, indicating that stock returns are not significantly affected by elections. This finding is consistent with the finding of Bialkowski et al. (2008), who provide evidence of increased stock volatility accompanied by negligible CARs during elections. They argue that much of the future policy uncertainty is resolved during balloting periods, hence stock prices can adjust dramatically in either direction causing stock volatility to increase while having an insignificant effect on stock return.[132] Disagreement among investors' views on stock valuation could be driven by their different views on electoral outcomes and the prospect of future policies (e.g. Knight, 2006; Boutchkova et al., 2012; Wagner et al., 2018). Future policies are expected to benefit firms in different ways. For example, Wagner et al. (2018) find that in the US, only the values of high-tax and domestically focused firms increased after Trump's victory in 2016 due to the prospect of lower corporate taxes and more restrictive trade policies. The results in Appendix 6.5 show that the election shock (*Poll_diff*) has an insignificant effect on stock return in post-election periods.

To test for asymmetric effects, the sample is divided into two sub-samples with negative and positive *Poll_diff*. Results are reported in Appendix 6.7 and Appendix 6.8 for the estimations of Eq. (6.9) and Eq. (6.12) on CAV and CAR, respectively. Election shocks seem to have an asymmetric effect on CAV. Particularly, in the case of positive changes, an increase in *Poll_diff* results in a decrease of stock volatility in [0;4], [0;5], [0;6] and [0;7] time windows. In the case of negative changes, *Poll_diff* does not seem to have a significant impact. This might be driven by the small number of observations (38 cases). Consistent with the main tests, election shocks have an insignificant effect on CAR in both cases.

For robustness checks, this Chapter also considers the effect of the ideology of the eventual largest party since it strongly affects future policies (Bialkowski et al., 2008). Hence, an additional independent variable indicating the ideology of the eventual largest party

[132] Bialkowski et al. (2008) examine changes in stock returns during the days after elections using a sample of 27 OECD countries from 1980s to 2004. They find that the mean of CARs within different time windows (e.g. 2, 5, 10, and 25 days) after elections is statistically insignificant and that the fraction of elections with positive CARs equals approximately 50%.

(*Ideology*) has been added to Eq. (6.9) and Eq. (6.12). Appendix 6.9 reports the results, which are robust and consistent with the main results across time windows.

6.7 Conclusion

This chapter investigates the reactions of stock markets to election uncertainty and election shock. It finds that stock markets tend to be more volatile in response to higher election uncertainty in pre-election periods. In addition, the empirical analyses show that stock volatility increases in post-election periods and this reaction is determined by the accuracy of the election prediction. However, stock returns seem to be unaffected by the election uncertainty and election shock. These findings indicate that the uncertainty around election days is more likely to cause disagreement among investors' views on a stock's fundamental value rather than the actual change in stock return. Even though prior studies on the relationship between stock performance and elections are insightful, none of them calculates election uncertainty and election shock directly from the daily polling data at a multi-country level. Opinion polls have become a popular platform for gauging voting intentions, hence they can be considered as a proxy for market expectation of election outcomes.

To answer the research question on whether the election uncertainty and election shock affect stock markets, this study uses a rich dataset of polling results and electoral outcomes of 26 EU countries (excluding Luxembourg and Lithuania) during the period from January 01, 2005 to September 03, 2019. Polling results for the eventual largest party, the eventual runner up party, and the incumbent party are hand-collected from various online sources (e.g. online articles and publicly available polling datasets). Given the polling dataset is at a multi-country level, this study provides a unique analysis on the election uncertainty associated with different political systems across countries in comparison to prior studies using data from a single country (e.g. Goodell and Vähämaa, 2020). The dataset of electoral outcomes is collected mainly from the European Election Database if available, if not updated yet data is obtained from government websites or newspapers. National stock indices are collected from Thomson Eikon for the sample period. To calculate the daily stock volatility following Parkinson (1980), the daily high and low stock prices are collected. After matching polling results, electoral outcomes, and stock dataset, this analysis covers 91 political elections.

In order to investigate the relationship between election uncertainty and stock indicators, such as stock volatility and stock return, in the run up to elections, this study performs the FEM with country and time FE to control for the unobserved variables' issues.

This study captures both the non-partisan and partisan effect of election uncertainty. Regardless of the partisan effect which assumes that markets prefer one political party to another, it finds that the stock volatility and abnormal volatility tend to be larger when the election outcome is more uncertain, as measured by a lower electoral poll spread between the eventual largest and runner up parties. The relation to election uncertainty is significant for both stock volatility and abnormal volatility at the 10% level. This finding is consistent with the election uncertainty hypothesis (EUH). The results are robust for country sub-groups: CORE and REM. The GIIPS group appears to have different effects from the other groups whereby abnormal volatility tends to decrease when the election uncertainty increases as predicted by the political uncertainty hypothesis (PUH). Accordingly, the uncertainty regarding future policy may decrease despite the increase in the election uncertainty. The impact of election uncertainty on stock returns is not significant except for the CORE group. This study finds that in the CORE group, stock abnormal return tends to decrease when the election uncertainty decreases as measured by the increase in support for the eventual largest party. This is consistent with the EUH.

Regarding the partisan effect, assuming that investors favour the incumbent party, this study shows a positive correlation between the stock volatility and the election uncertainty, while stock return is not correlated with election uncertainty. Higher (lower) partisan election uncertainty is measured as the decrease (increase) in the support for the incumbent party. In this analysis, it appears that investors in the CORE group are more sensitive to the negative change in the support for the incumbent party, while those in full sample, GIIPS, and REM group are more sensitive to the positive change. The election uncertainty should affect stock markets uncertainty as the election process disseminates information about the future policy (Goodell et al., 2020). These empirical findings are consistent with the predictions of Pástor and Veronesi's (2013) model in which political uncertainty carries a risk premium.

In an additional analysis, the event study and the FEM are used to examine how stock markets react and whether the election shock affects stock volatility and returns in post-election periods, respectively. The findings imply that stocks tend to be more volatile within three days after the election days. This prolonged reaction might be driven by the process of government formation after the elections. Election shock, as measured by the difference between the actual and expected electoral outcomes *Poll_diff*, is a determinant of changes in stock volatility after election days. Particularly, stock volatility decreases when there is less election-induced uncertainty measured by higher *Poll_diff*. In this case, investors might not be surprised at the electoral outcomes as they are already informed by the pre-election poll. Stock returns do not

significantly change following election days and *Poll_diff* seems to have an insignificant effect on stock return. These findings reveal heterogeneous effects of elections on stock markets.

This study contributes to two strands of the literature. First, the findings confirm the relationship among political uncertainty, policy uncertainty, and financial markets (see Pástor and Veronesi, 2013; Kelly et al., 2016; Goodell et al., 2020). This line of research is based on the idea that political uncertainty, as uncertainty about the government's future actions, drives financial uncertainty via its impact on policy uncertainty. Focusing on national elections, this study finds consistent results that the election uncertainty, as uncertainty about who will be elected, affects stock volatility. However, the effect of election uncertainty on stock return is not robust, except for the CORE countries. Instead of using betting markets in prior studies (e.g. Goodell and Vähämaa, 2013), the election uncertainty in this Chapter is measured directly from voters' expectations. Second, this Chapter extends Bialkowski et al.'s (2008) study, to pinpoint the factors of election shocks which could influence the stock volatility. They find that election shocks are driven by the electoral outcomes when the outcome of the election brings a change in the political orientation of the government, and when the government does not secure the parliament. The results of this study provide evidence that the accuracy of pre-election polls can be added as the determinant of election-induced volatility.

The findings provide important insights into the link between the election uncertainty and financial uncertainty in European countries, highlighting several implications for practitioners and academics. First, the results of this Chapter can be of interest to participants in option markets and volatility traders who seek to interpret how changes in the success likelihood of political parties may impact on the level of stock volatility. As Parkinson 's (1980) volatility has an explanatory power on both realized volatility and implied volatility (Engle and Gallo, 2006), options may trade at a higher implied volatility during the period of high intraday volatility as a result of election-induced uncertainty. Higher implied volatility in the period of potential political changes is associated with higher option prices (Bialkowski et al., 2008). In terms of strategies, traders can cash in on the above-normal volatility by designing specific combinations of options that can be profitable. Particularly, they could use option-based trading strategies such as straddles and strangles to exploit changes in implied volatility around elections as discussed by Bialkowski et al. (2008).[133] Additionally, this study indicates that the negative poll spread between the eventual largest and runner up parties (*Pol_unc*) has the

[133] Straddles and strangles are option strategies that allow investors to make profit if the share price moves in either direction – this is also called volatility strategy (Cuthbertson and Nitzsche, 2008). Accordingly, investors buy an equal number of call and put options with the same expiration date in these approaches. While call and put options in straddles have a common strike price, those in strangles have two different strike prices.

highest explanatory power on the predictability of changes in volatility. Thus, it would be rational to short sell put options in the run up to elections when *Pol_unc* tends to decrease (reducing volatility). It is also important for investors to know that the GIIPS group might have different exposure to election uncertainty compared to the rest of the EU countries. Second, pollsters may find the importance to provide pre-election forecast suffices for practical applications. Since the stock participants tend to react to the accuracy of pre-election polls in post-election periods, the efforts to formulate precise opinion polls should be furthered. Regulators and policy makers therefore should consider to the market impact of opinion polls when debating the new regulation and reform of polling firms.

Finally, elections capture only a subset of political events faced by investors, hence future research can analyse other political events, such as regulatory reforms, government shutdowns, the Brexit referendum, and the Scottish independence referendum. This will help in improving the understanding of the role of political events in determining prices of stocks and other financial assets, such as bonds, options, and credit default swaps.

Tables

Table 6.1 Descriptive statistics of opinion polls (%)

			Support for eventual largest party			Support for eventual runner up party		
Country	**Start date**	**End date**	**No. of Obs.**	**Mean**	**Std. Dev.**	**No. of Obs.**	**Mean**	**Std. Dev.**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Austria	12/07/2006	09/10/2017	192	25.76	4.85	192	25.24	3.37
Belgium	29/04/2007	14/05/2019	9	25.44	6.42	6	13.13	8.83
Bulgaria	03/07/2009	22/03/2017	33	26.14	4.92	33	22.50	4.74
Croatia	04/07/2008	03/09/2016	101	33.09	3.60	101	25.57	4.88
Cyprus	17/07/2015	13/05/2016	6	33.63	1.59	6	26.30	1.46
Czech	10/01/2005	17/10/2017	143	27.05	3.80	112	7.76	5.88
Denmark	07/02/2005	04/06/2019	349	23.43	3.00	349	23.82	5.45
Estonia	31/07/2006	28/02/2019	91	26.94	4.65	91	25.96	3.00
Finland	31/01/2006	09/04/2019	110	20.86	2.79	110	14.78	5.59
France	22/03/2007	05/05/2017	117	30.20	12.92	117	28.36	7.15
Germany	04/01/2005	22/09/2017	2022	36.97	3.62	2022	26.23	3.16
Greece	28/08/2007	05/07/2019	370	25.76	6.11	370	17.64	7.76
Hungary	28/03/2006	03/04/2018	188	47.96	5.54	188	20.34	4.55
Ireland	20/05/2007	23/02/2016	66	28.97	4.55	66	21.71	4.03
Italy	17/03/2006	16/02/2018	1122	19.26	9.06	1121	30.09	4.69
Latvia	02/07/2010	30/09/2018	16	19.86	3.76	16	10.06	4.83
Malta	07/01/2012	03/03/2013	5	51.72	0.64	5	24.88	2.83
Netherlands	10/06/2010	14/03/2017	1681	18.14	2.82	1681	15.82	3.00
Poland	09/01/2005	22/10/2015	301	30.38	6.12	301	28.53	5.14
Portugal	21/01/2005	30/09/2015	114	40.42	4.18	114	31.55	2.95
Romania	27/06/2008	07/12/2016	13	36.99	5.50	13	30.18	5.48
Slovakia	31/05/2010	14/02/2016	5	30.96	11.94	4	8.95	3.81
Slovenia	11/09/2008	01/06/2018	125	15.82	5.84	46	18.74	8.18
Spain	04/01/2005	27/04/2019	746	33.67	8.91	745	30.05	7.18
Sweden	22/08/2010	06/09/2018	326	28.02	3.66	326	23.93	4.92
UK	03/05/2005	07/06/2017	1090	35.64	4.04	1090	37.58	4.94

This Table presents descriptive statistics of the support for the eventual largest and runner up party in the run up to elections. The sample covers 26 EU countries (excluding Luxembourg and Lithuania) for the period from 2005 to 2019.

Table 6.2 Elections

Country	No. of elections	Years of election	Poll_diff (%)	Poll_spread (%)
(1)	(2)	(3)	(4)	(5)
Austria	4	2006, 2008, 2013, 2017	1.60	1.88
Belgium	3	2010, 2014, 2019	-6.34	1.47
Bulgaria	4	2009, 2013, 2014, 2017	1.61	9.09
Croatia	3	2011, 2015, 2016	5.22	1.83
Cyprus	1	2016	-1.11	5.80
Czech	3	2010, 2013, 2017	0.97	8.36
Denmark	4	2005, 2011, 2015, 2019	0.11	4.29
Estonia	4	2007, 2011, 2015, 2019	1.35	1.78
Finland	4	2007, 2011, 2015, 2019	-1.42	3.85
France*	6	2007, 2012, 2017	-1.28	9.03
Germany	4	2005, 2009, 2013, 2017	-1.12	10.75
Greece**	6	2007, 2012, 2015, 2019	4.84	5.27
Hungary	4	2006, 2010, 2014, 2018	-1.87	24.50
Ireland	3	2007, 2011, 2016	-1.28	14.67
Italy	4	2006, 2008, 2013, 2018	2.32	0.89
Latvia	3	2010, 2014, 2018	1.59	5.74
Malta	1	2013	14.63	12.00
Netherlands	2	2012, 2017	3.78	1.81
Poland	4	2005, 2007, 2011, 2015	-0.19	8.54
Portugal	4	2005, 2009, 2011, 2015	0.46	8.29
Romania	3	2008, 2012, 2016	0.72	21.13
Slovakia	3	2010, 2012, 2016	0.94	25.22
Slovenia	3	2011, 2014, 2018	3.27	3.55
Spain	5	2008, 2011, 2015, 2016, 2019	0.75	9.75
Sweden	2	2014, 2018	2.62	7.75
UK	4	2005, 2010, 2015, 2017	0.26	5.39
Total	91			

This Table presents the descriptive statistics of 91 elections of 26 EU countries (excluding Luxembourg and Lithuania) from 2005 to 2019 that have polling data available within 30 days ahead of the election. This Table also reports *Poll_diff* which is the average difference between the electoral outcome and the most recent polling result for the eventual largest party within 30 days prior to the election; and *Poll_spread* which is the average lead of eventual largest party over eventual runner up party in the most recent poll within 30 days prior to the election.
(*) Presidential elections in France have 2 rounds.
(**) Greece has 2 elections in 2012 and 2 elections in 2015.

Table 6.3 Summary statistics

Panel A. Summary statistics				
Variables	**Mean**	**Std. dev.**	**Min**	**Max**
Vol (%)	0.896	0.605	0.000	10.040
Ab_vol (%)	-0.014	0.559	-1.831	8.371
Ab_ret (%)	-0.005	1.323	-14.358	13.413
Elect_poll_chg (%)	0.027	2.373	-17.500	19.500
Pol_unc (%)	-3.273	10.163	-53.000	29.500
Avg_rat	43.780	12.103	2.000	52.000
Vix_chg (%)	-0.124	7.443	-35.059	76.825
Poll_diff (%)	0.813	4.158	-9.540	14.630
Y_crisis	0.385	0.489	0.000	1.000
Govsup_chg (%)	1.541	1.732	0.000	16.000

Panel B. Correlations								
	Vol	Ab_vol	Ab_ret	Elect_poll_chg	Pol_unc	Avg_rat	Vix_chg	Govsup_chg
Vol	1.000							
Ab_vol	0.840*	1.000						
Ab_ret	-0.120*	-0.143*	1.000					
Elect_poll_chg	-0.001	0.000	-0.004	1.000				
Pol_unc	0.051*	-0.012	0.012	-0.098*	1.000			
Avg_rat	-0.166*	0.008	-0.003	-0.015	-0.073*	1.000		
Vix_chg	0.067*	0.083*	-0.375*	-0.006	-0.004	0.010	1.000	
Govsup_chg	-0.002	0.006	-0.001	0.039*	-0.132*	-0.293*	-0.007	1.000

The table reports the summary statistic of all variables used in the regressions in Panel A and the Pearson correlation coefficients between variables in Panel B. *Vol*, *Ab_vol*, and *Ab_ret* are defined in Section 6.4. The control variables are defined in Appendix 6.1. * denotes correlations that are significantly different from 0 at the 1% significance level.

Table 6.4 The effect of non-partisan election uncertainty on stock volatility and abnormal volatility. Full sample

VARIABLES	Panel A: Vol			Panel B: Ab_vol		
	(1)	(2)	(3)	(4)	(5)	(6)
Pol_unc	0.002*		0.002*	0.001*		0.001*
	(0.001)		(0.001)	(0.001)		(0.001)
Elect_poll_chg		0.000	0.001		-0.000	0.001
		(0.003)	(0.003)		(0.003)	(0.003)
Avg_rat	-0.008***	-0.006***	-0.008***	0.002	0.004*	0.002
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)
Vix_chg	0.006***	0.006***	0.006***	0.006***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	1.085***	0.905***	1.084***	-0.141**	-0.301***	-0.142**
	(0.059)	(0.113)	(0.059)	(0.060)	(0.112)	(0.059)
Observations	9,216	9,332	9,216	9,215	9,331	9,215
R-squared	0.258	0.258	0.258	0.135	0.135	0.135
Country FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (6.5) and Eq. (6.6) using full sample of 26 EU countries (exclude Luxembourg and Lithuania) from 01/01/2005 to 03/09/2019. Dependent variables are daily volatility (*Vol*) and abnormal volatility (*Ab_vol)* presented in Panel A and Panel B respectively. *Pol_unc* is given as the negative of the election poll spread between the eventual largest and runner up parties. *Elect_poll_chg* is changes within 30 days in the support for the eventual largest party before the election. Control variables are defined in Appendix 6.1. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10 % level respectively.

Table 6.5 The effect of non-partisan election uncertainty on stock volatility. By country groups

VARIABLES	GIIPS			CORE			REM		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Pol_unc	-0.002		-0.002	0.007***		0.007***	0.003*		0.003*
	(0.002)		(0.002)	(0.002)		(0.002)	(0.002)		(0.002)
Elect_poll_chg		0.007	0.008		-0.003	-0.001		-0.003	-0.002
		(0.007)	(0.007)		(0.006)	(0.007)		(0.003)	(0.003)
Avg_rat	0.006	0.006	0.006	0.036***	0.030***	0.036***	-0.009	0.002	0.005***
	(0.006)	(0.006)	(0.006)	(0.011)	(0.011)	(0.011)	(0.006)	(0.007)	(0.001)
Vix_chg	0.006	0.006	0.006	0.006***	0.006***	0.006***	0.005***	0.005***	0.005***
	(0.004)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Constant	0.802***	0.824***	0.806***	-1.216**	-0.908*	-1.215**	0.961***	0.686***	0.363***
	(0.185)	(0.179)	(0.185)	(0.549)	(0.547)	(0.550)	(0.188)	(0.206)	(0.074)
Observations	2,416	2,418	2,416	4,128	4,131	4,128	2,672	2,783	2,672
R-squared	0.233	0.233	0.234	0.233	0.230	0.233	0.225	0.228	0.220
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (6.5) using full sample of 26 EU countries (exclude Luxembourg and Lithuania) from 01/01/2005 to 03/09/2019, which is divided into GIIPS, CORE, and REM. Dependent variable is daily volatility (*Vol*). *Pol_unc* is given as the negative of the election poll spread between the eventual largest and runner up parties. *Elect_poll_chg* is changes within 30 days in % support for the eventual largest party before the election. Control variables are defined in Appendix 6.1. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10 % level respectively.

Table 6.6 The effect of non-partisan election uncertainty on stock abnormal volatility. By country groups

VARIABLES	GIIPS			CORE			REM		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Pol_unc	-0.003*		-0.002	0.003**		0.003*	0.004***		0.004***
	(0.002)		(0.002)	(0.002)		(0.002)	(0.002)		(0.002)
Elect_poll_chg		0.007	0.007		-0.004	-0.003		-0.003	-0.002
		(0.007)	(0.007)		(0.006)	(0.006)		(0.003)	(0.003)
Avg_rat	0.010	0.009	0.010	0.009	0.006	0.009	0.001	0.011	0.001
	(0.006)	(0.006)	(0.006)	(0.011)	(0.011)	(0.011)	(0.007)	(0.008)	(0.007)
Vix_chg	0.006	0.006	0.006	0.006***	0.006***	0.006***	0.005***	0.005***	0.005***
	(0.004)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Constant	-0.298	-0.263	-0.294	-0.555	-0.409	-0.553	0.025	-0.196	0.023
	(0.193)	(0.187)	(0.193)	(0.538)	(0.534)	(0.539)	(0.192)	(0.216)	(0.192)
Observations	2,416	2,418	2,416	4,128	4,131	4,128	2,671	2,782	2,671
R-squared	0.104	0.104	0.105	0.184	0.183	0.184	0.174	0.173	0.175
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (6.6) using full sample of 26 EU countries (exclude Luxembourg and Lithuania) from 01/01/2005 to 03/09/2019, which is divided into GIIPS, CORE, and REM. Dependent variable is abnormal volatility (*Ab_vol*). *Pol_unc* is given as the negative of the election poll spread between the eventual largest and runner up parties. *Elect_poll_chg* is changes within 30 days in % support for the eventual largest party before the election. Control variables are defined in Appendix 6.1. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10 % level respectively.

Table 6.7 Partisan election uncertainty and both stock volatility and abnormal volatility

Panel A. Positive changes in the re-election probability of the incumbent party

VARIABLES	Full sample		GIIPS		CORE		REM	
	Vol	Ab_vol	Vol	Ab_vol	Vol	Ab_vol	Vol	Ab_vol
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Govsup_chg	-0.014***	-0.012**	-0.022**	-0.019**	0.003	0.002	-0.012**	-0.005
	(0.005)	(0.005)	(0.009)	(0.009)	(0.012)	(0.011)	(0.006)	(0.006)
Avg_rat	-0.007***	0.003	0.001	0.001	0.020	-0.005	0.001	0.001
	(0.003)	(0.003)	(0.008)	(0.008)	(0.016)	(0.016)	(0.004)	(0.009)
Vix_chg	0.006***	0.006***	-0.000	-0.000	0.008***	0.009***	0.007***	0.007***
	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)	(0.002)
Constant	1.034***	-0.176	1.050***	0.095	-0.389	0.184	0.664***	0.068
	(0.160)	(0.159)	(0.255)	(0.264)	(0.805)	(0.784)	(0.229)	(0.266)
Observations	4,342	4,342	1,219	1,219	1,829	1,829	1,294	1,294
R-squared	0.257	0.140	0.247	0.116	0.224	0.219	0.186	0.158
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Panel B. Negative changes in the re-election probability of the incumbent party

VARIABLES	Full sample		GIIPS		CORE		REM	
	Vol	Ab_vol	Vol	Ab_vol	Vol	Ab_vol	Vol	Ab_vol
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Govsup_chg	-0.002	-0.002	-0.010	-0.009	0.029*	0.030*	-0.002	-0.000
	(0.005)	(0.005)	(0.011)	(0.011)	(0.016)	(0.016)	(0.006)	(0.006)
Avg_rat	-0.008***	0.003	-0.001	-0.000	0.036**	0.010	-0.028***	-0.007
	(0.003)	(0.003)	(0.007)	(0.008)	(0.016)	(0.015)	(0.008)	(0.007)
Vix_chg	0.005**	0.005**	0.013**	0.013**	0.003	0.003	0.001	0.000
	(0.002)	(0.002)	(0.007)	(0.006)	(0.003)	(0.003)	(0.002)	(0.002)
Constant	0.959***	-0.287*	0.972***	-0.032	-1.333*	-0.723	1.437***	0.222
	(0.154)	(0.153)	(0.247)	(0.253)	(0.794)	(0.771)	(0.216)	(0.214)
Observations	4,372	4,371	1,264	1,264	1,875	1,875	1,233	1,232
R-squared	0.251	0.120	0.215	0.097	0.228	0.162	0.228	0.188
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

The Table presents the correlation coefficient estimated by using Eq. (6.7) and Eq. (6.8) for full sample of 26 EU countries (exclude Luxembourg and Lithuania) from 01/01/2005 to 03/09/2019, which is divided into GIIPS, CORE, and REM. *Vol (Ab_vol)* is daily volatility (abnormal volatility). *Govsup_chg* is the absolute value of changes within 30 days in the support for the incumbent party. Control variables are defined in Appendix 6.1. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10 % level respectively.

Table 6.8 Event study. Response of CAV to elections

Time window	Mean	Median
[0;1]	0.296***	0.068**
[0;2]	0.341**	-0.038
[0;3]	0.352*	-0.005
[0;4]	0.326	-0.092
[0;5]	0.293	-0.063
[0;6]	0.355	-0.167
[0;7]	0.457	-0.182

This Table presents average and median cumulative abnormal volatility (CAV) in response to the elections using full sample of 26 EU countries (exclude Luxembourg and Lithuania) from 01/01/2005 to 03/09/2019. CAV is calculated over different time window [0; 1], [0; 2], [0; 3], [0; 4], [0; 5], [0; 6], and [0; 7] where election day is on date 0. T-test and Wilcoxon test are used to examine whether the average and median CAVs are significantly different from zero. ***, **, and * indicate significance at the 1%, 5%, and 10 % level respectively.

Table 6.9 The effect of election shock on CAV

	[0;1]	[0;2]	[0;3]	[0;4]	[0;5]	[0;6]	[0;7]
Poll_diff	-0.016	-0.058*	-0.082**	-0.118**	-0.160**	-0.198**	-0.224**
	(0.020)	(0.030)	(0.037)	(0.051)	(0.063)	(0.081)	(0.100)
Avg_rat	-0.032**	-0.036	-0.034	-0.030	-0.026	-0.036	-0.044
	(0.015)	(0.024)	(0.034)	(0.043)	(0.051)	(0.063)	(0.079)
Vix_chg	0.028**	0.040*	0.038	0.050	0.069	0.087	0.099
	(0.013)	(0.021)	(0.025)	(0.033)	(0.043)	(0.061)	(0.073)
Y_crisis	0.173	0.078	-0.063	-0.127	-0.045	0.096	0.257
	(0.164)	(0.255)	(0.341)	(0.430)	(0.518)	(0.669)	(0.794)
Constant	2.383**	3.006	3.196	3.555	3.848	5.504	6.615
	(1.131)	(1.974)	(2.581)	(3.327)	(4.166)	(5.672)	(6.911)
Observations	91	91	91	91	91	91	91
R-squared	0.393	0.421	0.376	0.353	0.358	0.365	0.351
Country FE	YES	YES	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO	NO	NO

The Table presents the coefficient estimates of Eq. (6.9) using full sample of 26 EU countries (exclude Luxembourg and Lithuania) from 01/01/2005 to 03/09/2019. Dependent variable is cumulative abnormal volatility *(CAV)* over different time windows [0; 1], [0; 2], [0; 3], [0; 4], [0; 5], [0; 6], and [0; 7] where election day is on date 0. *Poll_diff* is the difference between election outcome and the most recent polling result for the eventual largest party within 30 days ahead of election. Control variables are defined in Appendix 6.1. In all regressions, FE are captured by a full set of country dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10 % level respectively.

Appendices

Appendix 6.1 List of variables

Variables	Definition
Vol (%)	The intraday high and low volatility (Parkinson, 1980)
Ab_vol (%)	Abnormal volatility equals to volatility today t = 0 minus the average volatility over the period [-230; -30] (Fan et al., 2020b)
Ab_ret (%)	Abnormal return equals to log return today t = 0 minus the expected return calculated by average return over the period [-230; -30] (Williams et al., 2015)
Elect_poll_chg (%)	Changes within 30 days in the support for the eventual largest party before the election (Goodell and Vähämaa, 2013)
Pol_unc (%)	Political uncertainty is the negative poll spread between the eventual largest and runner up parties (Kelly et al., 2016)
Avg_rat	Average sovereign credit rating of three biggest CRAs: S&P, Moody's, and Fitch based on 52-point scale (Abad et al., 2018)
Vix_chg (%)	The contemporaneous logarithmic changes of CBOE VIX index (Thomson Reuters Eikon) (Abad et al., 2018)
Poll_diff (%)	The difference between election outcome and the most recent polling result for the eventual largest party within 30 days ahead of elections (Bélanger and Soroka, 2012)
Y_crisis	Dummy variable equals to one during sovereign debt crisis (2008-2013) and 0 otherwise
Y_crisis2	Dummy variable equals to 0 for pre-election period (before 2008), 1 for crisis period (2008-2013), and 2 for post-crisis period (2013-2019)
Govsup_chg (%)	The absolute value of changes within 30 days in the support for the incumbent party (Goodell et al., 2020)

Appendix 6.2 The effect of non-partisan election uncertainty on stock abnormal return

VARIABLES	Full sample			GIIPS			CORE			REM		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Pol_unc	0.001		0.001	0.001		0.001	0.003		0.002	0.003		0.003
	(0.002)		(0.002)	(0.004)		(0.004)	(0.004)		(0.004)	(0.004)		(0.004)
Elect_poll_chg		-0.003	-0.005		-0.003	-0.004		-0.028**	-0.028**		-0.002	-0.002
		(0.006)	(0.006)		(0.014)	(0.014)		(0.014)	(0.014)		(0.006)	(0.007)
Avg_rat	-0.003	-0.002	-0.003	-0.009	-0.008	-0.009	-0.004	-0.009	-0.005	0.008	0.025	0.008
	(0.005)	(0.005)	(0.005)	(0.013)	(0.013)	(0.013)	(0.027)	(0.027)	(0.027)	(0.018)	(0.021)	(0.018)
Vix_chg	-0.067***	-0.067***	-0.067***	-0.091***	-0.091***	-0.091***	-0.084***	-0.084***	-0.084***	-0.025***	-0.025***	-0.025***
	(0.003)	(0.003)	(0.003)	(0.007)	(0.007)	(0.007)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
Constant	0.166	0.134	0.164	0.131	0.077	0.129	0.209	0.446	0.234	-0.274	-0.676	-0.276
	(0.261)	(0.261)	(0.261)	(0.406)	(0.397)	(0.406)	(1.352)	(1.335)	(1.353)	(0.525)	(0.589)	(0.526)
Observations	9,225	9,346	9,225	2,416	2,418	2,416	4,128	4,131	4,128	2,681	2,797	2,681
R-squared	0.147	0.145	0.147	0.173	0.173	0.173	0.241	0.242	0.242	0.047	0.047	0.047
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

The Table presents the coefficient estimates of Eq. (6.10) using full sample of 26 EU countries (exclude Luxembourg and Lithuania) from 01/01/2005 to 03/09/2019, which is divided into GIIPS, CORE, and REM. Dependent variable is abnormal return (*Ab_ret)*. *Pol_unc* is given as the negative of the election poll spread between the eventual largest and runner up parties. *Elect_poll_chg* is changes within 30 days in % support for the eventual largest party before the election. Control variables are defined in Appendix 6.1. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10 % level respectively.

Appendix 6.3 Partisan election uncertainty and stock abnormal return

Panel A. Positive changes in the re-election probability of the incumbent party

VARIABLES	Full sample	GIIPS	CORE	REM
	(1)	(2)	(3)	(4)
Govsup_chg	-0.003	-0.002	-0.008	-0.005
	(0.011)	(0.021)	(0.027)	(0.013)
Avg_rat	0.005	-0.008	0.012	-0.003
	(0.006)	(0.018)	(0.040)	(0.020)
Vix_chg	-0.061***	-0.086***	-0.077***	-0.025***
	(0.004)	(0.010)	(0.005)	(0.005)
Constant	-0.272	0.203	-0.623	-0.576
	(0.364)	(0.573)	(2.032)	(0.656)
Observations	4,353	1,219	1,829	1,305
R-squared	0.136	0.169	0.237	0.060
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Panel B. Negative changes in the re-election probability of the incumbent

VARIABLES	Full sample	GIIPS	CORE	REM
	(1)	(2)	(3)	(4)
Govsup_chg	0.002	0.019	0.029	-0.019
	(0.013)	(0.027)	(0.035)	(0.015)
Avg_rat	-0.007	-0.006	-0.023	0.015
	(0.006)	(0.016)	(0.041)	(0.020)
Vix_chg	-0.075***	-0.101***	-0.090***	-0.027***
	(0.004)	(0.011)	(0.005)	(0.006)
Constant	0.406	-0.211	1.217	0.269
	(0.369)	(0.512)	(2.078)	(0.576)
Observations	4,372	1,264	1,875	1,233
R-squared	0.172	0.212	0.265	0.056
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

The Table presents the correlation coefficient estimated by using Eq. (6.11) for full sample of 26 EU countries (exclude Luxembourg and Lithuania) from 01/01/2005 to 03/09/2019, which is divided into GIIPS, CORE, and REM. *Ab_ret* is abnormal return. *Govsup_chg* is the absolute value of changes within 30 days in the support for the incumbent party. Control variables are defined in Appendix 6.1. In all regressions, FE are captured by a full set of both country and year dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10 % level respectively.

Appendix 6.4 Event study. Response of CAR to elections

Time window	Mean	Median
[0;1]	-0.126	-0.021
[0;2]	0.013	0.062
[0;3]	0.02	0.118
[0;4]	0.001	0.208
[0;5]	-0.062	-0.185
[0;6]	-0.317	0.05
[0;7]	-0.435	0.015

This Table presents average and median cumulative abnormal return (CAR) in response to the elections using full sample of 26 EU countries (exclude Luxembourg and Lithuania) from 01/01/2005 to 03/09/2019. CAR is calculated over different time window [0; 1], [0; 2], [0; 3], [0; 4], [0; 5], [0; 6], and [0; 7] where election day is on date 0. T-test and Wilcoxon test are used to examine whether the average and median CARs are significantly different from zero. ***, **, and * indicate significance at the 1%, 5%, and 10 % level respectively.

Appendix 6.5 The effect of election shock on CAR

	[0;1]	[0;2]	[0;3]	[0;4]	[0;5]	[0;6]	[0;7]
Poll_diff	0.062	0.127	0.126	0.086	0.088	0.138	0.147
	(0.051)	(0.071)	(0.087)	(0.090)	(0.100)	(0.101)	(0.121)
Avg_rat	0.043	0.053	0.061	0.010	0.033	0.092	0.134*
	(0.040)	(0.071)	(0.093)	(0.091)	(0.098)	(0.086)	(0.080)
Vix_chg	-0.118***	-0.153***	-0.148***	-0.154***	-0.134***	-0.147***	-0.180***
	(0.026)	(0.040)	(0.037)	(0.037)	(0.034)	(0.038)	(0.049)
Y_crisis	0.309	0.368	0.478	0.394	-0.181	-1.029	-1.121
	(0.417)	(0.667)	(0.778)	(0.768)	(0.844)	(0.726)	(0.905)
Constant	-4.029*	-4.162	-4.474	-2.688	-2.473	-7.208	-10.043**
	(2.399)	(3.736)	(4.940)	(5.081)	(5.091)	(4.836)	(4.988)
Observations	91	91	91	91	91	91	91
R-squared	0.513	0.451	0.358	0.328	0.268	0.477	0.399
Country FE	YES	YES	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO	NO	NO

The Table presents the coefficient estimates of Eq. (6.12) using full sample of 26 EU countries (exclude Luxembourg and Lithuania) from 01/01/2005 to 03/09/2019. Dependent variable is cumulative abnormal volatility *(CAR)* over different time windows [0; 1], [0; 2], [0; 3], [0; 4], [0; 5], [0; 6], and [0; 7] where election day is on date 0. *Poll_diff* is the difference between election outcome and the most recent polling result for the eventual largest party within 30 days ahead of election. Control variables are defined in Appendix 6.1. In all regressions, FE are captured by a full set of country dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10 % level respectively.

Appendix 6.6 The effect of election shock on CAV – Time dummies

Panel A. With year FE

	[0;1]	[0;2]	[0;3]	[0;4]	[0;5]	[0;6]	[0;7]
Poll_diff	-0.009	-0.047	-0.072	-0.114	-0.155*	-0.185*	-0.217
	(0.027)	(0.042)	(0.056)	(0.073)	(0.088)	(0.110)	(0.133)
Avg_rat	-0.046**	-0.050	-0.044	-0.035	-0.029	-0.046	-0.045
	(0.021)	(0.038)	(0.052)	(0.065)	(0.077)	(0.097)	(0.118)
Vix_chg	0.034**	0.041*	0.036	0.050	0.064*	0.076	0.086
	(0.015)	(0.022)	(0.025)	(0.031)	(0.038)	(0.051)	(0.060)
Constant	2.291	2.659	2.876	2.348	2.389	4.251	4.715
	(1.456)	(2.403)	(3.245)	(4.044)	(4.878)	(6.485)	(7.833)
Observations	91	91	91	91	91	91	91
R-squared	0.517	0.522	0.446	0.450	0.474	0.485	0.474
Country FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES

Panel B. Without year FE

	[0;1]	[0;2]	[0;3]	[0;4]	[0;5]	[0;6]	[0;7]
Poll_diff	-0.019	-0.060*	-0.081**	-0.116**	-0.159**	-0.200**	-0.229**
	(0.020)	(0.031)	(0.038)	(0.052)	(0.064)	(0.081)	(0.100)
Avg_rat	-0.033**	-0.036	-0.034	-0.030	-0.026	-0.036	-0.045
	(0.014)	(0.024)	(0.033)	(0.043)	(0.051)	(0.063)	(0.079)
Vix_chg	0.029**	0.040*	0.038	0.049	0.068	0.088	0.101
	(0.014)	(0.022)	(0.026)	(0.034)	(0.044)	(0.063)	(0.076)
Constant	2.474**	3.047	3.163	3.488	3.824	5.554	6.750
	(1.143)	(1.992)	(2.566)	(3.319)	(4.174)	(5.723)	(6.979)
Observations	91	91	91	91	91	91	91
R-squared	0.384	0.420	0.376	0.352	0.358	0.365	0.350
Country FE	YES	YES	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO	NO	NO

Appendix 6.6 (continued)

Panel C. With Y_crisis2

	[0;1]	[0;2]	[0;3]	[0;4]	[0;5]	[0;6]	[0;7]
Poll_diff	-0.013	-0.058*	-0.084**	-0.125**	-0.171**	-0.211**	-0.245**
	(0.020)	(0.031)	(0.040)	(0.055)	(0.068)	(0.086)	(0.106)
Avg_rat	-0.041**	-0.038	-0.031	-0.016	-0.009	-0.021	-0.022
	(0.018)	(0.029)	(0.038)	(0.049)	(0.058)	(0.071)	(0.085)
Vix_chg	0.028**	0.040*	0.038	0.050	0.070	0.089	0.103
	(0.014)	(0.022)	(0.026)	(0.034)	(0.044)	(0.063)	(0.076)
Y_crisis2	-0.147	-0.041	0.059	0.243	0.298	0.271	0.402
	(0.149)	(0.233)	(0.303)	(0.372)	(0.431)	(0.530)	(0.609)
Constant	3.045**	3.206	2.934	2.545	2.664	4.502	5.187
	(1.269)	(2.164)	(2.731)	(3.563)	(4.410)	(5.921)	(7.047)
Observations	91	91	91	91	91	91	91
R-squared	0.395	0.421	0.376	0.356	0.362	0.367	0.354
Country FE	YES	YES	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO	NO	NO

The Table presents the coefficient estimates of Eq. (6.9) using full sample of 26 EU countries (exclude Luxembourg and Lithuania) from 01/01/2005 to 03/09/2019. Dependent variable is cumulative abnormal volatility (*CAV*) over different time windows [0; 1], [0; 2], [0; 3], [0; 4], [0; 5], [0; 6], and [0; 7] where election day is on date 0. *Poll_diff* is the difference between election outcome and the most recent polling result for the eventual largest party within 30 days ahead of election. Control variables are defined in Appendix 6.1. In all regressions, FE are captured by a full set of country dummies. Instead of using *Y_crisis* in Eq. (6.9), Panels A and B present estimations with and without year FE respectively. Panel C presents estimation, in which Y_crisis is replaced by Y_crisis2 (See Appendix 6.1for definitions). Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10 % level respectively.

Appendix 6.7 The effect of election shock on CAV. Asymmetric effect.

	[0;1]	[0;2]	[0;3]	[0;4]	[0;5]	[0;6]	[0;7]
Panel A: Positive Poll_diff							
Poll_diff	-0.053	-0.193	-0.288	-0.384*	-0.488*	-0.650*	-0.815*
	(0.083)	(0.123)	(0.171)	(0.214)	(0.267)	(0.339)	(0.423)
Panel B: Negative Poll_diff							
Poll_diff	0.034	0.054	0.025	0.014	-0.026	-0.041	-0.005
	(0.055)	(0.069)	(0.076)	(0.097)	(0.080)	(0.099)	(0.112)
Controls	YES	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO	NO	NO

The Table presents the coefficient estimates of Eq. (6.9) using full sample of 26 EU countries (exclude Luxembourg and Lithuania) from 01/01/2005 to 03/09/2019. Dependent variable is cumulative abnormal volatility *(CAV)* over different time windows [0; 1], [0; 2], [0; 3], [0; 4], [0; 5], [0; 6], and [0; 7] where election day is on date 0. *Poll_diff* is the difference between election outcome and the most recent polling result for the eventual largest party within 30 days ahead of election. The sample is divided into 2 groups with positive and negative *Poll_diff*. Control variables are defined in Appendix 6.1. In all regressions, FE are captured by a full set of country dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10 % level respectively.

Appendix 6.8 The effect of election shock on CAR. Asymmetric effect.

	[0;1]	[0;2]	[0;3]	[0;4]	[0;5]	[0;6]	[0;7]
Panel A: Positive Poll_diff							
Poll_diff	0.060	0.237	0.262	0.137	0.165	0.309	0.172
	(0.133)	(0.213)	(0.265)	(0.230)	(0.252)	(0.228)	(0.260)
Panel B: Negative Poll_diff							
Poll_diff	0.233	0.036	-0.084	-0.001	-0.056	-0.047	0.104
	(0.141)	(0.118)	(0.212)	(0.224)	(0.294)	(0.303)	(0.394)
Controls	YES	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO	NO	NO

The Table presents the coefficient estimates of Eq. (6.9) using full sample of 26 EU countries (exclude Luxembourg and Lithuania) from 01/01/2005 to 03/09/2019. Dependent variable is cumulative abnormal return *(CAR)* over different time windows [0; 1], [0; 2], [0; 3], [0; 4], [0; 5], [0; 6], and [0; 7] where election day is on date 0. *Poll_diff* is the difference between election outcome and the most recent polling result for the eventual largest party within 30 days ahead of election. The sample is divided into 2 groups with positive and negative *Poll_diff*. Control variables are defined in Appendix 6.1. In all regressions, FE are captured by a full set of country dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10 % level respectively.

Appendix 6.9 The effect of election shock on CAV and CAR. Robustness test which controls for ideology.

	[0;1]	[0;2]	[0;3]	[0;4]	[0;5]	[0;6]	[0;7]
Panel A: CAV							
Poll_diff	-0.016	-0.058*	-0.082**	-0.118**	-0.160**	-0.198**	-0.224**
	(0.020)	(0.030)	(0.039)	(0.052)	(0.064)	(0.081)	(0.101)
Panel B: CAR							
Poll_diff	0.062	0.126*	0.122	0.083	0.086	0.137	0.152
	(0.052)	(0.072)	(0.093)	(0.094)	(0.103)	(0.103)	(0.117)
Controls	YES	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO	NO	NO

The Table presents the coefficient estimates of Eq. (6.9) using full sample of 26 EU countries (exclude Luxembourg and Lithuania) from 01/01/2005 to 03/09/2019. Dependent variable is cumulative abnormal volatility *(CAV)* and cumulative abnormal return (*CAR*) over different time windows [0; 1], [0; 2], [0; 3], [0; 4], [0; 5], [0; 6], and [0; 7] where election day is on date 0. *Poll_diff* is the difference between election outcome and the most recent polling result for the eventual largest party within 30 days ahead of election. Control variables are defined in Appendix 6.1. In all regressions, FE are captured by a full set of country dummies. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10 % level respectively.

Chapter 7 Conclusion

The aim of the thesis is to investigate the underlying mechanisms behind changes in political support and the effect of such changes on financial markets. This thesis therefore explores the determinants of government support by studying the impact of credit risks and extreme events on public opinion. The thesis also examines the role of political preferences in explaining financial instability by considering stock markets' behaviour during elections.

Following the 2007-09 global financial crisis and the 2010-12 European sovereign debt crisis, European governments' majorities shrank while right-wing extremist and populist parties increased their vote shares amid the economic and financial turmoil (Funke et al., 2016; Guiso et al., 2019; Margalit, 2019). Railing against the party in office might increase the probability of removal of the incumbent at elections, shorten government duration, lead to changes in prime minister, president, or cabinet. The potential switch in political power, which causes partisan conflicts along with shifts in ideology and policies, results in an unstable political environment. More seriously, frequent changes of government with policy uncertainty hamper the recovery of business activities and economies in post-crisis periods (Funke et al., 2016). Political uncertainty also destabilises financial markets as investors cannot fully anticipate political costs/ benefits associated with governments' future actions (Pástor and Veronesi, 2013), especially during election periods when there are potential political changes. There is usually less reliable policy information available for market participants when a new government is elected compared to when the incumbent is re-elected, which increases the level of political uncertainty (Pantzalis et al., 2000). These issues highlight the need for understanding the political instability driven by changes in political preferences, in order to avoid a reoccurrence of partisan conflicts and to manage its economic and market impact.

Three key research questions are examined in Chapters 4 to 6 respectively: (i) *What is the impact of sovereign credit ratings on government support?* (ii) *What is the impact of terrorist attacks on government support?* and (iii) *How do stock markets react to election uncertainty and election shock?*

In order to answer these research questions, this thesis uses a unique dataset of polling results of European countries, which is collected manually from various available sources (e.g. online articles and publicly available polling datasets). The polling dataset consists of the support for the incumbent party from 2000 to 2017 (with 13596 daily observations used in Chapters 4 and 5) as well as the support for all political parties from 2005 to 2019 (with 9341 daily observations used in Chapter 6). In the absence of elections, polling result is the only

indicator of the public support for the party in office.[134] It could signal the electoral prospect of the incumbent, hence shifting in polling results may alter the policy choices of the government to keep public support. Despite the failure of the polling industry following the Brexit referendum or the 2016 US Presidential election, Jennings and Wlezien (2018) find no crisis in the accuracy of polling. Polls become more reflective of the eventual electoral outcome over the election timeline and have a significant market impact (see Section 3.1). Polls appear to have more signalling effect than votes (Nannestad and Paldam, 1994), yet most prior studies focus on government support at elections and seem to dissemble government support across time (See Section 2.2). These studies are unable to capture the immediate change in government support, hence there might be omitted variables that can affect both government support at elections and economic conditions. Reverse causality bias is also likely to occur as economic conditions can affect elections, and changes in political support can affect the economy via their impact on policy uncertainty in election year. The comprehensive polling dataset used in Chapters 4 and 5 facilitates unique analyses of government support across country and time, which have not been done before. In addition, the polling dataset provides a rich dataset of voters' expectation about the likelihood of winning for various political parties, which is employed to calculate the election uncertainty and election shock in Chapter 6. The most important contribution of the thesis' dataset is that having daily polling data avoids the endogeneity bias caused by confounding variables and reverse causality in empirical analyses. In addition, the use of frequent polling data reduces information contamination problem. Hence, analysing the polling data provides more robust estimation results, which contribute to the literature of economic voting and stock markets' reactions to political events. Although the polling dataset has some limitations with regards to random variations and systematic errors, aggregating polls over time and across different pollsters can minimise these errors (Pasek, 2015).

Chapter 4 examines the first research question: '*What is the impact of sovereign credit ratings on government support?'.* Several studies in economic voting show that voters evaluate the quality of their government based on the performance of national economies and financial markets (See Section 2.2.1). The role of CRAs has been under the spotlight during the debt crisis, with many European countries experiencing a series of negative rating events (Baum et al., 2016), which affect the stability of financial markets and economy. Hence, sovereign credit ratings are expected to have a significant impact on the way voters expect the government to respond. This stimulates the scrutiny of the impact of CRAs' ratings and raises questions about

[134] There is a limited availability of electoral betting data in European countries (See Chapter 3).

the effectiveness of their roles in politics beyond their economic and market impact. In comparison to other economic variables, sovereign credit ratings provide much more information and act as a more stable and forward-looking measurement of national economic and financial health. The potential political power of CRAs was first examined by Cunha et al. (2019), who provide evidence of municipal bond ratings' effects on US electoral outcomes at the county and congressional district level. In comparison, Chapter 4 focuses on the relationship between sovereign credit ratings and government support across time measured by polling results in European countries. Having polling data facilitates the estimation of the immediate political effect of CRAs' actions. This provides a better understanding of the signalling effect of CRAs with respect to the quality of the incumbent, which might alter voters' preferences. Based on the economic voting theory (see Section 2.2.1), a negative rating event is expected to decrease government support since countries with lower ratings are considered to have higher credit risk, less stable economy and financial markets, and vice versa. Voters hold the government accountable for such changes and alter their political support regardless of whether voters are sociotropic or egocentric (See Section 4.3).

Chapter 4 uses a sample of 27 EU countries (excluding Luxembourg) rated by the three biggest CRAs: S&P, Moody's, and Fitch, from 2000 to 2017.[135] The rating data is then jointly analysed with the dataset of polling results for the incumbent party using the fixed-effects model (FEM) and propensity score matching (PSM) to examine the research question. The final sample includes 326 rating, outlook and watch actions by 3 CRAs that have polling data available within 30 days after the date of rating events. The results of the FEM consistently support the significant effect of sovereign credit ratings on government support across CRAs and time windows, suggesting that when the level of sovereign rating increases (decreases), citizens reward (punish) the party in office. The results of the PSM reveal asymmetric effects of negative and positive rating events. Negative rating signals result in decreases in government support, while positive rating events do not have a significant impact. This is consistent with prior studies showing that negative rating events are more informative than positive rating events (Tran et al., 2019). The methods used in this chapter, the FEM and PSM, mitigate potential endogeneity issues induced by unobservable variables. The omitted variable bias is also largely reduced with the use of frequent polling data since polls reflect immediate changes in government support in response to rating events. It is also implausible to have reverse causality, as a change in government support in a short period is unlikely to result in a rating change, given the through-the cycle rating philosophy applied by CRAs (Kiff et al., 2013). The

[135] There is no polling data available for Luxembourg.

findings imply that negative rating actions are considered as a strong signal about the quality of the government, which can drive voters to switch away from the incumbent. Responding to citizens' changing support, the government would need to find ways to regain the confidence of electoral body in its ability to stabilise the economy and financial markets.

Chapter 5 addresses the second research question: '*What is the impact of terrorist attacks on government support?'.* In recent years, many European countries have been targeted and suffered deadly terrorist attacks. These attacks cause the destruction of human and physical capital, as well as grave consequences for national economies and financial markets. These potentially alter public opinion about the government either via individuals' emotion or perception of the incumbent's quality of the level of preparedness and response (Bagues and Esteve-Volart, 2016; Ashworth et al., 2018). Although terrorist attacks are outside the control of the government, prior studies provide evidence of their significant effect on the incumbent electoral outcomes (e.g. Montalvo, 2011) or cabinet duration (e.g. Gassebner et al., 2011). However, these studies are unable to capture the immediate change in government support after attacks. Exploiting the rich dataset of polling results, Chapter 5 fills this void and sheds light on public attitudes towards terrorism. Changes in public support affect electoral prospects of the incumbent, hence they are likely to influence the way the government responds and implements policies with respect to counter terrorism issues. Chapter 5 hypothesises that terrorist attacks have a significant impact on government support, with two competing theories to underpin the empirical analysis. While the theory of the "rally effect" suggests that terrorist attacks draw citizens together behind their leaders whom they think are capable to protect them (Mueller, 1970), the theory of the "public good effect" suggests that citizens would rail against the government because the government fails to keep them safe (Gassebner et al., 2011).

Chapter 5 employs the same dataset of polling results as in Chapter 4. The terrorism dataset is collected from the Global Terrorism Database during the sample period. Chapter 5 focuses on severe attacks that result in at least one person killed or injured and that have polling data available within 30 days after the dates of the attacks. The final sample includes 354 terrorist attacks. The use of frequent polling data allows the closely tracking of changes in government support in the aftermath of terrorist attacks, hence controls for the endogeneity bias caused by omitted variables. Following Dai et al. (2020), the FEM and PSM are employed to control for the potential confounding variables that can affect both polling results and terrorist attacks. These methods are unlikely to suffer from reverse causality bias since the occurrence of exogenous terrorist events is unlikely to be affected by a change in polling results in a short-time period. The results support the rally effect, suggesting that citizens seem to rally

behind their leaders rather than rail against them in response to severe attacks. However, terrorist attacks do not have a significant effect on government support in Germany and France, which appears to be different from the remaining countries. This is possibly resulted from variations in economic conditions, trust in government, or media coverage of the attacks in France and Germany versus other countries (Baum, 2002; Lai and Reiter, 2005; Chowanietz, 2011; Chatagnier, 2012). Focusing on the sample without Germany and France, the FEM is estimated using various sub-sample groups: country sub-groups (GIIPS and the remaining countries), type of attacks (transnational or domestic attacks), level of fatalities (only injured, at least one/three/five people killed), and repeated attacks (within a month, 3 months, and a year).[136] All the tests confirm the robustness of the rally effect in the aftermath of terrorist attacks. The rally effect is more pronounced in GIIPS countries and in the case of domestic attacks. Larger attacks and repeated attacks in a shorter-time period are more likely to result in more support for the government. These findings imply that citizens tend to provide more support for the government in the aftermath of terrorist attacks despite the consequences, in order to fulfil their need for protection. In response, the incumbents must show protection against terrorism is a prime issue in their political agenda. They should also respond with prompt actions to provide effective policies and improve counter terrorism systems. This helps maintaining the public support for the incumbents and to ensure they retain their place in next scheduled elections.

Chapter 6 considers the research question: '*How do stock markets react to election uncertainty and election shock?'.* Prior studies revealed that stock markets absorb election-related news and trends into stock prices during pre-election periods and that stock markets are surprised by electoral outcome shocks in post-election periods (See Section 2.4.1). Investors are sensitive to the likelihoods of various electoral outcomes since these reflect the election uncertainty and policy uncertainty. A better understanding of stock markets' reactions to election-induced uncertainty is needed, since it informs policy debates surrounding the best way to keep financial markets stable and allows market participants to hedge risk during the period of potential changes in political power. There are two hypotheses that could explain the relationship between elections and stock markets' behaviour: election uncertainty hypothesis (EUH) and political uncertainty hypothesis (PUH) (Goodell and Vähämaa, 2013). The EUH predicts that stock returns and stock volatility decrease when election uncertainty related to forthcoming electoral results is reduced, while the PUH suggests that stock volatility might increase if the uncertainty about future policies increases despite the lower election uncertainty.

[136] GIIPS group represents distressed peripheral economies, including Greece, Ireland, Italy, Portugal, and Spain.

The EUH and PUH expect opposing signs on the coefficients for stock volatility. Chapter 6 relies on these hypotheses to examine how stock markets respond to the election-induced uncertainty. To the best of my knowledge, the analysis presented in Chapter 6 is the first to evaluate the market impact of election uncertainty measured directly from changes in pre-election polling results at a multi-country level. Additionally, Chapter 6 applies a new measure of 'election shock' to capture the election shock and examines its effect on stock markets. 'Election shock' is calculated by taking the difference between the actual electoral outcome and voters' expectation measured by polling results prior to elections. It is expected that the more accuracy polling results provide, the less surprise investors receive, hence resulting in less stock return and volatility.

In Chapter 6, I employ a sample of 91 elections in 26 EU countries (excluding Luxembourg and Lithuania) from 2005 to 2019.[137] The polling data of the eventual largest party and eventual runner up party is used. This Chapter also exploits a dataset of elections obtained from European Election Database and government websites; and a dataset of stock prices collected from Thomson Eikon during sample period. The FEM and the event-study approach are employed to examine stock markets' reaction to elections (Fan et al., 2020b). Chapter 6 demonstrates that election uncertainty is positively associated with stock volatility as predicted by the EUH and that higher stock volatility during days after elections is determined by the level of the accuracy of election prediction. However, stock return appears to be unaffected by the election uncertainty and election shock. This implies that the uncertainty around elections is more likely to cause disagreements between market participants on stocks' fundamental value rather than actual change in stock return. The results highlight that the effect of election uncertainty on stock volatility is robust for the CORE and REM countries, while GIIPS countries appear to have a different effect.[138] In the GIIPS group, stock volatility tends to increase when election uncertainty decreases as predicted by the PUH. This might be due to the higher policy uncertainty despite lower election uncertainty. These findings of Chapter 6 are less likely to suffer from endogeneity bias since the FEM controls for time-varying unobservable variables. In addition, the omitted variable bias is reduced largely by using frequent polling data to capture the election uncertainty. The use of polling data also facilitates the calculation of a non-partisan election uncertainty indicator. This measure does not indicate whether changes in political support are toward or away from the incumbent party, so that the reverse causality is less likely to occur in empirical analyses. The results of Chapter 6 are

[137] There is no high and low stock prices data available for Lithuania during sample period.
[138] European countries are divided into three groups: "GIIPS", "CORE", and "REM". "CORE" represents Austria, Belgium, Finland, France, Germany, and Netherlands; "REM" represents the remaining countries.

widely consistent with prior studies (e.g. Kelly et al., 2016), which reveal that elections are associated with periods of increased volatility. In response, market participants can hold option contracts to hedge against alternative electoral outcomes. Opinion polls can be added as a proxy to assess market expectations about electoral outcomes.

Overall, this thesis provides insights into three important areas. Firstly, Chapter 4 takes a novel perspective on the political impact of sovereign credit ratings and contributes to the literature on economic voting. Particularly, to the best of my knowledge, it is the first study on the determinants of government support that considers shocks derived from sovereign credit ratings as a mechanism to explain the rational support/opposition for the government. Secondly, Chapter 5 contributes to the line of studies on changes in voters' preferences driven by exogenous events that negatively affect the economy. This study provides evidence of the immediate change in public support for the government (not at elections) after terrorist attacks at a multi-country level. This enhances the understanding of voters' rationality and attitudes in response to the consequences of terrorism. Finally, Chapter 6 furthers the existing literature on the relationship among political uncertainty, policy uncertainty, and market uncertainty. This study is the first to find the market impact of political uncertainty driven by changes in political support at multi-country levels. The thesis therefore provides a better picture about the interaction between political preferences with both financial and social instability.

The findings of this thesis have several implications. One of the principal implications of Chapter 4 is that incumbents should stabilise national economies and financial markets to avoid negative sovereign rating signals during their time in office, in order to maintain the support from electorates. Another implication of Chapter 4 is that CRAs can act as a disciplining force to limit incumbents' actions when they want to excessively increase public debt, as citizens perceive the quality of incumbents via the level of sovereign ratings assigned. Regulators and policymakers should consider the political power of CRAs when debating the new regulation and reform of CRAs. Legal liability for CRAs is needed so that CRAs are held accountable for their actions. Chapter 5 reveals the rally effect after terrorist attacks, however such effect might decrease or reverse when terrorist attacks occur more frequently (Nowak, 2018). The need to improve counter-terrorism systems to guarantee the security and safety of citizens is one of the top priorities of governments. Hence, in order to keep public support and increase the likelihood of being re-elected, the incumbents must use their powerful instrument to further enact effective policies, laws, and regulations in fighting against terrorism. Chapters 4 and 5 further the understanding of the underlying mechanisms behind changes in government support, which could be used in explaining the movements in the political landscape of

European countries. Chapter 6 finds a significant link between market uncertainty and election uncertainty, hence providing several implications for practitioners. During the period of potential political changes which induces higher stock volatility, investors should hold option contracts to hedge against an undesirable electoral outcome. As polling results are informative and impact the markets during elections, pollsters should seek to provide precise opinion polls. Regulators and policy makers should look into the need for reforms of polling firms' activities in formulating accurate opinion polls for practical applications.

Finally, there is scope for further research. The thesis limits itself to examining European countries, hence future research can investigate the determinants of government support in other countries as long as opinion polls are available. The question about the political impact of sovereign rating events could be explored in future research at a micro-level by examining how individuals respond to rating news, and whether the effect remains the same for market participants and non-market participants. At the individual level, the sociotropic and egocentric voting hypotheses can be tested, which could explain the causality of the mechanisms behind changes in voters' preferences in response to rating events. Similarly, the impact of terrorist attacks on voters' preferences can also be studied at an individual level, i.e. the differences in personal attitudes toward terrorism between victims and non-victims, those living in attacked areas and those living in non-attacked areas. Furthermore, the impact of ratings and terrorism events on changes in the support for the opposition parties could be investigated in future research, which could help understanding the political polarisation in European countries. Finally, further research could enhance the understanding of the link between politics and financial markets by investigating the market effect of policy uncertainty induced by elections, and analysing changes in prices of other financial assets, such as bonds, options, and CDS during elections.

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