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57 Channels (And Nothin On) - Does TV-News on the Eurozone Affect Government Bond Yield Spreads?

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Abstract

This paper empirically investigates the relationship between TV news coverage and the GIIPS countries' bond yield spreads using daily data between January 1, 2007 and December 1, 2016. We employ 1,542,233 human coded news items from evening news shows of leading TV stations in 12 countries which include 37,859 news on the EU, on the Eurozone and on country-specific economic issues. We find that an increasing share of news about the Eurozone reduces yield spreads, especially when the news has a positive tonality. This hints at the effectiveness of political communication through the media by European institutions and in particular the European Central Bank (ECB). In conjunction with the tonality of the news, we find that country-specific news have a significant impact on GIIPS yield spreads. A higher share of positive/negative news is positively associated with a decrease/increase of the GIIPS yield spreads vis-à-vis Germany. Moreover, some news is not immediately and completely priced in by market participants when it is released. In addition, this peculiar effect of country specific news is stronger when the respective news is aired on the North American media market.

JEL-Codes: E580, G120, L800, N140.

Keywords: Eurozone, Euro, political communication, media coverage, yield spreads, dynamic macro panel, FGLS.

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1 Introduction

"Whatever it takes". These three words by Mario Draghi, the European Central Bank (ECB)'s president, turned his talk at UKTI's Global Investment Conference in London on July 26, 2012 into a "celebrated speech" (Blanchard, 2014). Indeed, these words, to do "whatever it takes" to preserve the Euro, solved the coordination problem of investors confronted with uncertainty about the future of the Euro in general and the existence of the European Monetary Union (EMU) in particular: It reduced redenomination risk and triggered a downward spiral in interest rates. However, was this prime example of central bank communication a singular event or is there a systematic effect of communication, especially through the media, on the observed spread of bond yields?

During the financial and European sovereign debt crises, news about political actions of the governing bodies of the EMU and the political leaders of its member states were eagerly expected by financial market participants, when uncertainty about the future of the Euro was highest. This may speak for a systematic effect, but has not been empirically analyzed yet. Hence, in this paper, we investigate whether TV news stories on EU related economic issues with reference to the GIIPS countries, Germany or the Eurozone have a lasting effect on GIIPS interest rate spreads vis-à-vis Germany.[1] Moreover, we investigate the impact of media coverage in different media markets on financial markets. We distinguish between the North American media market, including TV news from Canada and the US, and the European media market, including TV news from Germany, Austria, France, UK, Italy, Spain and Switzerland.

We differ from the existing literature in various respects: Existing studies often use newswire data such as Reuters, Bloomberg, or media databases like Factiva, and follow an identification strategy of simple word counting techniques rather than full content analysis. For instance, most

[1] The so-called GIIPS are Greece, Italy, Ireland, Portugal and Spain. We selected those countries as they experienced a dramatic rise in yield spreads vis-à-vis Germany during the European sovereign debt crisis.

papers are based on the explicit or implicit assumption that specific "words" are associated with "good" or "bad" outcomes for bond pricing. These "words" inform algorithms which are used to analyze the effect of news on financial markets. These identification strategies can cause several problems: On the one hand, these sources can be biased by insufficient indexing, with the consequence that not all relevant news is provided. On the other hand, simple word counting and computer linguistic approaches often lead to shortcomings because they do not get the content precisely, for example, in terms of context and tonality.

In contrast, we draw on 1,542,233 news items from a sample of TV evening news aired by the leading TV stations in Austria, Canada, China, France, Germany, Italy, South Africa, Spain, Switzerland, UK, US and Vietnam including 37,859 news items on the EU and/or on economic issues related to the GIIPS countries, Germany and the Eurozone. The media data are unique in several respects: First, all featured news takes were coded. We therefore have observations of the news about the EU, Eurozone, the Euro and economies of certain member states, as well as all other news in each newscast. Hence, we are able to calculate the share of news dedicated to the Eurozone on each day. Second, the news shows were analyzed by human analysts and coded according to a huge set of variables, e.g., protagonist, topic, source, and tonality. In comparison to word counting or computer linguistic approaches, this leads to a much higher accuracy of the content analysis.

In addition, the difficulty of identifying a causal effect of media coverage on government bond yields has not been addressed adequately in most of the existing studies. We put special emphasis on causality referring to the timing of news and bond yields by testing a hypothesis for the identification of a causal effect between TV News and bond yields as suggested by Lopez and Weber (2017) and further explore the direction of a causal effect. We are aware that Granger causality can be problematic especially if rational expectations prevail. However, paying special attention on the timing as well as the newsworthiness of the news proxied by the country of

publication we can provide reliable causal evidence. Finally, most of the existing studies assume that news is always immediately priced in by market participants. We put this assumption under closer scrutiny by including lagged news variables. If we find any sustaining effects of news coverage on bond pricing, we can question whether that information is priced efficiently. This may not indicate a violation of the Efficient Market Hypothesis (EMH) but may be due to unclear communication of the governing institutions of the Eurozone.

The remainder of this paper is organized as follows: First, section 2 summarizes the main findings of other research on the effect of media on financial markets. Section 3 describes the data and estimation strategy. Section 4 presents the regression results. Finally, section 5 concludes.

2 Related Literature

Media play a vital role in the perception and decisions of individuals in both economic and political contexts, as information is often distributed through media channels. However, the media can never depict reality completely and are thus limited to a selective reality. In addition, the portrayed reality is prone to various types of distortions, the so-called media bias (Entman, 2007).[2] Consequently, an individual's perceptions and decisions based on information provided by the media might deviate from those based on a more unbiased set of information. Thus, a growing literature uses media data to explain perception and behavior. In an economic context, for Nadeau et al. (2000), Soroka (2006), and van Raaij (1989), the assessment of the state of the economy and economic expectations depend, at least partly, on media reports. Alsem et al.

[2]Of the various types of media bias, the most prominent are: advertising bias, when media change their news coverage in tone or volume in favour of their advertising clients (Dewenter and Heimeshoff, 2014; Dewenter and Heimeshoff, 2015; Gambaro and Puglisi, 2015; Reuter and Zitzewitz, 2006); newsworthiness bias, when news on certain issues crowd out coverage on other issues because they are seen as more newsworthy (Durante and Zhuravskaya, 2015; Eisensee and Strömberg, 2007); the negativity bias, when media focus more on catastrophes, crime, and threatening political and economic developments in comparison to more positive news (Garz, 2013; Garz, 2014; Soroka, 2006; Friebel and Heinz, 2014; Heinz and Swinnen, 2015); and political bias, when media coverage favours one or another side of the political spectrum (Anderson and McLaren, 2012; Besley and Prat, 2006; Prat, 2018).

(2008), Doms and Morin (2004) as well as Goidel and Langley (1995) allude to the impact of media reporting on consumer climate. Garz (2013) analyses the impact of distorted media coverage of unemployment on job insecurity perceptions, and Lamla and Maag (2012) investigate the role of media reporting for inflation forecasts of households and professional forecasters. Dewenter, Heimeshoff, and Thomas (2016) find evidence that the number of car sales depends, to some extent, on media coverage of the automotive industry. In addition, Ulbricht et al. (2017) employ media data to improve forecast industrial production in the longer run.[3]

More specifically, the causal effects of TV media coverage on financial markets has been subject to extensive research as well. One branch of the literature focuses on the impact of firm-specific news on equity markets. Busse and Green (2002), Antweiler and Frank (2005) and Tetlock (2014) for example analyze the impact of corporate news from TV, online and print media, respectively. Regarding TV, Busse and Green (2002) investigate the effect of 322 analyst reports aired on CNBCs popular Morning Call and Midday Call segments from June to October of 2000 on individual shares. The authors find that stock returns that receive a positive mention significantly increase within one minute. Abnormal returns dissipate within 5 minutes. Prices seem to incorporate most information in negative CNBC reports within 15 min, though this inference is uncertain because of the small number of such reports. The authors conclude that the market responds quite efficiently to TV reports.

We focus on another branch of the literature that analyses the impact of news on fixed-income markets, most notably the effect of media coverage on government bond yields during the EMU crisis. Büchel (2013), Mohl and Sondermann (2013) and Gade et al. (2013) analyze the impact of news on 10-year government bonds of the euro area countries. Büchel (2013) focuses on the GIIPS countries, only. Falagiarda and Gregori (2015) restrict their study on the 10-year

[3]Similarly, a growing literature exists in the political context as well, see Beckmann et al. (2017), Bernhardt et al. (2008), Enikolopov et al. (2011), DellaVigna and Kaplan (2007), Eisensee and Strömberg (2007), Gentzkow et al. (2011) and Snyder and Strömberg (2010).

government bonds of Italy. Beside the 10-year bond yields, Büchel (2013), like Conrad and Zumbach (2016) and Apergis et al. (2016), investigates the CDS of the GIIPS vis-à-vis Germany. Beetsma et al. (2013) base their communication study on public debt of the GIIPS countries, whereas Conrad and Zumbach (2016) additionally analyze the effect of communication on the USD/EUR exchange rate in the European financial market.

The sources of media data differ among existing studies. Most of them obtain their news data from media releases of agencies like Bloomberg, Reuters, Dow Jones Newswire and Market News International (Conrad and Zumbach, 2016; Falagiarda and Gregori, 2015; Mohl and Sondermann, 2013; Gade et al., 2013). In addition, Falagiarda and Gregori (2015) use the ECB Real Time Information System. Beetsma et al. (2013) use Eurointelligence, Apergis et al. (2016) and Büchel (2013) obtain the News data from Factiva, an online database of newspapers which categorizes its articles by subject and provides a code that identifies articles that discuss sovereign debt issues. In almost all contributions, algorithms allow for classifying news into certain categories (such as "good" and "bad" news).[4]

All studies find a significant impact of communication on the respective dependent variable. However, the detailed findings differ among existing studies. Conrad and Zumbach (2016) present evidence that statements regarding periphery countries cause stronger market responses than statements focused on the Eurozone as a whole between August 2011 and December 2011. Regarding the tone of the political statements, negative statements trigger the strongest response of the exchange rate. Büchel (2013) analyses news data for the period between January 2009 and August 2011. According to his main findings communication by representatives of Germany, France and the EU as well as ECB Governing Council members have an immediate impact on both types of securities, whereas communication of the smaller Eurozone member countries has no effect on the government bond market. The analysis differentiates between the

[4] An overview about the classification is provided in the Appendix A Table A.1.

tones of communication and finds that dovish statements significantly lowered CDS and bond yield spreads, compared to hawkish statements, which increased them. The period analyzed by Beetsma et al. (2013) runs from July 2007 to February 2012. The authors find that, on average, more news raise the domestic interest rate spreads of the GIIPS countries. Apergis et al. (2016) utilize news data for the period from October 2009 to June 2012. The authors report a significant positive impact of newswire messages of local news across the major newspapers in the GIIPS on CDS spread spillovers during the European sovereign debt crisis. Mohl and Sondermann (2013) conduct a study of news data between May 2010 and June 2011. They find a positive impact of the number of Eurozone government statements on government bond spreads in EMU. Based on their empirical study of news data between January 2009 and October 2011, Gade et al. (2013) conclude, that positive communication can lead to a compression of spreads, whereas negative communication can cause a widening of spreads. Falagiarda and Gregori (2015) find a significant difference in the impact of the distinct Italian administrations.

Our approach analyzes the effect of media coverage and news on government bond yields by improving on several problems of existing studies. First, most of the existing studies apply simple word counting or computer linguistic approaches. This is especially critical if only one "word" is used to inform the algorithm that a report is relevant or not. Hence, relevant reports and statements might be filtered out, if the wording is different from the search string. In addition, simple algorithms are not able to get the contextualized information about the word and therefore the full news content. Second, most of the existing studies use newswire services, whereby another misspecification could occur. "Newswire services are selective in their reporting..." and may wrongly report or misinterpret a statement by policy-makers as Ehrmann and Fratzscher (2007) criticize. Third, most of the existing literature is explicitly or implicitly based on the assumption that specific "words" are associated with "good" or "bad" outcomes for bond pricing. However, until now "word count" methods or computer linguistics were not able to get the

content sufficiently right. For instance, computer linguistic approaches achieve accuracy of no more than 60-70 percent, especially when it comes to topical context and tonality. As a consequence, Grimmer and Stewart (2013) conclude, that there is no substitute for human coding in scientific text analysis.

Fourth, the existing literature treats possible endogeneity concerns insufficiently. Beetsma et al. (2013), Apergis et al. (2016) and Aizenman et al. (2016) do not discuss those issues in their work at all. Büchel (2013) and Mohl and Sondermann (2013) assume that by the construction of their data news are contemporaneously exogenous and thereby endogeneity problems are solved. The financial market data are end-of-the-day data, whereby the news occur before markets close. They assume further that financial markets immediately react to an event, i.e., a public statement, and that events can be determined precisely (on a daily basis) such that confounding effects are minimized. Gade et al. (2013) and Falagiarda and Gregori (2015) have a similar strategy; however, they additionally conduct Granger causality tests in order to determine in which direction the effect runs. Conrad and Zumbach (2016) argue that those studies may suffer from endogeneity and describe that they overcome those issues by using high-frequency data. With intra-day data, the authors identify the effect of news on financial markets 15 minutes after their release though their media data suffer from the problems described above.

The assumption about financial markets' reactions to news in Büchel (2013), Mohl and Sondermann (2013), Gade et al. (2013) and Falagiarda and Gregori (2015) is critical for the following reason: Although markets generally react quickly to news (according to EMH) and thereby the assumption of the authors above seems plausible, some news may need more time to have an impact on financial markets and, more importantly, may need more time to be priced in especially during times of high uncertainty. Therefore, we ease this assumption and include lagged news variables in our empirical models. If news influences the spreads for more than the day they occur, the assumption of Büchel (2013), Mohl and Sondermann (2013), Gade

et al. (2013) and Falagiarda and Gregori (2015) does not hold. Additionally, the assumption that all events can be precisely determined on a daily basis is critical, especially with regard to the methodological data approach (Algorithms and word count techniques) and data source (Newswire services). It is likely that news may have occurred already at an earlier point in time, with a different wording. Moreover, the news may have already occurred but not on the used newswire platform.

3 Data and empirical strategy

3.1 Data

Dependent variable

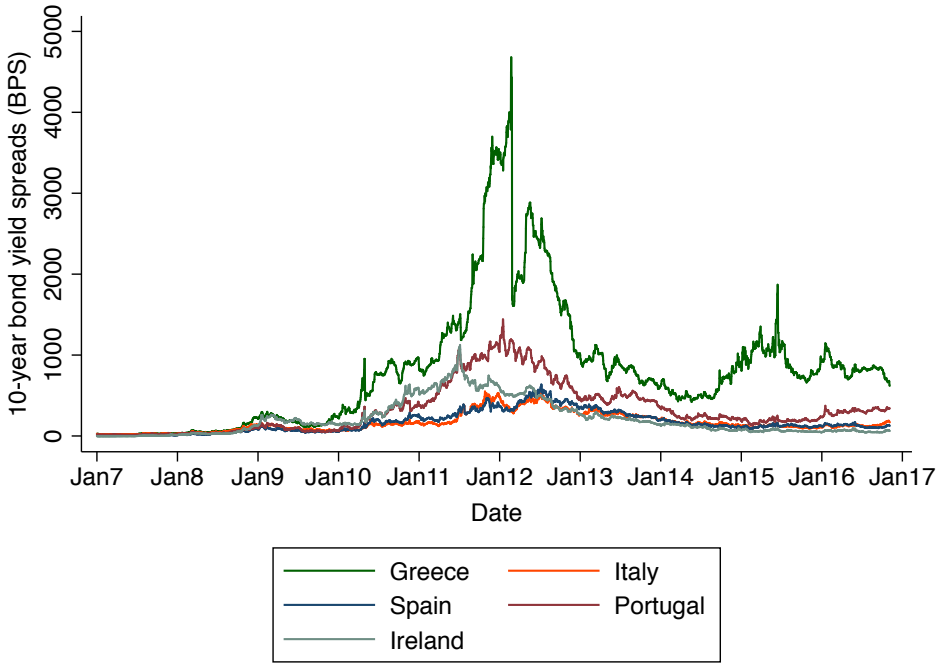
Daily government bond yields are provided by Thomson Reuters Datastream. We focus on 10-year maturity bonds, only. The sample is composed of six EMU member states (Germany and the GIIPS) for the time period from January 1, 2007 through December 1, 2016. The dependent variable is the daily government bond yield spread of the GIIPS vis-à-vis Germany in first differences.

Explanatory variables

The media data is based on the media content analysis by Media Tenor International.[5] The institute evaluates media based on over 700 characteristics, which are defined in a code-book, which is a binding coding manual. Each report is coded and categorized by media type (TV, print, general and specialized press, etc.), topic (such as unemployment, inflation, etc.), participating persons (such as politicians, entrepreneurs, managers, celebrities) and institutions (such as political parties, companies, football clubs), region of reference (such as Germany, USA, UK, world), time reference (future, present and past), the source of information (such as journalist,

[5] see www.mediatenor.com.

politician, expert, etc.), and other variables.



Source: Thomson Reuters Datastream and own illustration.

Figure 1: GOVERNMENT BOND YIELD SPREADS OF THE GIIPS VIS-À-VIS GERMANY

Reports are analyzed by news item, i.e., each time when a new topic, person, institution, region, time reference or source is mentioned, an additional news item is to be coded. In addition, the analysts capture the tone, i.e., if the relevant protagonists and/or institutions receive positive, negative or neutral coverage.[6] To achieve a high accuracy and to avoid systematic bias in the coding, the validity and reliability of the coding is checked by Media Tenor on a monthly basis both with standard tests and random spot checks, based on the code-book. Media Tenor guarantees a minimum accuracy of 85 percent.

In order to obtain a variable which is measuring the tonality of news the tonality is prepared as follows: -1 is assigned to negative news, 0 to neutral news and +1 to positive news. The sum

[6] In communication science the sentiment or tone of coverage is called tonality (Haselmayer and Jenny, 2017).

of the tonality is then divided by the number of all reports (positive, neutral and negative). This variable is called tonality of media coverage. The variable ranges from -1 (all news are negative) to +1 (all news are positive). The tonality variable is interacted with the news coverage variable. This interaction term is meaningful to analyse whether the effect of media coverage on bond yield spreads depends on the tonality and vice versa.

Table 1: MEDIA DATASET

TV news shows	Country	Time-frame	Total news*	Relevant news**
ARD Tagesschau	Germany	01/07-11/16	72,624	5,165
ARD Tagesthemen	Germany	01/07-11/16	89,425	6,251
ZDF heute	Germany	01/07-11/16	82,876	4,308
ZDF heute journal	Germany	01/07-11/16	84,224	6,314
BBC 1 Ten oClock News	UK	01/07-11/16	72,932	1,111
BBC 2 Newsnight	UK	01/07-11/16	37,821	1,118
NBC Nightly News	USA	01/07-11/16	65,429	136
CBS Evening News	USA	01/07-11/16	63,970	125
FOX Special Report	USA	01/07-11/16	77,544	322
ORF Zeit im Bild (ZIB1)	Austria	03/12-11/16	25,462	378
CBC News - The National	Canada	01/07-07/16	27,874	86
TF1 Le Journal 20.00	France	04/07-11/16	98,684	518
RAI 1 TG1	Italy	01/07-11/16	132,175	4,442
TVE 1 Telediario	Spain	06/07-11/16	178,502	5,266
SRF Tagesschau	Switzerland	01/07-11/16	90,913	2,050
VTV1 - Business News	Vietnam	01/13-11/16	9,700	68
CCTV	China	09/12-07/16	13,500	28
e.tv News	South Africa	01/07-11/16	62,447	27
SABC 2 Afrikaans News	South Africa	01/07-06/16	64,686	61
SABC 2 Setswana/Sotho News	South Africa	01/07-06/16	55,584	18
SABC 2 Zulu/Xhosa News	South Africa	01/07-07/16	65,212	22
SABC 3 News @ 18h30	South Africa	01/27-06/16	70,749	45
Total			1,542,233	37,859

* Total number of news items on all topics.
** News items on the economic issues of the GIIPS, Germany and the euro-area.

Our sample of media outlets consists of 22 TV news shows from 12 countries. News items were analyzed over the period from January 1, 2007 to December 1, 2016. Overall, 1,542,233 news items are included in the analysis. Skipping all items, which were not news stories focusing on the EU / economic issues with reference to the GIIPS countries, Germany or the Eurozone resulted in a total of 37,859. For a detailed overview over the analyzed media set see Table 1. From these data, different daily variables were generated based on (1) the news on the same day, (2) the news on the prior day, and (3) the sum of news on the prior 3 days.[7]

Figures B.1 - B.5 in the Appendix show the evolution of the (separate) GIIPS yields spreads and the share of the relevant news of total news interacted with the tonality over the sample time period. In general, during the period of yield spread growth, there was a higher share of negative news (country-specific and Eurozone) compared to the period where the yield spreads started to decline.

Control variables

The data for fiscal fundamentals is selected based on the theoretical and empirical finding that a country's credit risk affects the price of a bond and ultimately the yield spreads if the credit risk of the benchmark country is different. To control for credit risk, a quarterly credit rating variable that ranges from 1 to 20 is included. The highest value is equal to a AAA rating. A countrys credit rating is obtained from the Thomson Reuters Datastream database. Since the dependent variable is the difference between the GIIPS yields and Germany, the Credit Ratings are also included as the difference between the respective GIIPS country rating and Germany. It is calculated as the total value of the difference between the current rating vis-à-vis Germany in order to avoid negative numbers.

The perceived credit risk in the global economy may also have an effect (Gerlach et al., 2010). This perceived risk is measured using the Treasury Bill Eurodollar Difference (TED) spread,

[7]The summary statistics of the media variables are reported in Appendix B Tables B.1, B.2 and B.3.

which is the three-month LIBOR rate minus the three-month US Treasury bill rate. The data are available in the Thomson Reuters Datastream database.

Some empirical studies also use variables that control for the general economic situation (Ehrmann and Sondermann, 2012; Nickel et al., 2011). This inclusion is motivated by the fact that government revenues tend to decrease in a weak economic environment, causing debt and thus credit risk to increase (Attinasi et al., 2009). According to the theory of asset pricing, the price of a bond (and therefore its yield) is affected by changes in the default risk. To control for the Eurozones market-wide change in business climate, the total stock market index for the European Union (EU) can serve as a good proxy (Bruyckere et al., 2013).

Because investors' risk aversion turned out to be a major driver of yield spreads (Codogno et al., 2003), it is important to model this effect by finding good proxies. In theory, more risk-averse investors require higher yields to compensate for uncertainty. In this study, the EURO STOXX 50 Volatility index (VSTOXX) is used as a proxy for investors' risk aversion (Arghyrou and Kontonikas, 2012; Glick and Leduc, 2012).

3.2 Empirical strategy

The data are panel data (countries are the cross section dimension, n and days are the time dimension, t). The dependent variable (bond yield spreads) is a financial time series, which is highly persistent. Therefore, the model needs to include a lagged dependent variable. Thereby, we end up in estimating the following dynamic panel data model:

$$\Delta spreads_{i,t} = \alpha_0 + \rho 1 \Delta spreads_{i,t-1} + \beta \Delta X_t + \Sigma_{i=1}^{4} \delta_i D_i + \gamma \Delta Media_{i,t} + \lambda \Delta Media_t + \epsilon_{i,t} \quad (1)$$

with $i = 1, ..., 5$ denoting the GIIPS countries; and $t = 1, ..., 3623$ denoting the daily time dimension[8] and Δ denotes the change from $t-1$ to t. Equation 1 is estimated using a feasible generalized least squares (FGLS) estimator as it allows for the correction of groupwise

[8] $t = (7 * 365) + (2 * 366) + 336 = 3623$.

heteroscedasticity, cross-dependence (CD) among the panels and serial correlation of the error term.[9]

The dependent variable is the first difference of the 10-year government bond yield spread of country i at time t vis-à-vis Germany.[10] Because these series are highly persistent, the first lag of the dependent variable ($\rho 1 \Delta spreads_{i,t-1}$) is included as regressor. Thereby, the model becomes a dynamic model, which is important to take into account regarding the testing strategy.

$\beta \Delta X_t$ is a set of control variables that is selected following several studies about the determinants of government bond yields in EMU and includes financial market variables that are common for the included countries. In detail these variables are the Euro-STOXX index, TED spread, total stock market index for the EU and a dummy for the period of the European sovereign debt crisis.[11]

The Euro-STOXX index (as in Falagiarda and Gregori, 2015) is serving as a proxy for risk aversion on the European market. Following Codogno et al. (2003), the measure of financial risk aversion is assumed to raise yield spreads. According to asset pricing theory, an increase in risk-aversion needs to be compensated by a higher yield. The TED spread is intented to control for the perceived credit risk in the global economy and has an expected positive effect on the yield spreads as described by Gerlach et al. (2010). In contrast, the total stock market index for the EU is assumed to lower the yield spreads according to Bruyckere et al. (2013). Because an

[9] See Appendix B.1 for the test results of the residual analysis.

[10] First differences are used due to the presence of non-stationarity of the 10-year bond yield spreads of the GIIPS (see Appendix B.1 Table B.5). Additionally, the yields of the GIIPS countries instead of the spreads vis-à-vis Germany are used in order to account for the fact that the German yields may be influenced by the selected news, too.

[11] The crisis dummy ranges from November 5, 2009 to July 27, 2012. As most others in this field we pick the start date on November 5, 2009 when the then new Greek Prime Minister, Giorgos Papandreou, announced that Greece's annual budget deficit would be 12.7 percent of GDP more than twice the previously announced figure. This event led to a cascade of events that culminated into Mario Draghi's famous words on July 26, 2012 when the ECB president gave an account of the eurozone economy at a conference in London. By that time bond yields of weak euro-member governments were soaring, and traders doubted that national, euro- or EU-level institutions could get their act together in time to avert disaster. Draghi sought to convince international investors that the region's economy wasn't as bad as it seemed. He then made the momentous remark: "Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough."

improved business climate in the Eurozone positively influences credit risk and thereby lowers yields. Finally, we control for the period of the European sovereign debt crisis, since the yield spreads were higher during that period. Therefore, a positive sign is expected for the coefficient of the crisis dummy. We control for the credit risk of a country, by taking into account credit ratings of the respective country. Since the dependent variable is the difference between the GIIPS yields and Germany, the credit rating is included as the (total) rating difference between the respective country vis-à–vis Germany at time t. Since Germany is rated the best during the whole period, the greater the value of the total rating difference the higher the credit risk. Therefore, we expect the coefficient to have a positive sign.

In order to control for country-specific fixed effects, country dummies ($\Sigma_{i=1}^{4} D_i$) are also included in the estimation. The estimated coefficient $delta_i$ of country $i = 1, ..., 4$ represents the time-fixed effects to the omitted category, which is Italy.[12]

$Media$ is the set of media variables that are described in detail in the section above. Since two different categories of media news are included, $\gamma Media_{i,t}$ captures all country specific news (for all $i = 1, ..., 5$ denoting the GIIPS countries) at time t[13], whereby $\lambda Media_t$ captures all news covering the Eurozone as a whole at time t.[14]

$$\begin{aligned} \Delta spreads_{i,t} = \alpha_0 + \rho 1 \Delta spreads_{i,t-1} + \beta \Delta X_t + \Sigma_{i=1}^{4} \delta_i D_i + \gamma \Delta Media_{i,t} \\ + \lambda \Delta Media_t + \eta \Delta Media_{i,t-1} + \nu \Delta Media_{t-1} + \epsilon_{i,t} \end{aligned} \tag{2}$$

$$\begin{aligned} \Delta spreads_{i,t} = \alpha_0 + \rho 1 \Delta spreads_{i,t-1} + \beta \Delta X_t + \Sigma_{i=1}^{4} \delta_i D_i + \gamma \Delta Media_{i,t} \\ + \lambda \Delta Media_t + \Sigma_{t=-1}^{-3} \Delta \eta Media_{i,t} + \Sigma_{t=-1}^{-3} \Delta \nu Media_t + \epsilon_{i,t} \end{aligned} \tag{3}$$

with $i = 1, ..., 5$ denoting the GIIPS countries; and $t = 1, ..., 3623$ denoting the daily time

[12] Germany cannot be chosen as the base category, as it is already the base category for the yield spread calculation.
[13] In detail, these are: Share of country-specific news of total news and the interaction of this news share with the tonality of country specific news.
[14] In detail, these are: Share of Eurozone news of total news and the interaction of this news share with the tonality of Eurozone news.

dimension[15] and Δ denotes the change from $t-1$ to t.

In order to test for time-varying effects, equation 2 and 3 include media variables with differing time dimensions. Compared to Equation 1, equation 2 additionally includes news on the prior day, whereas equation 3 includes the cumulative news on the prior three days. The idiosyncratic error of the model in all estimated equations is $\epsilon_{i,t}$.

Among many possible endogeneity problems, that curb the identification of the effect of media coverage on government bond yields, reverse causality may be most important in our case. Several causes should be taken into consideration regarding the data: First, government bond yields vary during trading days, only. Therefore, any news that is released after markets close or during non-trading days cannot be priced in before markets open again. For this reason we assign all information from non-trading days to the following trading day. Additionally, instead of holding prices constant during non-trading days, we exclude the non-trading days from the regression, which reduces the number of days from 3,623 to 2,586. Second, the government bond yield data are end-of-the-day data. Our news data were released on evening news shows. However, these news reports are summaries of the most important events *during* the day (mostly *before* the stock market is closed). Given these considerations and data preparations, we can assume that the news is contemporaneously exogeneous $E(\epsilon_{i,t}|X_{i,t})$.

We additionally run Granger causality tests for panel data as proposed by Lopez and Weber (2017). For the whole panel, we find evidence of one-way Granger causality from news to sovereign bond yields, but not vice versa.[16] We are aware that Granger causality analysis is not without controversy regarding rational expectations as initially discussed by Sargent and Wallace (1976) or Buiter (1984). However, as presented in the following section we pay special attention on the timing as well as the newsworthiness of the news proxied by the country of publication. Hence, we believe to provide reliable causal evidence.

[15] $t = (7 * 365) + (2 * 366) + 336 = 3623$.
[16] See Appendix B.2 Table B.6.

4 Results

4.1 Baseline Results

Equations (1)-(3) are estimated using an FGLS estimator correcting for CD, heteroscedasticity and the autocorrelation of the error term. Tables 2 - 5 show the estimation results. The dependent variable is the first difference of the 10-year bond yield spread of the GIIPS countries vis-à-vis Germany. We estimate the effect of media coverage on bond yield spreads in Tables 2 and 3 and further differentiate news coverage by different media markets (i.e., different news shows in North America and Europe) in Tables 4 and 5.

The control variables show the expected signs. The lagged dependent variable is statistically significant which confirms that financial time series are highly persistent (see also Table 3). Lags of higher order are insignificant and are therefore omitted for reasons of parsimony. The first differences of the government bond yield spreads of the GIIPS vis-à-vis Germany were on average about 0.7 bps higher during the European sovereign debt crisis period compared to the periods before and after the crisis (only marginally significant at the 10% level).

The volatility index for the euro area (EURO-STOXX 50 Volatility index), which is a proxy for investors' risk aversion, has a positive and significant effect on bond yield spreads. Notice that we use the logs of the EURO-STOXX 50 Volatility index in order to narrow its range. A 1% increase in the first difference of the EURO-STOXX 50 Volatility index raises the first difference of the GIIPS bond yield spreads by 0.2 bps. The estimated coefficient of the European stock market index indicates that a 1% improvement of the overall economic situation in Europe significantly reduces bond yield spreads by 1.4 bps, which is in line with the theory, too. Credit risk seems to play a minor role given the statistically insignificant coefficients of the TED spread and credit rating spreads.

Table 2: IMPACT OF MEDIA COVERAGE ON GIIPS BOND YIELD SPREADS

	(1)	(2)	(3)
Lagged dependent variable	0.015	0.018	0.012
	(0.01)	(0.01)	(0.01)
Period during the European sovereign debt crisis	0.716*	0.762*	0.753*
	(0.32)	(0.31)	(0.32)
EURO STOXX 50 Volatility index (logarithm)	15.40***	15.27***	15.16***
	(2.69)	(2.69)	(2.73)
European stock market index (logarithm)	-137.6***	-137.9***	-138.2***
	(11.12)	(11.12)	(11.29)
TED spread	-0.217	-0.217	-0.334
	(1.12)	(1.12)	(1.22)
Credit rating spreads	-0.034	-0.031	-0.034
	(0.04)	(0.04)	(0.04)
Share of country-specific news of total news	28.24***	26.95**	31.94**
	(8.16)	(9.0)	(10.12)
Share of Eurozone news of total news	-1.057	-20.08	-19.3
	(11.65)	(13.73)	(13.36)
Share of country-specific news of total news (1 lag)		-3.532	
		(8.88)	
Share of Eurozone news of total news (1 lag)		-42.67**	
		(16.41)	
Share of country-specific news of total news (Cum. 3 lags)			6.940
			(9.16)
Share of Eurozone news of total news (Cum. 3 lags)			-36.71**
			(12.38)
Country fixed-effects	Yes	Yes	Yes
Constant	0.013	0.03	0.025
	(0.28)	(0.28)	(0.29)
Observations	12,930	12,930	12,920
Wald test on joint significance	597.58 ***	607.69 ***	590.25 ***

The table reports coefficients estimated by FGLS correcting for CD, heteroscedasticity and autocorrelation of the error term. The dependent variable is the 10-year bond yield spreads of the GIIPS vis-à-vis Germany. Robust standard errors are in parentheses. Columns (1) to (3) display the estimation results of the 3 different models described in the empirical strategy section. All variables (except dummy variables) are in first differences. Weekend days are excluded from the regression.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

As indicated by the Granger causality test of the panel (Appendix B.2 Table B.6), we further investigate the effect of media coverage on the government bond yield spreads of the GIIPS countries vis-à-vis Germany in general.[17] Therefore only the share of the news is included in the estimation of Table 2. The first column of Table 2 shows the estimation result of equation 1, which estimates the effect of the news media coverage on the GIIPS yield spreads at time t. We find that a higher share of country-specific news significantly increases the GIIPS yield spreads vis-à-vis Germany. However, the magnitude of this effect is rather small. A one standard deviation increase in the first difference of the share of country-specific news raises the first difference of the GIIPS bond yields spreads by only 0.2 bps.[18] The share of Eurozone news at time t does not show a significant effect on GIIPS yield spreads.

However, when we additionally account for the tonality of the news (see Table 3) the share of Eurozone news shows a significant effect on the GIIPS yield spreads on itself and in interaction with the tonality.

The tonality of news itself does not have a significant impact on the GIIPS bond yield spreads. As we argued above, we interact the tonality with the news coverage in order to allow for the effect of media coverage on bond yield spreads to depend on the tonality and vice versa. The partial effect of the share of Eurozone news on the GIIPS bond yield spreads depends on the tonality of news (which ranges from -1 to +1). If the tonality of Eurozone news is close to +1 an increase in the share of Eurozone news reduces the bond yield spreads (statistically significant at the 1% level). For instance, if the tonality is +1 (all Eurozone news are positive) an increase in the share of Eurozone news by one standard deviation reduces the GIIPS bond yield spreads by about 2.3 bps.[19] We can conclude that Eurozone news coverage is statistically significant

[17] In order to account for the fact that German yields may be as well influenced by the selected news, we estimate the effect of news on the GIIPS yields instead of the spreads. The results do not differ in a meaningful manner from those of the yield spreads regression. (See Appendix C Table C.1 and C.2.)

[18] The magnitude of a one standard deviation change of the explanatory variable can be calculated by the following formula: Estimated coefficient * standard deviation of the explanatory variable. Here: $28.24 * 0.006 = 0.2$.

[19] This is calculated as follows: $(-38.05 * 0.01 + (-189.3 * 1 * 0.01) = -2.3$.

during days with extreme tonality reporting (rather close to +1 or -1).[20] Including the tonality of country-specific news reveals that the coverage of country-specific news is insignificant (see Table 3). In interaction with the tonality the effect is statistically significant at the 10% level. However, the economic size of the effect is minor, not only for the days with a neutral tonality but as well for those days when reporting is at the extreme bounds and news are either all positive or all negative.

The partial effect of the tonality on the GIIPS bond yield spreads (holding all other variables fixed) is of interest as well. An increase in the tonality of country-specific or Eurozone news causes GIIPS bond yield spreads to decrease. But this effect depends on the share of country-specific/euro-related news from total news, since the interaction term of the tonality and the share of news is significant as well. For instance, if the share of Eurozone news over total news is zero the effect of a one standard deviation change in the tonality of those news is also close to zero.[21] If we use the mean value of the share of Eurozone news (0.004), we find that a one standard deviation increase in the tonality of Eurozone news reduces the GIIPS bond yield spreads by 0.3 bps. During the European sovereign debt crisis, when the average share of Eurozone news was higher (0.008) a one standard deviation increase/decrease in the tonality of Eurozone news lead to a GIIPS yield spread decrease/increase by 0.6 bps. The economic and statistical significance of the tonality of country-specific news is small but it points to the expected direction (more good news reduce the spreads whereas more bad news increase them).

[20] In the sample, the tonality of Eurozone news is +1 on 48 days and -1 on 199 days.
[21] The standard deviation of tonality of Eurozone news is 0.4. $-189.9 * 0.4 * 0 = 0$.

Table 3: IMPACT OF MEDIA COVERAGE AND TONALITY ON GIIPS BOND YIELD SPREADS

	(1)	(2)	(3)
Share of country-specific news of total news	17.46	6.742	9.138
	(9.75)	(11.16)	(12.43)
Share of Eurozone news of total news	-38.05**	-69.95***	-68.20***
	(13.28)	(15.72)	(15.69)
Tonality of country-specific news	-0.003	0.068	0.1
	(0.14)	(0.17)	(0.18)
Tonality of Eurozone news	0.26	0.268	0.478
	(0.35)	(0.41)	(0.41)
Share of country-specific news * Tonality	-37.28*	-61.98**	-73.88***
	(17.93)	(20.47)	(22.42)
Share of Eurozone news * Tonality	-189.3***	-257.7***	-244.8***
	(36.91)	(45.59)	(44.77)
Share of country-specific news of total news (1 lag)		-22.24*	
		(11.25)	
Share of Eurozone news of total news (1 lag)		-72.07***	
		(18.72)	
Share of country-specific news * Tonality (1 lag)		-54.84**	
		(20.51)	
Share of Eurozone news * Tonality (1 lag)		-120.6*	
		(51.43)	
Share of Eurozone news of total news (Cum. 3 lags)			-56.58***
			(15.16)
Share of country-specific news * Tonality (Cum. 3 lags)			-75.55***
			(21.84)
Share of Eurozone news * Tonality (Cum. 3 lags)			-110.8*
			(48.08)
Lagged dependent variable	Yes	Yes	Yes
Financial market controls	Yes	Yes	Yes
Country fixed-effects	Yes	Yes	Yes
Constant	0.02	0.053	0.042
	(0.28)	(0.27)	(0.29)
Observations	12,930	12,930	12,920
Wald test on joint significance	647.57 ***	678.13 ***	653.80 ***
$X^2(3)^1$	18.69 ***	20.99 ***	23.56 ***
$X^2(3)^2$	34.79 ***	48.73 ***	39.33 ***

The table reports coefficients estimated by FGLS correcting for CD, heteroscedasticity and autocorrelation of the error term. The dependent variable is the 10-year bond yield spreads of the GIIPS vis-à-vis Germany. Robust standard errors are in parentheses. Columns (1) to (3) display the estimation results of the 3 different models described in the empirical strategy section. All variables (except dummy variables) are in first differences. Weekend days are excluded from the regression. [1] Test on joint significance for the interaction variables of country-specific news. [2] Test on joint significance for the interaction variables of Eurozone news. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

One explanation for the increased importance of Eurozone news as compared to country-specific news might be as follows: As investors cast doubt on their pre-crisis expectation that the governing institutions of the euro area would buy up their bonds during financial distress (Eichengreen et al., 1998), communication and TV coverage on the Eurozone calmed down their sentiments that were tempered by uncertainty. From a financial markets perspective, the Eurozone can be seen as insurance for the countries' bonds. As long as the Eurozone exists, the risk of a total default of the bonds is seen as rather limited and positive news on the Eurozone might be seen as a trustworthy indicator for such a limited default risk.

In order to test for time-varying effects, Columns (2) and (3) of Tables 2 and 3 include media variables with differing time dimensions (news on the prior day and cumulative news on the prior 3 days) and show the estimation results of equations 2 and 3. Thereby, we relax the restrictive assumption that news is immediately priced in by market participants when it is released. As we argued above, some news may affect financial markets for a longer period of time and, more importantly, may need more time to be priced in. In particular, the results show that the share of coverage of the Eurozone on the prior day as well as on the previous 3 days has a significant effect on the crisis countries' yield spreads (Table 2). As for the t-t dimension the tonality of the news is relevant for the magnitude of the effect. If we additionally control for the news on the prior days we find that the estimated effect of the news in t increases for both the Eurozone news and the country-specific news.[22] This indicates that the estimation suffers from an omitted variable bias if prior days news is not controlled for. This finding also implies that news (Eurozone news and country-specific news) affect financial markets for more than a single trading day. This finding contradicts the assumption by Büchel (2013), Mohl and Sondermann (2013), Gade et al. (2013) and Falagiarda and Gregori (2015).

[22] An increase in the share of Eurozone news by one standard deviation induces a spread reduction by 3.3 bps if the tonality of the news is 1. This corresponds roughly to a change in the standard deviation of the GIIPS bond yield spreads of 11% (3.3/30 (standard deviation of the dependent variable)).

4.2 Results for Different Media Markets

Furthermore, we are interested in investigating the effect of media coverage by different media markets on financial markets. We distinguish between the North American media market, that includes TV news from the U.S. and Canada, and the European media market, that includes TV news shows from Germany, Austria, France, UK, Italy, Spain and Switzerland. The results of Table 4 column (1) show that the general effect of the different news on the GIIPS yield spreads differs among the analyzed media markets. Eurozone news has an effect on the GIIPS yield spreads only when aired on the European media market. In addition, country-specific news that is aired on the North American media market has a much higher impact on the GIIPS spreads compared to news aired on the European media market.

A one standard deviation increase in the share of country-specific news that is aired in the North American media markets raises the GIIPS bond yield spreads by 0.4 bps[23] (statistically significant at the 1% level), whereas this effect for country-specific news that is aired on the European media market amounts to 0.2 bps (see Table 4).

When we consider the tonality of news in relation to the news (Table 5), country-specific news shows a statistically and economically significant impact, when aired on the North American media market. If the tonality of news is -1 (all country-specific news is negative) a one standard deviation increase in the share of country-specific news raises the GIIPS bond yield spreads by 10 bp.[24] Consequently, if the tonality of country-specific news is 1 (all news is positive) the GIIPS bond yield spreads are reduced by 10 bps. However, if we analyze the news characteristics of country-specific news released in the North American media market we find that the mean of the tonality for all GIIPS countries is close to -1.

[23] This is calculated as follows: $517.1 * 0.0007 = 0.4$.
[24] This is calculated as follows: $-1434.7 * 0.007 * (-1) = 10$.

Table 4: IMPACT OF MEDIA COVERAGE ON GIIPS BOND YIELD SPREADS BY DIFFERENT MEDIA MARKETS

	(1)	(2)	(3)
Share of country-specific news (E.media)	22.80**	22.33*	24.08*
	(8.29)	(9.23)	(10.34)
Share of country-specific news (NA.media)	517.1***	460.5***	723.2***
	(118.0)	(136.2)	(155.8)
Share of Eurozone news (E.media)	-2.818	-22.21	-22.41
	(11.83)	(14.0)	(13.54)
Share of Eurozone news (NA.media)	176.1	200.6	208.6
	(188.0)	(228.7)	(208.9)
Share of country-specific news (E.media)		-2.502	
		(9.1)	
Share of country-specific news (NA.media)		-114.8	
		(131.5)	
Share of Eurozone news (E.media, 1 lag)		-42.53*	
		(16.69)	
Share of Eurozone news (NA.media, 1 lag)		-20.91	
		(266.3)	
Share of country-specific news (E.media, cum. 3 lags)			1.875
			(9.51)
Share of country-specific news (NA.media, cum. 3 lags)			280.4*
			(136.7)
Share of Eurozone news (E.media, cum. 3 lags)			-39.68**
			(12.62)
Share of Eurozone news (NA.media, cum. 3 lags)			129.6
			(210.4)
Lagged dependent variable	Yes	Yes	Yes
Financial market controls	Yes	Yes	Yes
Country fixed-effects	Yes	Yes	Yes
Constant	0.011	0.03	0.034
	(0.28)	(0.28)	(0.29)
Observations	12,930	12,930	12,920
Wald test on joint significance	616.03 ***	626.85 ***	615.43 ***

See remarks Table 2. NA.media is a shorthand for the North American media market, which includes TV news shows in America and Canada. E.media is a shorthand for the European media market which includes TV news shows in Germany, Austria, France, UK, Italy, Spain and Switzerland.

Table 5: IMPACT OF MEDIA COVERAGE AND TONALITY ON GIIPS BOND YIELD SPREADS BY DIFFERENT MEDIA MARKETS

	(1)	(2)	(3)
Share of country-specific news (NA.media)	-186.9	-1,828.9***	-1,414.1***
	(268.5)	(380.5)	(409.4)
Share of Eurozone news (E.media)	-36.79**	-68.25***	-68.27***
	(13.64)	(16.08)	(16.24)
Share of Eurozone news * tonality (E.media)	-172.4***	-236.3***	-233.2***
	(38.04)	(46.99)	(47.01)
Tonality of country-specific news (NA.media)	2.878**	4.875***	3.268*
	(1.03)	(1.2)	(1.3)
Share of country-specific news * tonality (NA.media)	-1,435.2***	-3,775.0***	-3,110.3***
	(370.9)	(524.4)	(525.1)
Share of country-specific news (NA.media, 1 lag)		-1,871.1***	
		(293.9)	
Share of Eurozone news (E.media, 1 lag)		-69.65***	
		(19.01)	
Share of Eurozone news * tonality (E.media, 1 lag)		-114.6*	
		(52.6)	
Share of country-specific news * tonality (NA.media, 1 lag)		-2,345.3***	
		(440.9)	
Share of country-specific news (NA.media, cum. 3 lags)			-1,780.7***
			(345.9)
Share of Eurozone news (E.media, cum. 3 lags)			-59.83***
			(15.81)
Share of Eurozone news * tonality (E.media, cum. 3 lags)			-116.1*
			(50.89)
Share of country-specific news * tonality (NA.media, cum.			-2,468.4***
3 lags)			(505.4)
Lagged dependent variable	Yes	Yes	Yes
Financial market controls	Yes	Yes	Yes
Country fixed-effects	Yes	Yes	Yes
Constant	0.008	0.042	0.044
	(0.27)	(0.27)	(0.29)
Observations	12,930	12,930	12,920
Wald test on joint significance	680.77 ***	753.79 ***	705.60 ***
$X^2(3)^1$	28.78 ***	41.22 ***	34.37 ***
$X^2(3)^2$	6.92 *	4.67	2.72
$X^2(3)^3$	10.99 **	10.77 **	9.05 **
$X^2(3)^4$	30.91 *	61.43 ***	55.80 ***

See remarks Table 4. [1] Test on joint significance for the interaction variables of Eurozone news on the European media market. [2] Test on joint significance for the interaction variables of Eurozone news on the North American media market. [3] Test on joint significance for the interaction variables of country-specific news on the European media market. [4] Test on joint significance for the interaction variables of country-specific news on the North American media market.

This indicates that TV news coverage on the North-American media market is mainly negative (Table B.1) and thus yield increasing spreads for the observed sample period. Columns (2) and (3) of Table 5 allow for time varying effects and reveal a significant effect not only of news in t but also of those in $t-1$ and $\Sigma_{t=-1}^{-3}$ on the GIIPS bond yield spreads in t. The coefficient for the country-specific news on the North American media market in t is even three times as high as the coefficient when not controlling for lagged news effects.

The stronger impact of the news that is released on the North American media market might be explained by the fact, that only very big and newsworthy news about the GIIPS economies is aired on the North American media market. The descriptive statistics of the news variables by different media markets shows that the mean of the country-specific news, that is aired on the North American media market, is lower than the mean of the country-specific news, that is aired on the European media market. The news aired on the North American media market could be declared as those news that is surprising to market participants. This conjecture seems plausible, since we find very similar coefficients for the news variables in interaction with the day when Mario Draghi held his famous unexpected and surprising speech in London on July 26, 2012.

Surprisingly, news about the Eurozone has a significant impact on GIIPS yield spreads only when released on the European media market. The descriptive statistics of the news from the Eurozone on the North American media market indicates that almost no reports about the Eurozone occurred on the North American media market as compared to the country-specific ones. Referring to that, it seems that only the negative country-specific events made news shows on the North American media market.

5 Conclusions

This paper explores the relationship between media coverage and risk evaluation on financial markets using daily data between January 1, 2007 and December 1, 2016. We find that media coverage affects bond yield spreads of the GIIPS countries vis-à-vis Germany.

The analysis of the impact of news stories on bond spreads is not new. However, existing studies often use newswire services, like Reuters, Bloomberg, or media databases like Factiva and apply simple word count techniques instead of content analysis.[25] These data have severe shortcomings as they are not precisely getting the content, for instance in terms of context and tonality. In contrast, our data comes from a full sample of TV evening news aired by the leading TV stations around the world. Moreover, they are analyzed by human analysts and coded with respect to a multitude of variables, e.g., topic, source, protagonist and tonality. In comparison to word count or computer linguistic approaches this still leads to a much higher accuracy in evaluating the content. In total, the contribution is based on 1,542,233 reports from evening news shows of leading TV stations in Austria, Canada, China, France, Germany, Italy, South Africa, Spain, Switzerland, UK, US and Vietnam. Among them are 39,796 reports targeting Economic and Euro issues of the GIIPS countries, Germany and the Eurozone.

According to our results, the share of news about the Eurozone has a significant effect on the crisis countries' yield spreads. The size and direction of the effect depends on the tonality of the news. A higher share of news about the Eurozone today as well as in the past (prior day, prior 3 days) significantly reduces the yield spreads of the GIIPS countries vis-à-vis Germany today if the tonality is positive (more positive than negative). Further, the effect is only economically significant on those days on which the tonality of news is extreme (rather close to +1 or -1).

[25] Conrad and Zumbach (2016), Falagiarda and Gregori (2015), Mohl and Sondermann (2013) and Gade et al. (2013) use newswire services. Falagiarda and Gregori (2015) use the ECB Real Time Information System. Beetsma et al. (2013) use Eurointelligence, Apergis et al. (2016) and Büchel (2013) use a online database of newspapers.

Although the sign and statistical significance of the country-specific news goes in the same direction as the Eurozone news, the effect of country-specific news on the GIIPS yield spreads is economically less important. As in the past, the Eurozone gave reasons to conjecture about the existence of common liability (at least in parts) from the perspective of the financial market, the Eurozone can be seen as an insurance for the bonds of member countries. As long as the Eurozone exists, from an investor's perspective, the default risk of the bonds is still considered rather limited such that positive news on the Eurozone might be interpreted as a trustworthy indicator for this persistence. Comparing media markets, we find different effects. For instance, Eurozone news that is released on the North American media market has no impact on the GIIPS yield spreads, whereas country-specific news has a strong effect on the spreads. As North American media often only cover country-specific news if they are huge, often negative, and thus seen as newsworthy, this effect may be driven by bad news, that came as a surprise and were unexpected to market participants.

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Appendix

A Literature

Table A.1: LITERATURE OVERVIEW

Author	Dependent variable	News source	Classification
Beetsma et al. (2013)	Public debt	Eurointelligence	Classification into bad, good and unclassified news: "By "bad news" ("good news") we mean news that we expect to lead to a tightening (relaxation) of the governments intertemporal budget constraint or news that we expect to lead to a rise (fall) in the interest rate." (Beetsma et al., 2013, p. 89).
Büchel (2013)	GIIPS gov. bonds CDS	Factiva (Reuters, Dow Jones Newswires, Agence France-Press, Associated Press Newswires, and Market News International)	None; simply counts per date.
Gade et al. (2013)	10y gov. bonds	25,000 news media releases (Bloomberg, Dow Jones News Wire, Market News International and Reuters)	An algorithm searches for predetermined words regarding public finance.
Mohl and Sondermann (2013)	10y gov. bonds	15,000 news agencies reports from Bloomberg, Dow Jones Newswire, Market News International and Reuters	No obvious classification into positive and negative statements. Focus on keywords like restructuring, bailout and the European Financial Stability Facility (EFSF).
Falagiarda and Gregori (2015)	10y gov. bonds (GER, ITA)	ECB Real Time Information System. Media releases from the following agencies: Bloomberg, Reuters, Dow Jones Newswires and Market News International	Fiscal policy announcement: +1 if the announcement signals a future deterioration (budget improvements) 0 if the announcement is budget-neutral -1 if the announcement signals a future budget consolidation.
Apergis et al. (2016)	CDS	FACTIVA: online database of newspapers, which categorizes its articles by subject, and provides a code that identifies articles that discuss sovereign debt issues	A word was considered negated if it was preceded within five words by one of these negation terms. It was possible within an article to track both negative and positive words, although in the case of a negative article, positive words could be hardly tracked.
Conrad and Zumbach (2016)	USD-EUR and CDS	Reuters	Statements which suggest a joint liability for national debt within the EZ (e.g. Eurobonds) are coded with +1. Opposite statements are coded with -1.

B Data characteristics

Table B.1: SUMMARY STATISTICS OF GREECE, ITALY, SPAIN - COUNTRY-SPECIFIC NEWS VARIABLES

Variables	N	mean	sd	min	max
Greece					
Share of country-specific news of total news	3,622	0.00541	0.0194	0	0.238
Tonality of country-specific news	874	-0.515	0.496	-1	1
Share of country-specific news * Tonality	3,622	-0.00292	0.0124	-0.173	0.0379
Share of country-specific news (E.media)	3,622	0.00507	0.0182	0	0.236
Tonality of country-specific news (E.media)	843	-0.508	0.499	-1	1
Share of country-specific news * tonality (E.media)	3,622	-0.00270	0.0116	-0.158	0.0379
Share of country-specific news (NA.media)	3,622	0.000242	0.00151	0	0.0225
Tonality of country-specific news (NA.media)	150	-0.781	0.464	-1	1
Share of country-specific news * tonality (NA.media)	3,622	-0.000197	0.00136	-0.0225	0.00345
Italy					
Share of country-specific news of total news	3,622	0.00261	0.00539	0	0.0815
Tonality of country-specific news	1,403	-0.0732	0.509	-1	1
Share of country-specific news * Tonality	3,622	-0.000235	0.00268	-0.0385	0.0207
Share of country-specific news (E.media)	3,622	0.00259	0.00534	0	0.0815
Tonality of country-specific news (E.media)	1,396	-0.0689	0.507	-1	1
Share of country-specific news * tonality (E.media)	3,622	-0.000220	0.00265	-0.0385	0.0207
Share of country-specific news (NA.media)	3,622	1.52e-05	0.000261	0	0.00746
Tonality of country-specific news (NA.media)	16	-0.875	0.342	-1	0
Share of country-specific news * tonality (NA.media)	3,622	-1.34e-05	0.000249	-0.00746	0
Spain					
Share of country-specific news of total news	3,622	0.00281	0.00620	0	0.0811
Tonality of country-specific news	1,320	-0.180	0.655	-1	1
Share of country-specific news * Tonality	3,622	-0.000643	0.00362	-0.0604	0.0245
Share of country-specific news (E.media)	3,622	0.00277	0.00606	0	0.0811
Tonality of country-specific news (E.media)	1,311	-0.173	0.653	-1	1
Share of country-specific news * tonality (E.media)	3,622	-0.000610	0.00355	-0.0604	0.0245
Share of country-specific news (NA.media)	3,622	3.48e-05	0.000482	0	0.0184
Tonality of country-specific news (NA.media)	30	-0.961	0.150	-1	-0.333
Share of country-specific news * tonality (NA.media)	3,622	-3.07e-05	0.000380	-0.00845	0

NA.media is a shorthand for the North American media market, which includes TV news shows in America and Canada. E.media is a shorthand for the European media market which includes TV news shows in Germany, Austria, France, UK, Italy, Spain and Switzerland.

Table B.2: SUMMARY STATISTICS OF PORTUGAL AND IRELAND - COUNTRY-SPECIFIC NEWS VARIABLES

Variables	N	mean	sd	min	max
Portugal					
Share of country-specific news of total news	3,622	0.000707	0.00510	0	0.133
Tonality of country-specific news	241	-0.569	0.558	-1	1
Share of country-specific news * Tonality	3,622	-0.000474	0.00419	-0.121	0.0101
Share of country-specific news (E.media)	3,622	0.000677	0.00501	0	0.130
Tonality of country-specific news (E.media)	228	-0.582	0.547	-1	1
Share of country-specific news * tonality (E.media)	3,622	-0.000457	0.00411	-0.118	0.0101
Share of country-specific news (NA.media)	3,622	1.87e-05	0.000258	0	0.00725
Tonality of country-specific news (NA.media)	24	-0.792	0.588	-1	1
Share of country-specific news * tonality (NA.media)	3,622	-1.43e-05	0.000253	-0.00725	0.00322
Ireland					
Share of country-specific news of total news	3,622	0.000767	0.00702	0	0.197
Tonality of country-specific news	207	-0.533	0.596	-1	1
Share of country-specific news * Tonality	3,622	-0.000463	0.00518	-0.142	0.0257
Share of country-specific news (E.media)	3,622	0.000739	0.00678	0	0.188
Tonality of country-specific news (E.media)	194	-0.515	0.603	-1	1
Share of country-specific news * tonality (E.media)	3,622	-0.000438	0.00494	-0.132	0.0257
Share of country-specific news (NA.media)	3,622	2.71e-05	0.000403	0	0.0144
Tonality of country-specific news (NA.media)	27	-0.852	0.362	-1	0
Share of country-specific news * tonality (NA.media)	3,622	-2.38e-05	0.000391	-0.0144	0

NA.media is a shorthand for the North American media market, which includes TV news shows in America and Canada. E.media is a shorthand for the European media market which includes TV news shows in Germany, Austria, France, UK, Italy, Spain and Switzerland.

Table B.3: SUMMARY STATISTICS OF THE EUROZONE NEWS VARIABLES

Variables	N	mean	sd	min	max
Share of Eurozone news of total news	21,732	0.00287	0.00833	0	0.120
Tonality of Eurozone news	5,970	-0.240	0.525	-1	1
Share of Eurozone news * Tonality	21,732	-0.000705	0.00324	-0.0369	0.0155
Share of Eurozone news (E.media)	21,732	0.00280	0.00817	0	0.111
Tonality of Eurozone news (E.media)	5,790	-0.236	0.526	-1	1
Share of Eurozone news * tonality (E.media)	21,732	-0.000677	0.00317	-0.0369	0.0155
Share of Eurozone news (NA.media)	21,732	4.44e-05	0.000480	0	0.0149
Tonality of Eurozone news (NA.media)	258	-0.605	0.461	-1	0
Share of Eurozone news * tonality (NA.media)	21,732	-2.58e-05	0.000325	-0.00995	0

NA.media is a shorthand for the North American media market, which includes TV news shows in America and Canada. E.media is a shorthand for the European media market which includes TV news shows in Germany, Austria, France, UK, Italy, Spain and Switzerland.

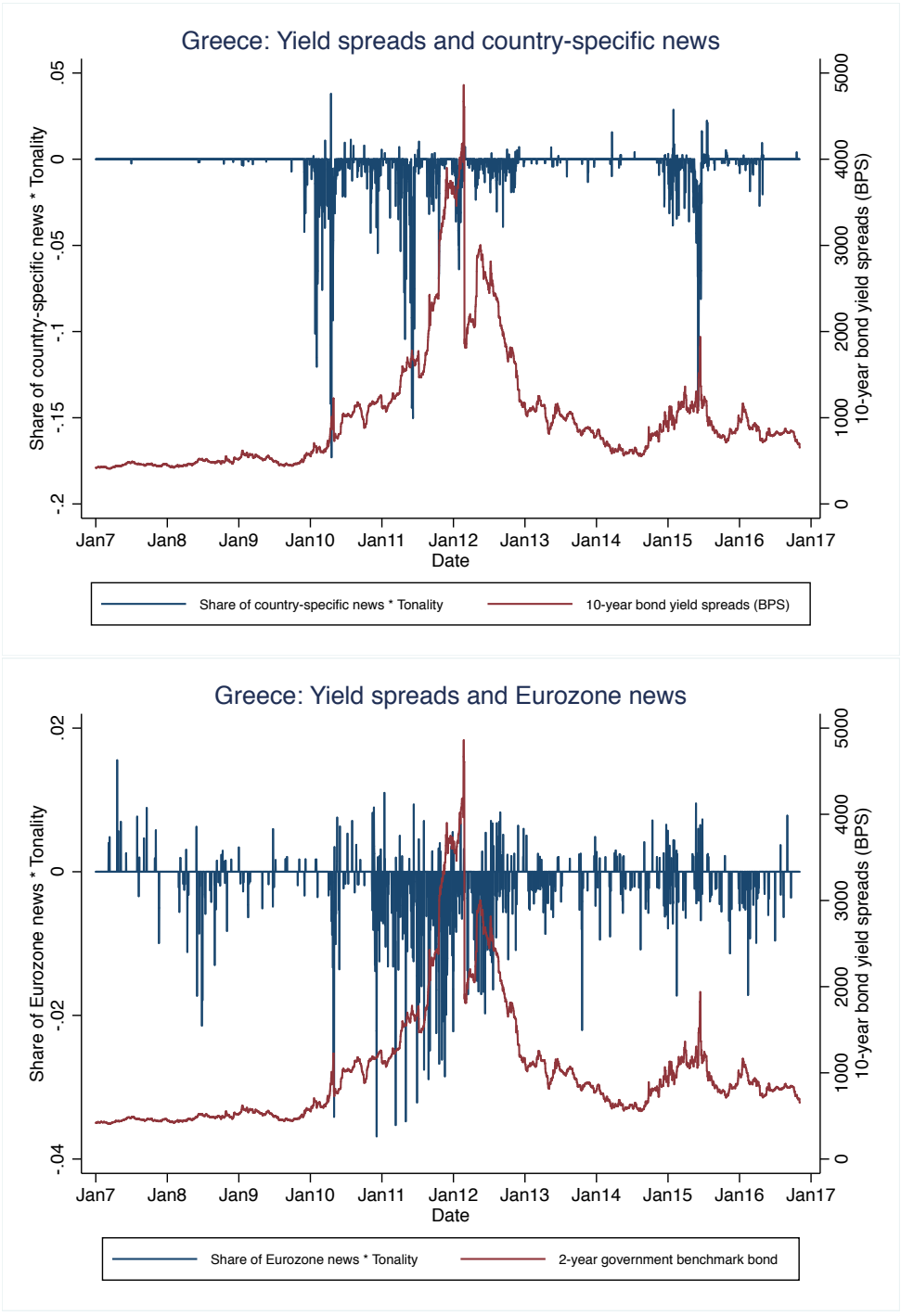

Figure B.1: 10-YEAR BOND YIELD SPREADS OF GREECE AND COUNTRY-SPECIFIC OR EUROZONE NEWS

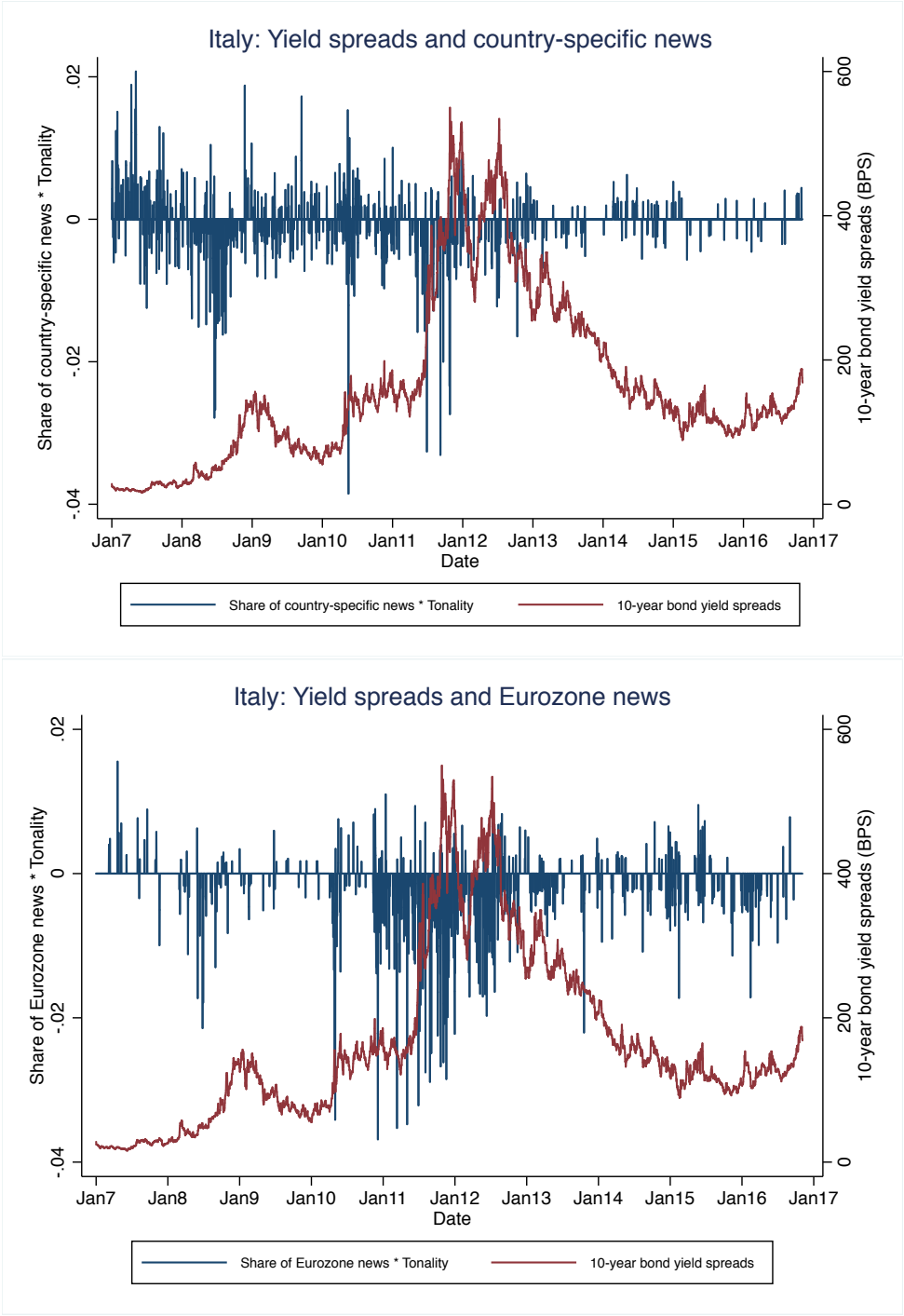

Figure B.2: 10-YEAR BOND YIELD SPREADS OF ITALY AND COUNTRY-SPECIFIC OR EUROZONE NEWS

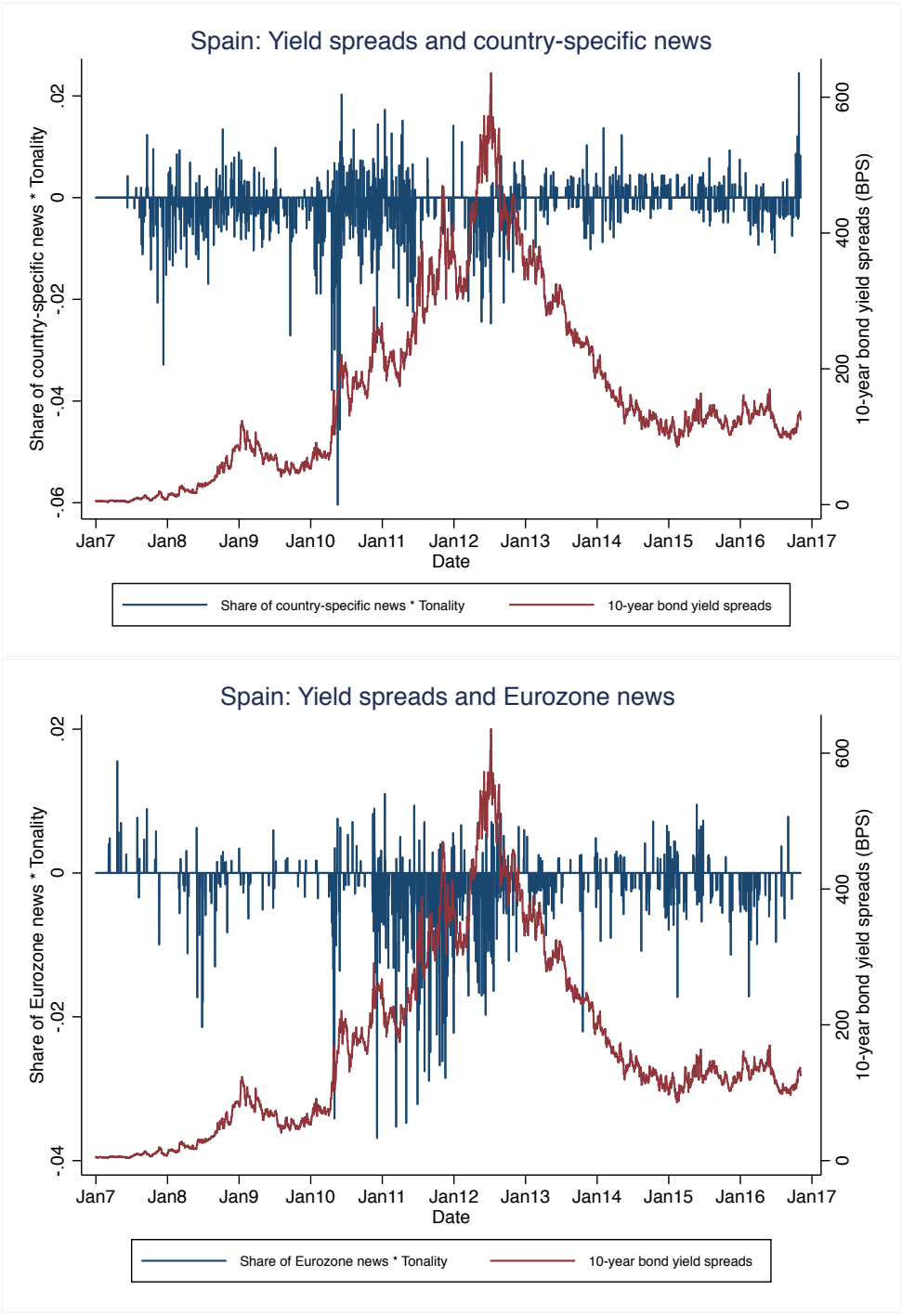

Figure B.3: 10-YEAR BOND YIELD SPREADS OF SPAIN AND COUNTRY-SPECIFIC OR EUROZONE NEWS

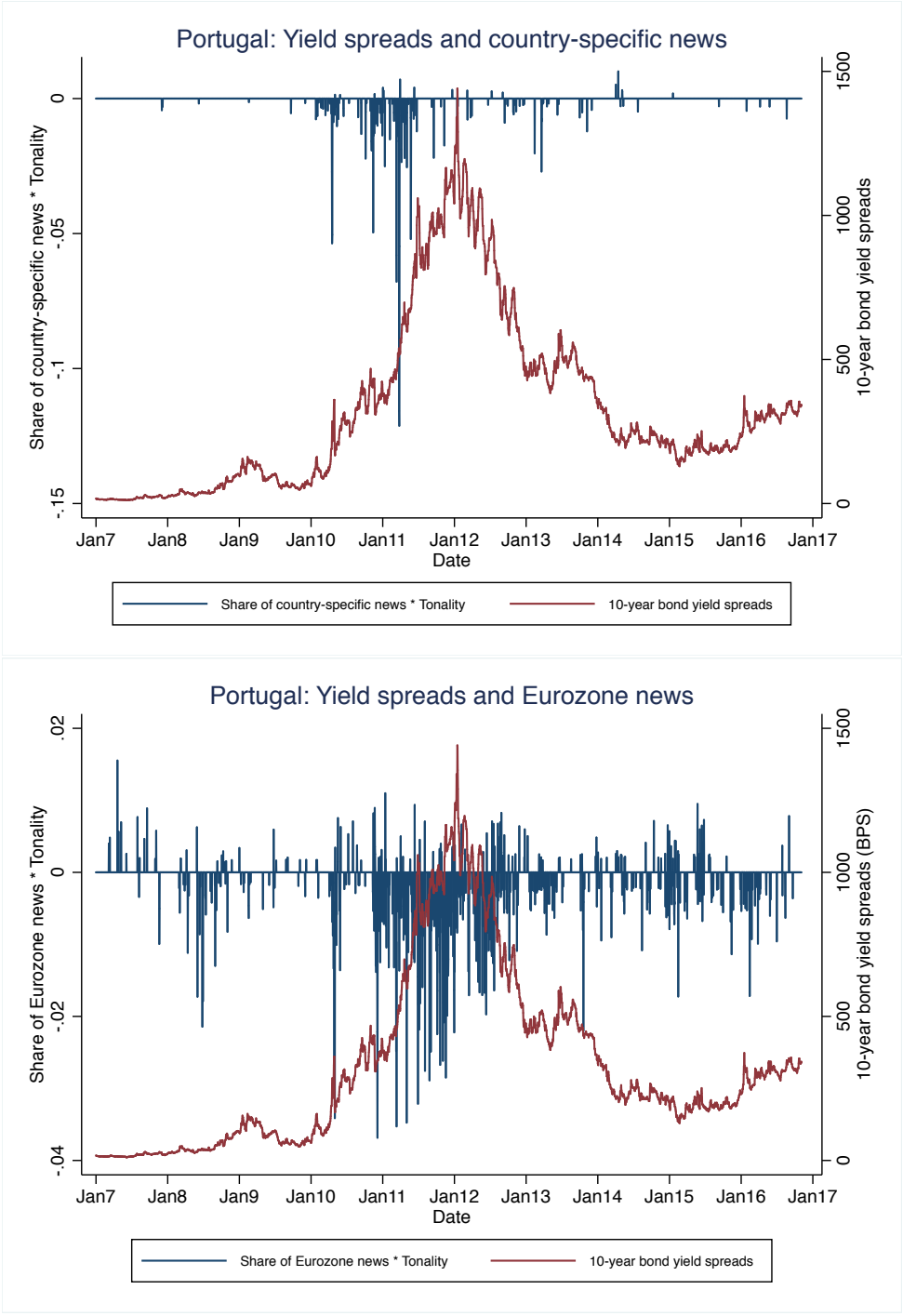

Figure B.4: 10-YEAR BOND YIELD SPREADS OF PORTUGAL AND COUNTRY-SPECIFIC OR EUROZONE NEWS

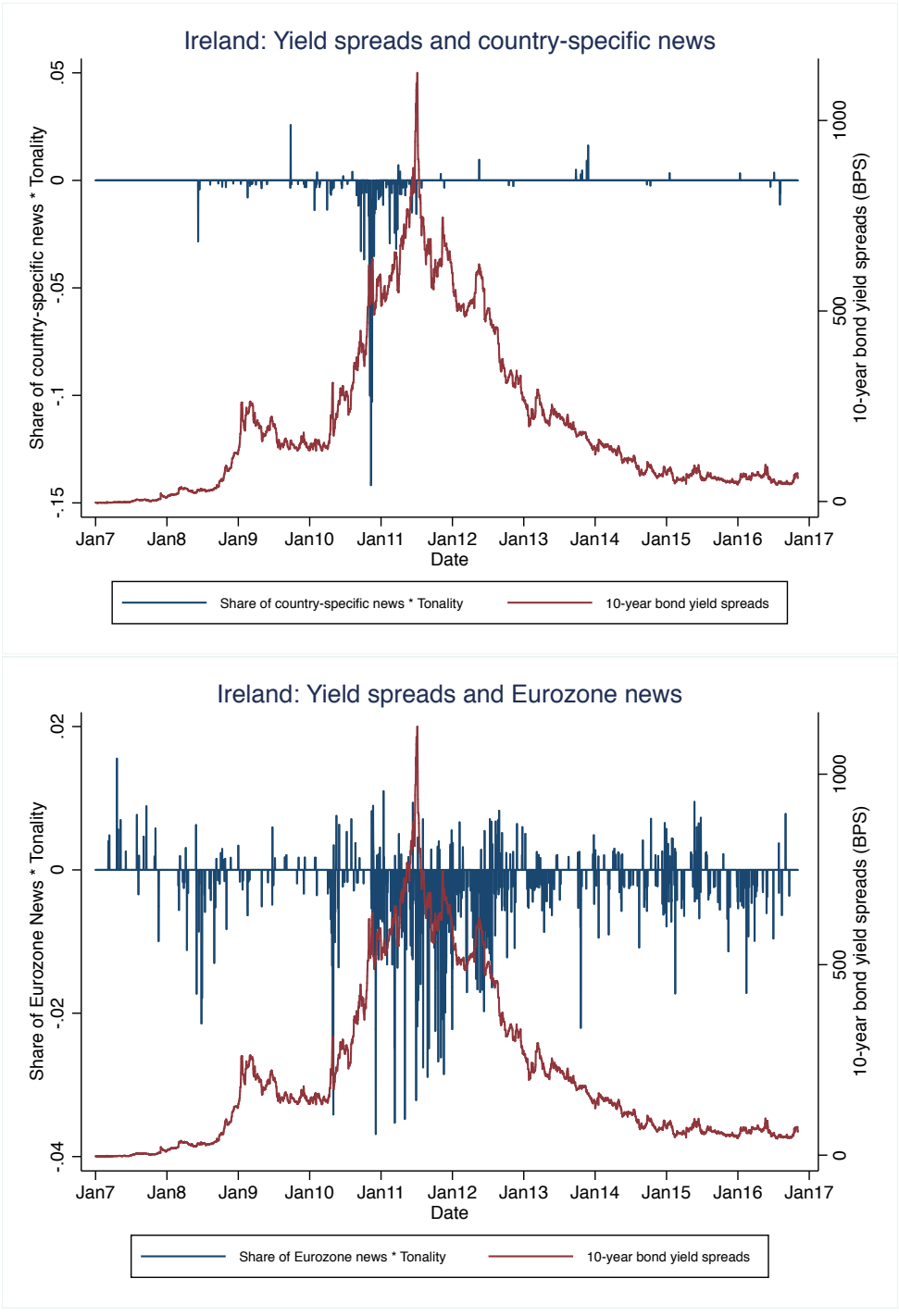

Figure B.5: 10-YEAR BOND YIELD SPREADS OF IRELAND AND COUNTRY-SPECIFIC OR EUROZONE NEWS

B.1 Data and Residual Analysis: Testing for groupwise heteroscedasticity, autocorrelation, corss-sectional dependence and unit root

Regression model:

$$\Delta spreads_{i,t} = \alpha_0 + \beta \Delta X_t + \epsilon_{i,t} \tag{B.1}$$

with $i = 1, ..., 5$ denoting the GIIPS countries; and $t = 1, ..., 3623$ denoting the daily time dimension. The controls include a measure of risk aversion (VSTOXX), the total stock market index for the EU and the TED spread.

First, a Breusch-Pagan Lagrange Multiplier (LM) test for cross-sectional independence in the residuals of equation B.1 is conducted, following Baum (2001) and Breusch and Pagan (1980). The test is valid for large T and small N. The null hypothesis of no CD is rejected for the 10-year government bond yield spreads at the 1% significance level (see Table B.4, Column (1)). This implies CD of the residuals. Furthermore, a modified Wald statistic for groupwise heteroscedasticity in the residuals of equation B.1 is calculated, following Baum (2001). Homoscedasticity is the null hypothesis of this test, which is rejected at the 1% significance level for the dependent variable (see Table B.4, Column (2)). Finally, a Wald test for serial correlation in the idiosyncratic errors, discussed by Drukker (2003), is conducted. The null hypothesis of no serial correlation is rejected for the 10-year bond yield spreads (see Table B.4, Column (3)).

Regarding testing for the existence of a unit root process of the time series, the optimal lag length for each panel is determined first with Akaike's information criterion (AIC). Then, an Augmented Dickey-Fuller-test (ADF) is conducted. The test assumes that all series are non-stationary. The null hypothesis cannot be rejected (see Table B.5, Column (2)). Hence, the 10-year bond yield spreads do not follow a stationary process. In order to avoid spurious regression problems, the first difference of the 10-year bond yield spreads is selected as dependent variable.

Table B.4: TEST RESULTS RESIDUAL ANALYSIS

	CD *	Groupwise heteroskedasticity **	Serial Correlation ***
10-year bond yield spreads	25310.995	2.6e+05	900.082
	(0.0000)	(0.0000)	(0.0000)

* CD is tested with the Breusch and Pagan (1980) LM test. The resulting test statistic of the Breusch and Pagan (1980) LM test is distributed $Chi - squared(d)$, where: $d = N_g * (N_g - 1)/2)$, under the null hypothesis of cross-sectional independence.

** Groupwise heteroscedasticity in the residual of a fixed-effects regression model is tested with a Wald statistic. It tests the hypothesis that $sigma^2(i) == sigma$ for $i = 1, N_g$, where N_g is the number of cross-sectional units. The resulting test statistic is distributed $Chi - squared(N_g)$ under the null hypothesis of homoscedasticity.

*** Wald test for the null hypothesis of no serial correlation.

Note: p-values are reported in parantheses.

Table B.5: TEST RESULTS UNIT ROOT

	Optimal lag length *	10-year government bond yield spreads, ADF test **
Greece	4	-2.317
		(0.1667)
Italy	3	-1.902
		(0.3310)
Spain	4	-1.826
		(0.3677)
Portugal	2	-1.584
		(0.4915)
Ireland	4	-1.442
		(0.5620)

* The optimal lag length for each panel is selected based on Akaike's information criterion (AIC).

** The Augmented Dickey-Fuller test that a variable follows a unit-root process. The null hypothesis is that the variable contains a unit root. The optimal lag length of each panel is used for the ADF test. MacKinnon p-values in brackets.

B.2 Identification: Testing for the causal direction of the effect of media coverage on bond yields

Table B.6: TEST RESULTS GRANGER CAUSALITY TEST

Dependent variable	Explanatory variable	Granger non-causality test results*
10-year bond yield (first diff.)	Share of country-specific news of total news	8.9293 (0.0000)
10-year bond yield (first diff.)	Share of Eurozone news of total news	8.7754 (0.0000)
Share of country-specific news of total news	10-year bond yield (first diff.)	1.4472 (0.1478)
Share of Eurozone news of total news	10-year bond yield (first diff.)	-0.9223 (0.3564)

* The test procedure is based on the work by Dumitrescu and Hurlin (2012). To test for Granger-causality in panel data the procedure by Lopez and Weber (2017) is applied. The null-hypothesis of the test is that the explanatory variable does not Granger-cause the dependent variable. P-values for the test are reported in parantheses.

C Robustness

Table C.1: IMPACT OF MEDIA COVERAGE ON GIIPS BOND YIELDS

	(1)	(2)	(3)
Lagged dependent variable	0.013	0.015	0.008
	(0.01)	(0.01)	(0.01)
Period during the European sovereign debt crisis	0.538	0.580	0.566
	(0.31)	(0.31)	(0.32)
EURO STOXX 50 Volatility index (logarithm)	7.307**	7.189**	7.226**
	(2.67)	(2.68)	(2.71)
European stock market index (logarithm)	-26.83*	-27.02*	-27.32*
	(11.05)	(11.06)	(11.19)
TED spread	-0.415	-0.413	-0.348
	(1.111)	(1.112)	(1.21)
Credit rating spreads	-0.0420	-0.0395	-0.0434
	(0.04)	(0.04)	(0.04)
Share of country-specific news of total news	25.46**	25.16**	31.32**
	(8.18)	(9.0)	(10.17)
Share of Eurozone news of total news	4.964	-12.24	-8.164
	(11.62)	(13.67)	(13.25)
Share of country-specific news of total news (1 lag)		-1.074	
		(8.88)	
Share of Eurozone news of total news (1 lag)		-38.85*	
		(16.32)	
Share of country-specific news of total news (Cum. 3 lags)			11.13
			(9.19)
Share of Eurozone news of total news (Cum. 3 lags)			-26.37*
			(12.26)
Country fixed effects	Yes	Yes	Yes
Constant	-0.019	-0.005	-0.007
	(0.27)	(0.27)	(0.29)
Observations	12,930	12,930	12,920
Wald test on joint significance	95.46 ***	117.63 ***	115.49 ***

The table reports coefficients estimated by FGLS correcting for CD, heteroscedasticity and autocorrelation of the error term. The dependent variable is the 10-year bond yield spreads of the GIIPS vis-à-vis Germany. Robust standard errors are in parentheses. Columns (1) to (3) display the estimation results of the 3 different models described in the empirical strategy section. All variables (except dummy variables) are in first differences. Weekend days are excluded from the regression.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C.2: IMPACT OF MEDIA COVERAGE AND TONALITY ON GIIPS BOND YIELDS

	(1)	(2)	(3)
Share of Eurozone news of total news (first diff.)	-23.87	-52.95***	-53.45***
	(13.23)	(15.68)	(15.53)
Share of country-specific news * Tonality (first diff.)	-37.13*	-58.49**	-70.56**
	(18.00)	(20.44)	(22.58)
Share of Eurozone news * Tonality (first diff.)	-142.4***	-208.1***	-219.8***
	(36.78)	(45.49)	(44.34)
Share of Eurozone news of total news (1 lag)		-65.79***	
		(18.66)	
Share of country-specific news * Tonality (1 lag)		-48.23*	
		(20.50)	
Share of Eurozone news * Tonality (1 lag)		-118.2*	
		(51.27)	
Share of Eurozone news of total news (Cum. 3 lags)			-54.29***
			(14.99)
Share of country-specific news * Tonality (Cum. 3 lags)			-67.24**
			(21.97)
Share of Eurozone news * Tonality (Cum. 3 lags)			-154.0**
			(47.57)
Lagged dependent variable	Yes	Yes	Yes
Financial market controls	Yes	Yes	Yes
Country fixed-effects	Yes	Yes	Yes
Constant	-0.010	0.019	0.014
	(0.27)	(0.27)	(0.29)
Observations	12,930	12,930	12,920
Wald test on joint significance	95.56 ***	119.13 ***	118.62 ***
$X^2(3)^1$	17.27 ***	18.61 ***	22.02 ***
$X^2(3)^2$	23.76 ***	33.25 ***	33.04 ***

The table reports coefficients estimated by FGLS correcting for CD, heteroscedasticity and autocorrelation of the error term. The dependent variable is the 10-year bond yield spreads of the GIIPS vis-à-vis Germany. Robust standard errors are in parentheses. Columns (1) to (3) display the estimation results of the 3 different models described in the empirical strategy section. All variables (except dummy variables) are in first differences. Weekend days are excluded from the regression. For reasons of clarity the table reports only the statistical significant estimation results. [1] Test on joint significance for the interaction variables of country-specific news. [2] Test on joint significance for the interaction variables of Eurozone news. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.