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Political Competition: How to Measure Party Strategy in Direct Voter Communication using Social Media Data?

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Political Competition: How to Measure Party Strategy in Direct Voter Communication using Social Media Data?

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Abstract

Political competition, party strategy and communication in the era of social media are growing issues. Due to the increasing social media presence of parties and voters alike, direct communication is more important for party competition. This paper aims to improve the methodological approach used to analyze political competition and communication. The dataset includes over 30,000 Facebook status messages posted by seven German parties from January 2014 until February 2018. Topic modeling, which is commonly used in other fields, allows for evaluating party communication on a daily basis. The results show the high accuracy of calculating party-relevant issues. To determine the tone of the debate, a sentiment analysis was conducted. The prevalence of topics and sentiments over time allows for precise monitoring of the political debate.

Keywords: Political competition, Party strategy, Decision making, Social media, Topic models, Sentiment analysis

JEL: C81, D72, D83, D91

1. Introduction

Political competition, party strategy and communication in the era of mass social media are growing issues. The understanding of these issues, however, is still rather poor. The importance of communication and its effects are discussed across disciplines. Quattrone and Tversky (1988) described the issue of framing politically relevant issues and its effect on voters' choices. Both sides – demand side and supply side – of politics are of interest considering (1) the possibly unselfish and irrational cognition of voters (Bischoff and Siemers, 2013; Caplan, 2001) and (2) decision-makers who are either far removed from the assumptions of the rational homo economics (Sunstein and Thaler, 2003) or have strong reelection incentives. Political strategists can use well-known biases to influence or even manipulate the voters' choices. Rupert Sausgruber and Jean-Robert Tyran (2011) showed in laboratory experiments that communication between subjects (i.e., voters) reinforces prior beliefs and group identities. The increasing usage of social media of politicians and voters requires a better understanding of this communication channel to understand election processes.

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The traditional perspective of a benevolent government maximizing utility is outdated. Schnellenbach and Schubert (2015) observed the growing importance of behavioral aspects in the political economy. However, most of the literature is limited to voter choice and behavior. Parties and politicians are either ignored or treated as endogenously given. Due to the growing importance of social media and debates about the influence of filter bubbles, the measurement of party communication should not be neglected. The small number of studies that include parties use hand-coded party programs to analyze party-specific issues. However, party programs are suboptimal for two reasons. First, these programs are published before elections and do not reflect changes in the topical focus. Second, only a small proportion of voters read party programs; therefore, the reach of these programs is small.

This paper aims to improve the methodological approach used to analyze political competition and communication. Topic modeling, which is commonly used in other fields[1], allows for observing party communication on a daily basis and minimizes human coding. Due to the increasing social media presence of parties and voters, direct communication is more important for party competition. The results show the high accuracy of calculating party-relevant issues. In addition, the prevalence of topics over time and their positivity or negativity are available. With these results, the operationalization of topic prevalence for analyzing the success of party strategy on voter turnout and the relevance of topics for voters is possible.

This paper is structured as follows. Section 2 compiles the models and findings about voter behavior and political competition as well as psychological results on cognitive biases and limitations in the context of processing information. Section 3 introduces topic modeling, including the theoretical background and basic notations. Latent-Dirichlet-Allocation (LDA) will be described in depth, and it was chosen as it fits the data best. The data used and the cleaning process are discussed in section 4. Section 5 presents the main results and implications of running LDA on Facebook messages. The paper closes with a short conclusion and outline.

2. Literature Review

The tradition of modelling political action dates back to Downs (1957) who referred to ideas developed by Hotelling (1929). It is assumed that vote-maximizing parties follow the strategies of profit-maximizing firms by placing themselves as close as possible to each other with minor deviation to the right or left on the ideological left-right continuum. For the assumption of single peaked preferences of voters, this results in an equilibrium even for multiparty systems. Davis et al. (1970) criticized this approach due to the strict assumptions that are incompatible with real world election problems. The assumption of dominant positions in a multidimensional world is untenable. Hinich (1977) rejected the equilibrium at the median if voter choices are no

[1] See, for example Bholat et al. (2015); Cerchiello and Nicola (2018); Dybowski and Adämmer (2018); Hansen and McMahon (2016).

longer clearly defined or candidates are barely distinguishable. Various advances were made in modeling equilibria for multidimensional issues and different types of voter preferences (Hinich et al., 1973; Riker and Ordeshook, 1973).

It is widely accepted that cognitive biases and limitations lead to inefficient or irrational market behavior.[2] However, the conclusion, at least in the past, has often been to call for a paternalistic policy intervention to correct market outcomes. The assumption of a benevolent maximizer of social welfare is questionable (Berggren, 2012; Cooper and Kovacic, 2012; Loewenstein and Haisley, 2007). The system of demand and supply in politics is a complex system of principal-agent relationships, self-interest, cognitive limitations and irrational behavior. Cowen (2005) concluded that voters do not know their cognitive limitations but rather think that they know the truth. In addition, political communication tends to lead to polarization rather than convergence of opinions (Bénabou and Tirole, 2016; Cowen, 2005).

Empirical evidence mainly based on laboratory experiments suggests a strong influence of predefined opinions on the processing of new information. Information-processing theory states that predefinitions are built on values, ideology and experiences (Le Yaouanq, 2018; Rabin and Schrag, 1999; Sunstein, 2001). Education, racial and religious backgrounds influence these. Early experiments (Lord et al., 1979) showed that predefined opinions on complex topics lead to biased interpretations of empirical evidence. Lord et al. (1979) analyzed the effect of positive and negative evidence on the efficacy of the death penalty on the people's evaluation. They found that prior opinions are even enforced.[3]

For the demand side of politics, the introduction of "imperfect self-knowledge, imperfect willpower and imperfect recall" (Tirole, 2002, p. 643) can serve as a workable theoretical foundation for voter choices. In their joint work, Bénabou and Tirole (2006), Bénabou (2008), Bénabou and Tirole (2011) and Bénabou (2015) discuss a variety of cognitive limitations that occur (1) in the evaluation of information on the efficacy of markets versus state, (2) during political ideology formation and (3) due to network effects on world views.

The previous evidence draws a picture of nonrational voters in a Bayesian sense. These findings tremendously change expectations about voter choices and decisions. This, however, only depicts the demand side of politics. The "single-minded focus on voter behavior is misguided" (Ashworth and Bueneo de Mesquita, 2014, p. 565) because it is impossible to make predictions about election results without studying the interaction of voting behavior and politicians' behavior, which is directly influenced by voters. Ashworth and Bueneo de Mesquita (2014) focus on the strategic interaction between the incumbent, the challenger and a

[2] Akerlof (2002); Kahneman (2003); Mullainathan and Thaler (2000).
[3] Further studies enforce this finding: see, for example, Munro and Ditto (1997), Plous (1991), McCright and Dunlap (2011).

representative voter. The discussion, however, mainly focuses on voters and either ignores the supply side or assumes it is endogenous. Do politicians act rationally or irrationally, and even more interesting, do they use information about the voters' cognitive limitations to manipulate votes to their own benefit. Stigler (1972) concludes that spatial models fail to analyze the link between voter preferences and party competition.

Caplan (2008) is one of a few who discussed the rationality or irrationality of politicians. He claimed that rationality depends on the topic – politicians have strong incentives to be informed and rational about their popularity; however, their assessment of political outcomes does not need to be as rational. Political competition is mainly discussed in terms of agenda setting, including issue ownership, issue divergence vs. convergence and voter salient issues. Glazer and Lohmann (1999) and Dragu and Fan (2016) evaluated the electoral agenda setting with two major results. First, the multidimensional issue space is reduced to a lower dimensional space in which the political debate takes place. Second, minority and majority parties tend to prefer different issues. While minority parties rely on controversial topics and are single focused, majority parties focus on consensual topics. These results are in line with the finding of the effect of absolute and comparative advantages of issues on the convergence vs. divergence of these (Amorós and Puy, 2013; Stigler, 1972). These results, however, reflect a one-sided perspective of parties' strategic agenda setting, neglecting interactions with voter preferences and choices. The statement a "good politician tells the public what it wants to hear; a better one tells the public what it is going to want to hear" (Caplan, 2008, p. 168) motivates to jointly evaluate electoral competition and voter choices.

Two branches of empirical research have evaluated the relationship between party strategy and voter preferences. The essential question is who reacts to whom. On the one hand, parties can be sensitive to changes in voter preferences and opinions. On the other hand, voters are able to change their decisions regarding who they will vote for due to electoral competition. Adams et al. (2009) found that the reaction to changes in public opinion crucially depends on the party's ideological position in the left-right party spectrum. While parties in the center and to the right tend to adjust their policy, leftist parties are less responsive to those changes. The conclusion drawn is that parties in the left spectrum have a long-term policy agenda. The results on context-dependent voting found by Callander and Wilson (2008) considered both voter and party choices. Psychologically, the context of decisions is relevant, i.e., a candidate is not chosen on his / her individual agenda but on the whole set of candidates and their positioning in the ideological space. Context-dependent voting, therefore, influences the voters' individual voting decisions. Parties, however, also adjust their strategies to context-dependent voting. The more relevant the context, the greater the tendency of parties to react ambiguously in their policy statements. In addition, issue ownership and issue-specific competence influence voting decision more, at least in countries with ideological convergence

of party programs (Green and Hobolt, 2008). In contrast to these findings, Adams et al. (2011) did not find significant reactions of voters to policy announcements in party manifestos. They concluded that voters react according to their perceptions of party position rather than on an announced shift.

A major shortcoming of all empirical analyses is the measurement of party position and strategic agenda setting. Two proxies of party positions are used. Many studies have used hand-coded party manifestos based on the Comparative Manifesto Project (CMP) as information about the importance and position of parties about relevant issues (e.g., Kohl, 2018; Rode and Sáenz de Viteri, 2018). These, however, limit the evaluation to a single point in time during the election period, and in addition, voters rarely read party manifestos. A further limitation of party manifestos is their objective nature, which differs from other types of party communication, such as speeches or social media, which is informed by emotions and personal references. The second proxy is the position of parties on the ideological left-right continuum. Comparisons of these positions show that voters barely adjust their perceptions of party ideologies between two elections. Therefore, the methodological background might be a reason for surprising results in connecting electoral competition with voter choices. A few studies have examined electoral competition on social media channels. These, however, were either limited in terms of the amount of data (Štětka et al., 2014), concentrated on emotions or likes only (Bene, 2018; Sandoval-Almazan and Valle-Cruz, 2018) or used quantitative information about the parties' social media presence, such as number of posts, likes, naming of specific persons (Effing et al., 2016). This paper suggests measuring electoral competition by using the mass social media communication of parties on a large scale and extending the data by looking at the textual information of social media data. In regard to quantitative information about posts, topic models allow for obtaining information about issue relevance by party and sensitivity analysis provides information about the positivity or negativity a party communicates about the respective topics. In addition, the availability of daily data is a major advantage.

3. Topic Modeling

Text analyses and information retrieval include several issues that complicate automated analyses. These are, among others, synonyms, semantic structure and irony. With increasing computational power, automated and unsupervised methods have become more effective.

Deerwester et al. (1990) established one of the first methods, the Latent Semantic Analysis (LSA), which effectively allows for automated indexing, which is an extension of simpler Vector Space Models (VSM) (e.g., Salton et al., 1975). LSA uses document-term matrices that contain information on the semantic structure. The reduction of dimensionality using Singular Value Decomposition (SVD) has two main advantages. The idea is that it is easier to find similarities

between documents in the latent space than in the original document-term matrix. SVD is a concept in linear algebra using basic properties of *m x n* matrices that produce two matrices that relate terms to concepts and documents to concepts and a diagonal matrix with the diagonal elements being singular values of the original matrix. The singular values show the relative importance of concepts in the latent semantic space. Only a predefined number of k topics remain, which reduces the calculation time, and the smaller vector space still represents the similarities between the documents sufficiently, which indicates a possibility of noise reduction.

First applications have used LSA to improve search queries to solve the problem of language variety, i.e., the detection of synonyms and words that refer to a concept. This approach, however, has some major disadvantages. As the model has only a basic statistical foundation, the application remains limited. Probabilistic Latent Semantic Analysis (pLSA) is an extension by Hofmann (1999) that partly solves this limitation. The application of this model is, for example, able to learn categories of texts from a training set and to predict the categories conditional on the learned parameters of previously unseen documents. Basically, pLSA introduces conditionally independent documents and word labels for a given specific topic. In contrast to the prior models, this allows for the possibility that one document contains more than one topic.

$$p(d, w_n) = p(d) \sum_z p(w_n|z)\, p(z|d) \tag{1}$$

with document (d), words (w) over the vocabulary (n) and topics (z).

The model learns the topic mixture for each document in the training dataset. Two major aspects impede a larger field of application. First, it is not possibility to assign probability to previously unseen documents. Second, the number of parameters that are estimated increases linearly with the number of training documents, which increases the risk of overfitting.

Latent Dirichlet Allocation (LDA) solves several of these limitations (Blei et al., 2003). The essential step forward is that documents are a random mixture over latent topics and each topic has a specific distribution over words. In contrast to pLSA, which uses the calculated parameters in the training set to evaluate of the test set, LDA instead calculates the topic distribution on a Dirichlet prior. LDA assumes that a topic is distributed over a specific vocabulary and that each document consists of topics with varying proportions.

The probabilistic generative process is defined as follows.

For each topic:

$$\beta_k \sim Dir_V(\eta) \tag{2}$$

For each document:

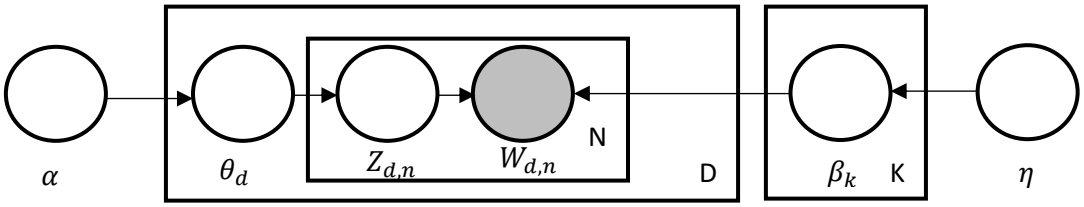
$$\theta_d \sim Dir(\alpha) \tag{3}$$

For each word:

$$\begin{aligned} &Z_{d,n} \sim Mult(\theta_d), with\ Z_{d,n} \in \{1, \dots, \mathrm{K}\} \\ &W_{d,n} \sim Mult\left(\beta_{Z_{d,n}}\right), with\ W_{d,n} \in \{1, \dots, V\} \end{aligned} \tag{4}$$

LDA makes use of two Dirichlet random variables. The topics β_k are a distribution over the vocabulary V (with topics 1 to K) and the per-document topic assignment θ_d. The Dirichlet distribution uses fixed parameters η and α that influence the topic distribution over words and the documents distribution over words, respectively. The per-word topic assignment $Z_{d,n}$ is the third hidden variable that defines the underlying latent structure of the corpus. $W_{d,n}$ is the observed variable containing information about the vocabulary used in the corpus (Blei and Lafferty, 2009).

Figure 1: Graphical Representation of the LDA



The graphical representation is equivalent to the following inference problem.

$$\begin{aligned} &p(\beta_{1:K}, \theta_{1:D}, Z_{d,n}, W_{n,d} | \eta, \alpha) \\ &= \prod_{k=1}^{K} p(\beta_k|\eta) \prod_{d=1}^{D} [p(\theta_d|\alpha) \prod_{n=1}^{N} [p(z_{n,d}|\theta_d) p(w_{n,d}|z_{d,n}, \beta_{1:K})]] \end{aligned} \tag{5}$$

Key to the evaluation of the hidden variables is the corresponding posterior distribution, which is the conditional distribution of the latent content given the observed documents. Figure 1 shows all possible conditional dependencies. The posterior distribution is intractable due to the hidden variable structure. LDA solves the problem by approximation. Several methods have been proposed; in the following, Gibbs sampling will be used, which is a form of a Markov Chain Monte Carlo. The idea is to estimate the conditional probability of assigning a word to a specific topic given the topic assignments to all other words. The algorithm starts by assigning

each word to a random topic and reevaluates the assignment in each iteration step. Therefore, it is crucial that the number of iterations is sufficient for the estimation to converge to the posterior distribution.[4]

Two prior parameters can be predefined. For modeling short messages, α is relevant. It is defined as the concentration parameter. For primarily short messages, α is set smaller than 1, meaning that one document contains mainly one topic. If on contrary α is higher than or equal to 1, the texts are more likely to contain more than one topic. For the analysis of this paper, α equals 0.2. The second parameter η defines the distribution of words per topic and is set automatically by the algorithm within this approach.

LDA is limited due to the usage of the Dirichlet distribution, which is unable to capture correlations between topics (Blei and Lafferty, 2006). The strong independence assumptions of the Dirichlet distribution do not allow for topic correlations. Less strict logistic normal distributions can solve this problem. However, LDA produces good results for the present data. Therefore, and because LDA is well established, it makes sense to use it here.[5]

While LDA produces meaningful results in terms of the used vocabulary, the emotions remain unnoticed. Sensitivity analysis is a method that can be used to determine the positivity or negativity of a message. The sensitivity analysis is based on the dictionary of positive and negative words compiled by Remus et al. (2010). Values between -1 and 1 are assigned to each negative word and positive word, symbolizing how strong the sentiment is for each word. The polarity weighting is retrieved by pointwise mutual information. Briefly, the method classifies new words by semantic association (Recchia and Jones, 2009). For this paper, the weight of each word in a message (if that word is available in the dictionary) is evaluated. The counts of positive and negative words are aggregated to the mean sentiment of each message. In addition, the mean positivity and negativity of each status message is calculated.

4. Data

Political communication and the usage of social media have changed. Recent examples show that voters have changed information channels – though in a different context – the usage of social media during the Arab spring shows both the power and reach of this channel. Data confirm the growing number of active users over the last decade. Over the last decade, the usage of social media has increased immensely. The direction of print media usage shows the reverse trends. TV consumption remains constant. However, the new communication channel has gained importance for party competition. In contrast to other countries, Facebook is the

[4] For a more in depth description of the Gibbs sampling procedure, see, for example Steyvers and Griffiths (2006).

[5] The foundations of the used code are based on Wiedmann and Niekler (2017).

most important platform in Germany. Twitter is a niche platform; therefore, Facebook data will be used in the following analyses.

Table 1: Users of Social Media Channels in Millions (Germany)[6]

	2013	2014	2015	2016	2017	2018
Facebook	27.4	23.9	24.7	23.5	22.9	21.7
Instagram	0.0	0.0	4.9	6.2	6.3	10.5
Twitter	3.5	2.8	2.8	2.8	2.1	2.8

Source: Krupp and Bellut (2018); Notes: Question: Which social media channel do you use at least weekly?

The following analysis is based on Facebook status messages at the federal level. No politicians at the Land level (federal state) are included, due to differences in party positions and for issue focus, the distinction is relevant. The dataset includes party leaders and general secretaries as well as official party pages. Specifically, it includes information on all seven parties that are members of the German Bundestag (Lower House) who were elected in September 2017. Ordered on the left-right continuum beginning on the left, the dataset includes the Lefts (Linke), the Greens (Gruene), the Social Democrats (SPD), the Liberals (FDP), the Conservatives (CDU), the local Bavarian Conservatives (CSU)[7] and the Alternative for Germany (AfD). The Lefts, the Greens and the AfD divide the office of the party leader. Therefore, both party heads are selected for the dataset instead of the single party leader and general secretary, in the case of the other parties.

To introduce the methodological approach and demonstrate the relevance of the results, the party leaders and general secretaries with the longest terms of office during the study period are used for the analysis. For further analyses, it would be of interest to change both party leader and general secretary when there are changes. If a candidate is voted out of office, his followers remain, and the newly elected candidate might need some time to influence a wider public. Therefore, it is reasonable to introduce a transition time between the election of a new party leader / general secretary and the change in the data.

Important for any further analyses is sufficient data cleaning. To receive meaningful results, two stop word lists with general German words with no direct content meaning and one with party names and important party members are excluded from the original text messages. Due to data cleaning, some messages are empty and deleted from further analysis. Additionally,

[6] The data is based on surveys. While Facebook irregularly publishes user numbers by country, Twitter data are only available by survey results. The number of Twitter users varies between one and five million, depending on the source and whether, non-member readers of Twitter messages are included.

[7] CDU and CSU have an agreement that they enter a parliamentary group in the Bundestag and that the CSU runs for election only in Bavaria and the CDU in all other federal states.

messages that include pictures or videos are not captured by this method. This explains why some of the messages were deleted.

The dataset includes messages from January 2014 until February 2018. Because the federal election was held on September 24th 2017, the dataset contains the pre-election period, the election campaign and the comparatively long coalition negotiations. Due to the entry of a new party (AfD) into the German political constellation and its immediate success, the last election cycle is especially interesting for electoral competition. The dataset includes 32,093 messages in total. The activity of the parties differs, and the following are more active on Facebook: the Liberals (6128 messages before / 6054 after data cleaning), the Lefts (5332 / 5306), the Alternative for Germany (5012 / 5009) and the Social Democrats (4452 / 4423). The local Bavarian Conservatives (3861 / 3810), the Conservatives (3757 / 3701) and the Greens (3551 / 3486) are the three parties with the least messages on Facebook. For future analyses, including other social media channels such as Twitter or Instagram is possibly necessary. Facebook, however, is the social media channel with the most users, especially in Germany. Thus, it is appropriate for the first experimental approach.

Social media data have some major advantages compared to other data sources; however, the text is mainly short and the spelling and the grammar mistakes are challenging for the analyses. In addition, party messages tend to include several issues at once. The results in the form of the θ values for each document verify this assumption, i.e., the percentage of topic occurrence in each message. Therefore, it is reasonable to use the percentage of issues (topics) per message rather than considering the dominating issue. Nonetheless, the dominating issue gives an idea regarding where the party sets the focus. Furthermore, the short messages and the discussion of subtopics within single messages lead to a deep subdivision of topics. To allow an analysis at different aggregation levels, the topics are grouped and coded by hand.

Next, regarding the up-to-date nature of the data, likes and/or shares of messages can be used as proxies for the resonance of the content. Information about likes and shares is relevant for a second reason: shares and likes increase the range of messages as they appear in the users' timeline.

One topic that is highly discussed is the usage of bots in election campaigns; for this study, it is not necessary to distinguish between bots and personal posts. Users are unable to evaluate the different kinds of posts. Therefore, information processing is the same irrelevant of how messages are generated.

A limitation of the present analyses is the focus on textual data. Pictures and video messages transmit much information about party communication, especially sentiments. However, this

information requires using different methods of data processing and modeling. For the future, including pictures and videos could improve the meaning of the results.

5. Results

Political competition and communication are dependent on the general situation. To provide a broad overview of the decisions and incidents, the following perspectives provide some points of reference that are relevant for the study period. The list is not complete but rather is an orientation for the interpretation of the political debate. For each year, the list contains major events in the categories of politics and society and economics, as these are relevant categories observed in social media communication.

The observation period begins shortly after the Lower House elections in September 2013. The ruling coalition changed from a coalition of the CDU/CSU (Conservatives) with the FDP (Liberals) to a (grand) coalition of the CDU/CSU with the SPD (Social Democrats). Due to the small size of the opposition (approximately 20%), minority rights were highly discussed. In addition, regulations on fixed-term contracts and changes in renewable energy were relevant in domestic policy. Internationally, the conflict between the Ukraine and Russia in the Crimea was discussed, and the NSA scandal damaged the relationship between Germany and the US. On a European level, the election of the European Parliament and the Transatlantic Trade and Investment Partnership (TTIP) negotiations were relevant. Overlapping topics between politics and economics remained in the context of the world financial crisis, i.e., the interest rate policy of the European Central Bank (ECB) and the financial aid program for Greece. Due to the developments in the aftermath of the Arab Spring and the growing Syrian conflict, the refugee inflow to Germany was a topic of discussion. With the increasing inflow of refugees, the debate about the integration of a large number of refugees intensified. Additionally, more crimes connected to racism and xenophobia were observed. The destabilized situation in the Middle East led to and supported the gaining strength of the IS (ISIS).

Domestic policy issues dominated 2015. Laws were passed and came into force concerning a national minimum wage, rent control and a controversial bargaining unit law. Regarding parties' strategies, the change in leadership of the right-wing party AfD influenced the policy orientation and the German political spectrum. At the EU level, the election of a new Prime Minister in Greece changed Greek ambitions to change the terms of the EU aid program. Internationally, the G7 summit took place in Germany, and the Paris Climate Conference led to a global agreement. The VW emission scandal strongly affected the German automotive industry. In terms of socially relevant topics, there was public interest in the terror attacks in France as well as the increasing number of refugees due to the ongoing conflict in Syria.

International agreements and foreign developments dominated the debate in 2016. At the EU level, the successful BREXIT referendum distressed the EU. Two agreements the

Comprehensive Economic and Trade Agreement (CETA) free trade agreement between the EU and Canada and an agreement with Turkey regarding refugee movements were concluded. The attempted coup in Turkey and the following arrest and stricter legislation intensified the discussion about cooperating with Turkey. Similarly, the newly elected US president was met with skepticism. Both politically and socially, discussions focused on the publication of the Panama Papers and the perceived homeland security threats due to several terror attacks in Nice and Berlin and other smaller attacks. Both of these attacks increased public criticism of the ruling coalition.

Due to the elections for the Bundestag (Lower House), fewer policy decisions were made in 2017. However, two controversial laws were passed: the marriage for homosexuals and the possibility of registering a third gender (diverse). In the European context, the discussion about the independence referendum in Catalonia and other ongoing independence movements intensified. In addition, the defeat of the independent candidate in the French presidential election against the extreme right-wing candidate was a signal for the EU rather than strengthened nationalism. Internationally, the developments in Turkey, with an increasing number of arrests of critical journalists, politicians and researchers, and the successful constitution referendum, changing the parliamentary into a presidential democracy, concerned the international community. The international community was also concerned with noting the resignation of the US from the Paris Climate Agreement. From the social perspective, the incidents of the New Year celebrations caused discussions about the integration of refugees due to the sexual harassment incidents in Cologne, mainly by immigrants.

The above list should only be interpreted as support to contextualize and interpret the following analysis on parties' social media communication.

The analysis resulted in a total of 30 to 40 topics identified per party. However, these topics are highly subdivided; to achieve interpretable results a codebook was developed. It was possible to extract 39 topics in 16 categories from the more detailed topic list by party.[8] The subtopic structure gives a good impression about the orientation of the debates. To provide an overview of relevant topics and show the meaningful results by extracting Facebook statuses, the most relevant topics per party are described. Some of the most striking examples show that the profile of each party is depicted by social media communication and that significant political and social events are visible in the data.

Table 2 is the most condensed version of the topical structure. The main focus of the parties is defined in two ways: the topics the party communicates most about across all evaluated topics and / or the topics the party use unique position features. The results obtained by topic

[8] See the Appendix for a complete list of topics.

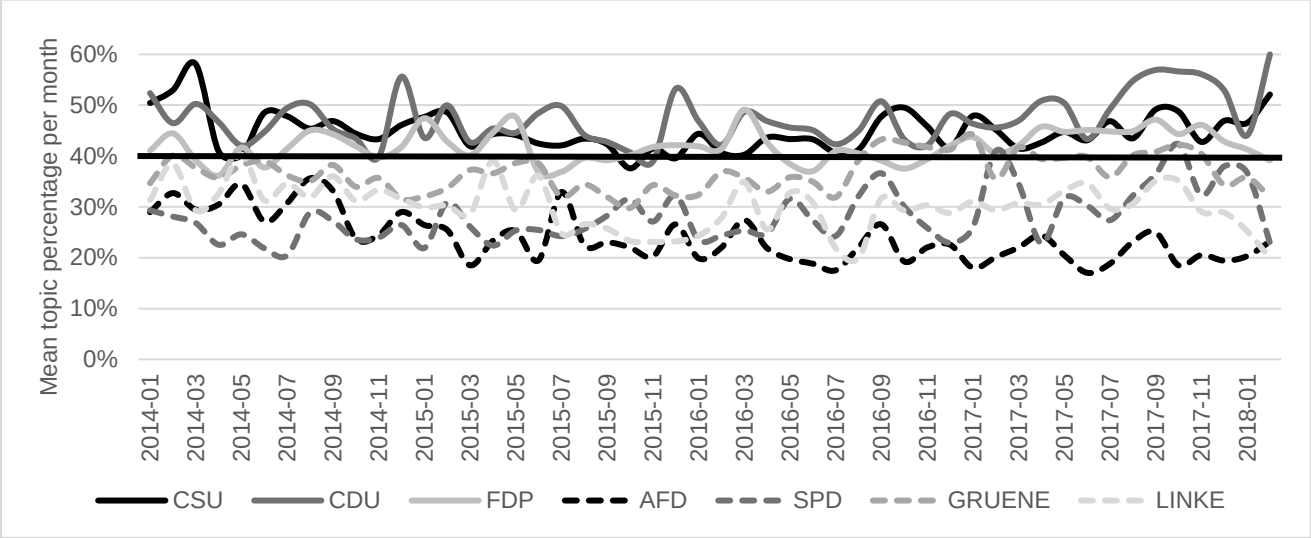
modeling contain information about the proportion of each topic in each Facebook statement. Using the percentage information and a calculation to determine which topic is the main topic of each statement, Table 2 summarizes the topical structure. The overview supports previous findings on electoral competition and show the following: (i) incumbents and challengers have different preferences in terms of agenda setting, and (ii) niche or smaller parties focus on a signature topic. The more detailed evaluation over time is in line with more theoretical assumptions about party competition, namely, voter choice and party position are dependent on context and the position on the left-right continuum influences adjustments in party positions due to changes in public opinion.

Table 2: Topical Focus of Party Communication

	LINKE	GRUENE	SPD	FDP	CDU	CSU	AfD
Main Focus	Social Policy	Energy	Social Policy	Social Policy	Job Market	Migration	Migration
		Society (Equality Rights)	Growth, Free Trade and Digitalization	Budget, Free Trade, Digitalization	Budget, Free Trade and Digitalization	Party	Criticism Parties
				Party	Party		EU (2014 /15)
Other relevant topics	Party	Party	Party				Party
	EU (2015)		EU (2014)	EU (2015)	EU (2014)	EU (2014)	
						Security	Security
		Extremism (right)	Extremism (right)				Extremism (left) / Terror
	Society		Society				
		Migration (2014 / 15)		Migration (2015)			
		Budget, Growth and Free Trade					
	International Conflicts						

The Party topic is an example of a topic that all parties pay considerable attention to. This is not surprising considering that the topic Party includes issues such as party programs, election campaigns, public debates and congratulations to party members. However, the Party topic is set as main topic for CSU, CDU and FDP and as other relevant topic for all other parties. Figure 2 shows, in contrast to the other topics, a comparatively unambiguous dividing line at 40% topic occurrence. The FDP and Greens, however, are borderline cases, as they slip below / above the 40% line for a number of cases. However, for both parties the spikes are above / below the 40% line; therefore, the allocation of the parties to the respective categories is reasonable. Spikes are mostly observed during party events, when there have been newly elected party leaders and during election campaigns at both the Land (federal state) and federal levels.

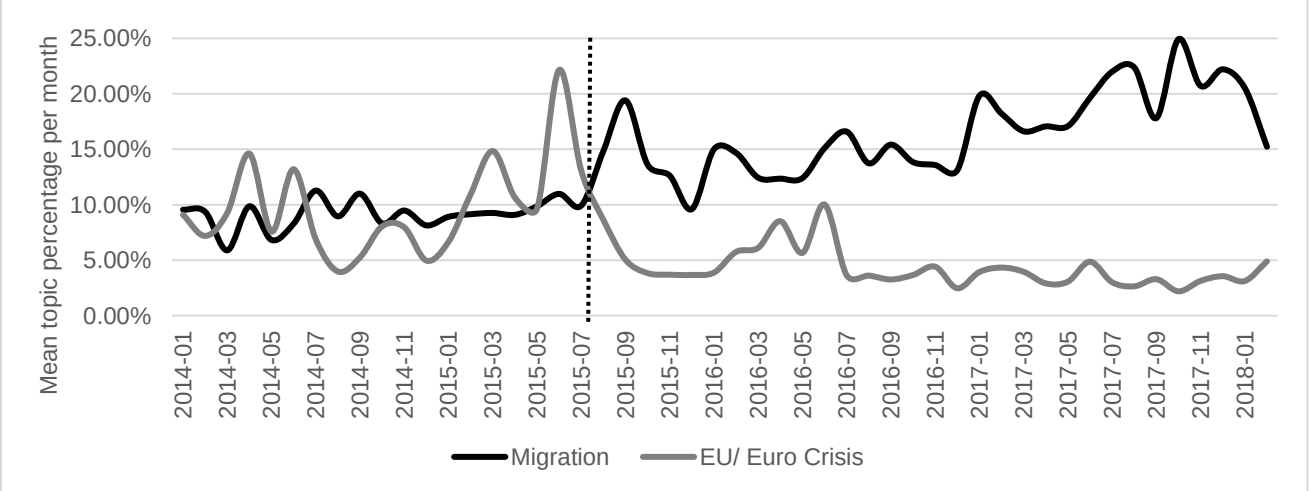
Figure 2: Party-specific Topics



In contrast to the party topic, regarding subject matter, the parties differ both in focus and in topic proportions. To show that the results are meaningful but multifaceted, I provide some examples of the policy changes of parties, the focus on niche topics, the visibility of important incidents and differentiated levels of focus on the same topic across parties.

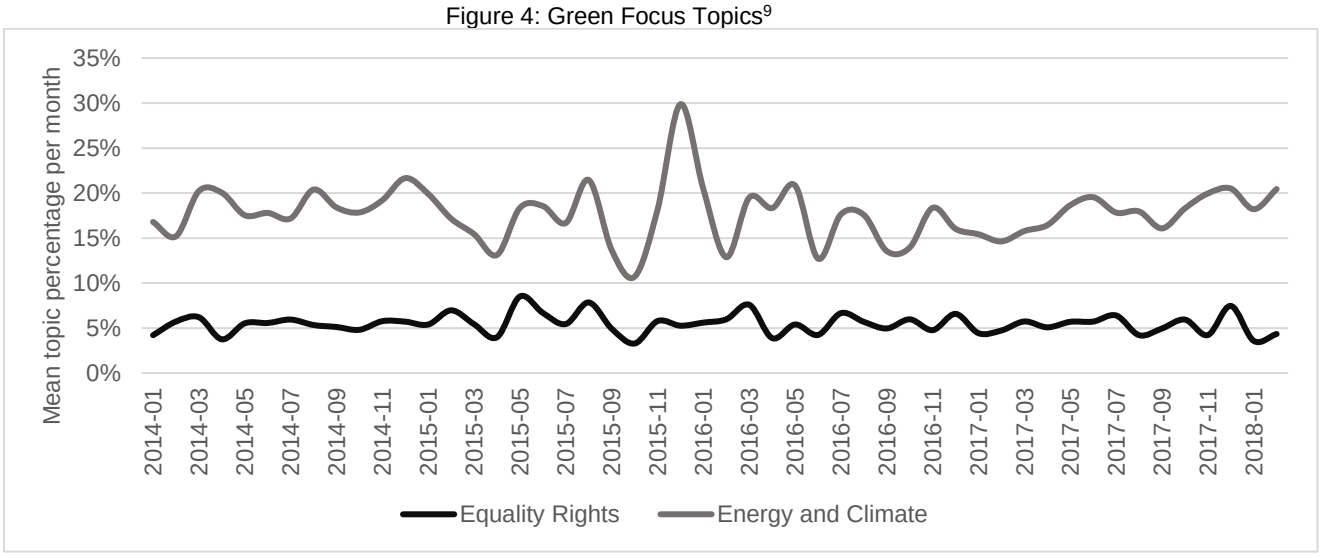
First, the data allow us to follow party strategy and focus setting on a daily basis, or reasonably, on the aggregated monthly level. The importance of the frequent update of the party's strategy becomes obvious when looking at the change in the party leader of the AfD in June 2015, as shown in Figure 3. While the party was founded as the Euro critic's party, the change in leadership shifted the attention to migration-related issues. Surely, the spike in migration-related statements was not only due to the change in leadership as the summer months of 2015 were also those with the highest number of refugees crossing the German border. Nevertheless, in contrast to other parties, the continuing large number of statements regarding migration indicate a policy change. This emphasizes the potential of social media data in tracking the policy and focus changes of parties.

Figure 3: AfD Policy Change



Second, previous mostly theoretical studies have showed that niche parties concentrate on a focus topic, a unique position feature. Most smaller German parties, i.e., Lefts, Greens, and AfD discuss these niche topics, though with different intensities. The FDP is an exception because their topic portfolio depicts a large variety of topics without a striking outlier. For the AfD, as shown in Figure 3, migration is the primary election campaign topic. The Lefts will be discussed later, as their focus lies on social policy, which is interesting in terms of the differing focus settings of the parties. The Greens, as the ecological party, naturally focus on energy and climate issues and traditionally on socially relevant topics, mainly equal rights for women and homosexuals. Although the percentage they devote to equal rights is not high, it is constantly between 5 to 10%, which is higher than that of all other parties. Figure 4 shows that both issues are continuously relevant in party communication. The spike in 2015 may have occurred because of the Paris climate agreement. The topics additionally show that the Greens' had a different perspective on the topic than other parties. They tended to controversially discuss and criticize policy decisions as insufficient, where the ruling coalition was more concerned with the success of increasing the supply of renewable energy. This result supports, on the one hand, previous considerations of the niche party strategy and, on the other hand, findings that ruling parties prefer to emphasize success rather than controversial topics.

Figure 4: Green Focus Topics[9]

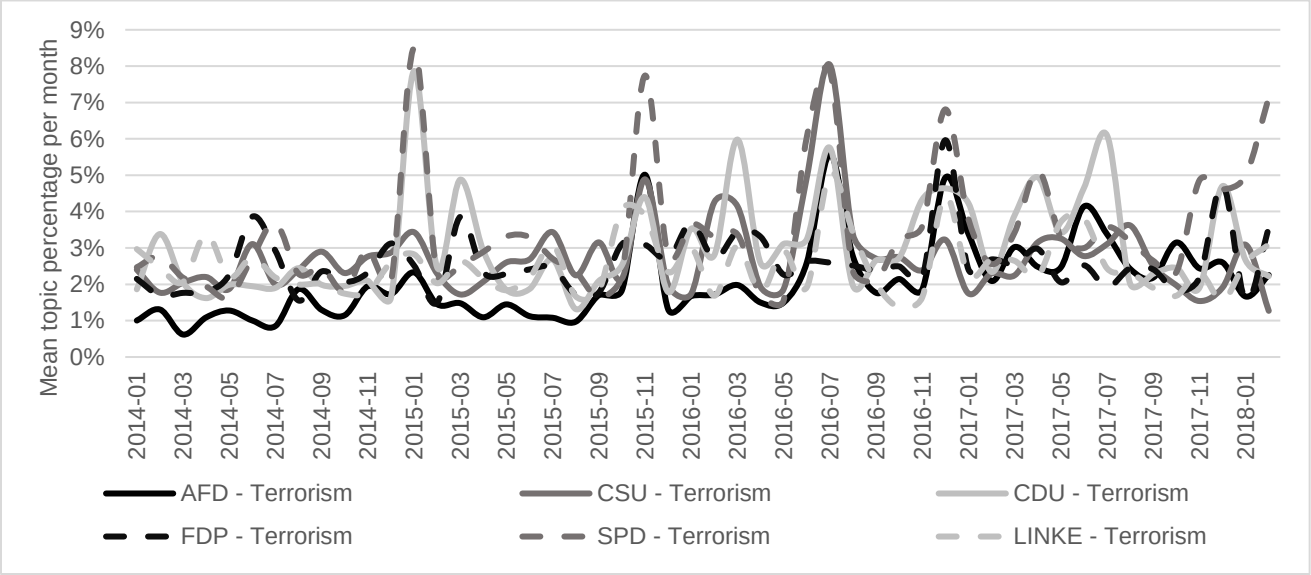


Third, important incidents of international or national importance are visible in the data, which shows that socially and voter relevant topics are captured by the method. This example is chosen due to the clear-cut appearance of events. In particular, the data reflect the increasing number of terror attacks in Europe and Germany. The spikes shown in Figure 5 can be assigned to specific attacks, for example, in January 2015, the attack on Charlie Hebdo, the Paris attacks in November 2015, two smaller attacks in July 2016 in southern Germany and

[9] Piled up line diagram.

the Christmas market attack in December 2016. In addition, the parties differ in terms of the debate focus. While most parties concentrated on expressions of sympathy for the victims, the AfD highlighted the Islamic background of the attacks and security risks.

Figure 5: Important Incidents - Terrorism



Fourth, although they discussed the same topics, the parties focused on very different issues. This becomes obvious for social policy topics. Table 3[10] shows the ten most frequent words used for labor market-related topics. The previously described subdivision of topics is clarified here. In addition, the agenda setting shows both the difference between center-left and center-right parties and the concentration on a controversial versus a goal-oriented debate structure. While the Lefts discuss a wide range of labor market issues with a special focus on social justice, the CDU focuses on achievements and good labor market conditions in terms of low unemployment. The differences between center-left and center-right parties become visible by comparing the CDU and SPD. Both parties formed a coalition in 2013, though the SPD focuses on central social democratic topics such as the minimum wages, which is not mentioned by the CDU. The FDP instead stresses an issue that the other parties barely discuss: the foundation environment and the bureaucratic obstacles the founders are confronted with. The Facebook status messages contain many more differences in party communication. The above example shows the meaningful results obtained by applying topic models to official party social media communication.

[10] The words are translated from German to English. In the Appendix, a full list of social policy topics is available.

Table 3: Agenda Setting - Labor Market

LINKE

Labor Market: Labor Law	Labor Market: Unions	Labor Market: Wages	Labor Market: Unemployment Benefit
Work	Employed	Euro	Hartz (unemployment benefit)
Good	Union	Minimum wage	Sanction
Subcontracted employment	Good	Million	Affected
Employed	Work	Year	Abolish
Human	Verdi (German Union)	Billion	Basic right
Living	Support	Company	Job Centre
Temporary (employment)	Strike	Number	Sanction free
Job	Salaries	Exception	Minimum social security
Precarious	Amazon	Low	Federal government
Same	Metal	Demand	Andrea

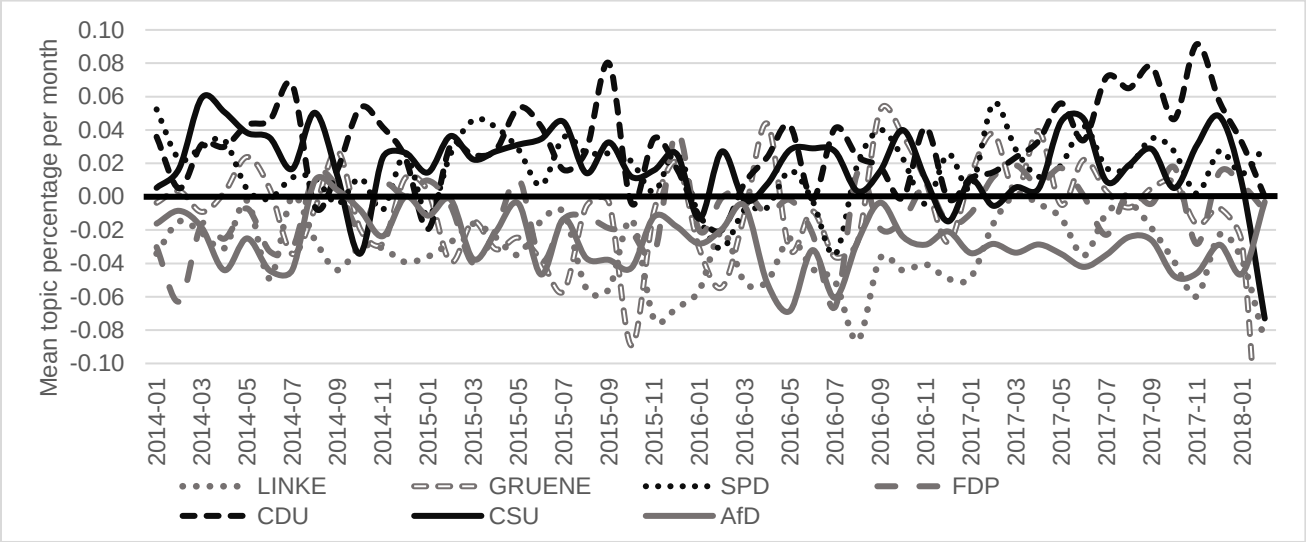
SPD	**FDP**	**CDU**	
Labor Market: Wages/Unions/Start-ups	Labor Market: Start-ups	Labor Market: General	Labor Market: Unemployment
Minimum wage	Better	Self	Germany
Pension	Germany	Strong	Good
Work	Work	Germany	Human
Human	Founder	Inside	Economy
Good	Idea	Economy	Year
Year	Company	Work	Unemployed
Law	Bureaucracy	Keep	Number
Percent	Demand	Prosperity	Work
Employee	Just	Labor Market	Percent
Andrea	Need	Time	Labor Market

The selected examples provide a good overview of the results. However, the results obtained indicate that there are many more conclusions about party competition. In particular, combining communication strategies with voter preferences is promising. Because social media communication is party specific and distinguishable, voters take this into account when they consider whether to vote and whom to vote for. To emphasize the potential of the method, I briefly describe two further advantages of using social media data. The data include information about the reaction of users to statements in the form of likes and comments. In addition to a quantifiable reaction, these data contain information about the distribution of a statement apart from the likes of party pages. This will be of importance when operationalizing the topical data for analyses of voter – politician reactions.

The tone of the debate indicates the influence of party communication on voter choice. For the evaluation, a simple sentiment analysis using a dictionary approach counting positive and

negative words is applied. The method has some limitations, especially as the dictionary does not contain some of the specific words used in the policy debates that are connoted either positive or negative. Nevertheless, for a first impression, this analysis is sufficient. Figure 6 shows the mean sentiments of all Facebook statements by month and by party. Evidently, the ruling parties tend to communicate in a more positive way, while AfD is especially negative. The result is not surprising but confirms the findings of the results regarding the words extracted by the topic model. Considering all these issues, the results provide a complex overview of party communication and agenda setting.

Figure 6: Mean Sentiment by Party



6. Conclusion

Political competition and communication on social media channels has increased over the last decade. It is a topic of growing importance in an increasingly digitalized world. Politicians, voters and researchers alike need to gain a better understanding of how this transmission channel influences voting outcomes and the political environment. Using topic modeling, it is possible to analyze social media communication on a large scale. Direct party-voter communication can be evaluated on a daily basis with additional information about Facebook user resonance and sentiments. The results show that this method produces interpretable results at four major levels. For changes in party strategy, the results reflect both the timing and direction of topical changes. Previous findings on the topical focus of smaller parties are supported by the results of this study. Furthermore, these results show that important national and international incidents are visible within the data. Finally, the results show that while the topics are similar across parties, the focus of the debate differs. The structure of these focuses combined with sentiments and user reactions draws a complex picture of political strategy.

In general, the analysis of the parties' social media communication confirms previous findings on strategical party competition. Dragu and Fan (2016) and Glazer and Lohmann (1999)

evaluated strategic agenda setting in an electoral competition context – concluding that the issue space is reduced in complexity and that minority and majority parties choose their focus differently. The focus set by the parties in social media confirms these findings. Adams et al. (2009) observed that center and right-wing parties are more responsive to changes in public opinion than left wing parties are. Concerning the opposition parties, the AfD, as a party in the right spectrum, reacted strongly to the public interest concerning the increasing number of refugees applying for asylum. In contrast, the Linke (left wing) maintained its focus during the study period. However, this should be interpreted as support rather than confirmation due to the short observation period, which is not necessarily representative of other legislation periods. Issue ownership and voter perceptions of topic-specific competences were evaluated by Green and Hobolt (2008), and their impacts on voter decision can be supported in the sense that smaller parties particularly focus on the ownership of representative topics. The available data on direct party communication can now be used to study its effect on voter choices. Previous findings by Adams et al. (2011) showed no effect of party agenda setting on voter choices. However, the party manifestos that were used could be one reason for not finding relevant effects. Up-to-date and direct communication data can possibly improve the understanding of the relationship between party strategy and voter choices. By considering both psychological findings on the processing of information and the polarization of opinions (Bénabou and Tirole, 2016), it is reasonable to assume that strategical political communication affects voter choice. This implication highlights the concept that there is a supply-demand relationship between parties and voters. However, although we were able to obtain monthly information about voter choices and preferences, there was limited data on supply-side strategies. Social media- and machine-based topic models improve the analysis of supply-side data. Having similar data on demand and supply-side politics enables a better analysis of mutual connections.

These results can be applied to several potential issues, including the reactions of voters to party communication, party strategy adjustments due to changes in voter opinions and the comparison of political competition internationally. International comparisons are difficult because hand coding requires more researchers and impedes comparability across languages. Topic modeling thus minimizes the need for human coding, and as clustering approaches are used, linguistic differences play a minor role. The examples show the potential of the strategy used in this study. However, due to growing interest, better and even more elaborate topic model strategies may be able to provide deeper insights on party strategies.

Appendix A.

Appendix A1: Coding scheme

Category	Topic	Sub-Topic
Party specific	1 Party	a. Congratulations (Party members, successful elections) b. Party program c. Party venues (conferences, ash Wednesday, …) d. Party members and party offices (without specific topic) e. Regional (Constituency, regional party focus)
	2 Party Program	
	3 Public Debate	a. Talk shows b. Announcements of interviews c. Debates on Facebook
	4 Election	a. Election programs b. Announcements of elections c. Elections campaign d. Coalition negotiations
	5 German Bundestag	Debates and votes in the Lower House
European Union	6 EU Politics	a. European Union: Program b. European Union: Challenges (nationalism, Brexit) c. EU: Election
	7 Euro-Crisis	
Migration	8 Refugee Migration	a. Refugees: General b. Refugees: Job market c. Refugees: Social security d. Refugees: Integration (primary culture) e. Refugees: Criminality (specifically sexual violence) f. Refugees: Upper limit g. Refugees: Boarder control h. Refugees: Deportation i. Refugees: Support j. Refugees: Causes of escape k. Criticism migration policy
Security	9 Homeland security	a. Surveillance b. Police and Army
Social Policy	10 Job Market	a. Unemployment b. Wages c. Unemployment benefit (Hartz IV) d. Basic level of social protection e. Labor law (working hours, working contracts, …) f. Unions g. Start-ups

	11 Pension Policy	a. Pension plans b. Old-age poverty
	12 Familiy Policy	a. Work-life balance b. Mother pension c. Child care allowance d. Child poverty
	13 Nursing Care Policy	
	14 Living Space Policy	
	15 Education Policy	a. Schools b. Kindergarten
Society	16 Society	a. Demonstrations b. Problems (general) c. Youth
	17 Historical Memory	a. German reunification b. Second World War
	18 Religion	a. Christian b. Muslim
	19 Equality Rights	a. Women b. LGBT-Community
Extremism	20 Political Extremism	a. Left b. Right (Populism, Racism, NSU terrorism)
	21 Terrorism	a. Islamic b. Condolences
Budget, Growth	22 Budget	a. Black Null b. Investments
	23 Property	Property taxes
	24 Growth	a. Factors of Growth b. Prosperity
	25 Free Trade	a. TTIP b. CETA
	26 Digitalization	
	27 Rural Development	
Transport	28 Transport Policy	a. Toll b. Exhaust emission scandal
Energy and Climate	29 Energy Transition	a. Coal energy b. Nuclear energy
	30 Agricultural Policy	a. Animal husbandry b. Farming (genetic engineering)
	31 Climate Protection	a. Climate conferences b. Climate change
Jurisdiction	32 Courts	a. Decision b. Criticism

Media	33	a. Newspaper / TV b. Talk Shows without party participation
Data	34Data Protection	a. Data preservation b. NSA
International	35 Turkey	a. Joining the EU b. Criticism c. Genocide
	36 International Conflicts	a. Ukraine b. Israel-Palestine c. Iraq/Iran d. Syria e. USA
	37 USA	
Criticism	38	a. Office-holding coalition b. Chancellor
Mixed Topics	39	a. Filling words b. Social Media special

Appendix A2: Topic Prevalence by Party

		AFD	CDU	CSU	FDP	SPD	GRUENE	LINKE
Party	1	X	X	X	X	X	X	X
	2	X	X		X	X	X	X
	3		X	X	X	X	X	X
	4	X	X	X	X	X	X	X
	5	X			X	X	X	X
EU	6	X	X	X	X	X	X	X
	7	X		X	X			X
Migration	8	X	X	X	X	X	X	X
Security	9	X	X	X	X	X		X
Social Policy	10		X	X	X	X		X
	11				X			X
	12		X	X		X	X	X
	13							X
	14					X		X
	15	X			X	X		
Society	16	X	X	X	X	X		X
	17		X	X	X	X		X
	18	X	X	X		X	X	
	19					X	X	X
Extremism Terror	20	X				X	X	
	21	X	X	X	X	X		X
Budget Growth Develop.	22	X	X	X	X		X	
	23							X
	24	X				X	X	
	25	X	X		X	X	X	X
	26		X		X	X		
	27		X	X				
Transport	28	X		X	X		X	
Energy Climate	29				X	X	X	
	30						X	
	31						X	X
Jurisdiction	32	X						X
Media	33	X			X			X
Data	34				X			
International	35	X		X	X		X	X
	36	X			X	X		X
	37					X		
Criticism	38	X			X			
Mixed	39	X						X

Appendix A3: Social Policy

LINKE

Job Market: Labor Law	Job Market: Unions	Job Market: Wages	Job Market: Unemployment Benefit	Pensions	Family Policy: Child poverty	Nursing Care	Living Space
Work	Employed	Euro	Hartz (German unemployment benefit)	Pensions	Children	Nursing Care	Social
Good	Union	Minimum wage	Sanction	Year	Human	Hospitals	Public
Subcontracted employment	Good	Million	Affected	East	Poverty	Nurse	Stuttgart
Employed	Work	Year	Abolish	Human	Live	Good	Affordable
Human	Verdi (German Union)	Billion	Basic right	Old age poverty	Social	Staff	Flat
Living	Support	Company	Job Centre	Senior	Society	Healthy	Rent
Temporary (employment)	Strike	Number	Sanction free	Need	Youth	Better	Year
Job	Salaries	Exception	Minimum social security	Law	Germany	Employed	Education
Precarious	Amazon	Low	Federal government	Higher	Euro	Missing	House building
Same	Metal	Demand	Andrea	Solidarity	Participating	Hospital	Living

SPD				FDP	
Job market: Wages/Unions/Start-ups	Family policy	Living space	Education	Job Market: Start-ups	Pensions
Minimum wage	Child	Social	Education	Better	Pensions
Pension	Family policy	Human	Euro	Germany	GroKo (German Great Coalition)
Work	Time	Society	Federal	Work	Generation
Human	Single parent	Good	Municipal	Founder	Private
Good	Young	Germany	Federal state	Idea	Pension package
Year	Profession	Solidarity	School	Company	Old
Law	Better	Political	Billion	Bureaucracy	Fair
Percent	Support	Integration	Better	Demand	Work
Employee	Nurse	Need	Good	Just	Flexible
Andrea	Parents	Live	Investments	Need	Company

CDU		
Job Market: General	Job Market: Unemployment	Family Policy
Self	Germany	Family Policy
Strong	Good	Children
Germany	Human	Good
Inside	Economy	Wish
Economy	Year	Week
Work	Unemployed	Better
Keep	Number	Parents
Prosperity	Work	Appointment
Job Market	Percent	Happy
Time	Job Market	Profession

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