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The political click:
political participation through e-petitions in Germany

Abstract:

Electronic petitions can serve as an influential mechanism for political participation. We present a study on the dynamics in the German e-petitioning system which was introduced in late 2008. Drawing on a data set of signatures, we analyze four aspects: a) the types of petitions found, b) the temporal dynamics of petitions, c) the types of users found and d) the intersection of different petitions' supporter populations. We present evidence that a) the system is dominated by a very small number of high-volume petitions and that b) these high-volume petitions have a delayed boosting effect on the base activity in the petition system. We furthermore c) present a typology of users, showing that although highly active "new lobbyists" and "hit-and-run activists" exist, one- or two-time petitioners have the largest impact. Finally, it is indicated that d) many of the high-volume petitions share a significant part of their user base, hinting at a complex, topically motivated network of supporters. Through the application of methods from what has been called "Computational Social Sciences", we illuminate a highly relevant field of political behavior online, while demonstrating the capability of data-driven approaches in such novel domains.

Introduction

As a result of the ever-increasing adoption of e-participation tools by governments, new data sources are created. This holds great promise for researchers of political participation. Every interaction of citizens with these tools leaves data traces. While not all data on these interactions are saved, let alone published the cases in which researchers have access to this data are very fortuitous. Based on this data researchers are able to learn how people use e-participation tools in the context of their daily lives without having to rely on user's recollections or data based on controlled experiments. Since these data are the byproduct of interactions by users with a given e-participation tool and not the result of careful data collection based on a specific research design, researchers face the challenge to use the data available to them and connect them to relevant questions that transcend the mere novelty of new data sets. This paper is an attempt at this challenge.

In 2005 the German *Bundestag* implemented an online platform that allowed users to post and co-sign petitions directed at the German parliament online (https://epetitionen.bundestag.de). These public petitions are posted online, together with names and dates of supporting co-signatures. These data allow researchers to examine the behavior of the platform's users. Do users sign only one petition or many? Do they use the e-petition platform only once or do they return? While at first glance these questions might seem of little interest to researchers of political participation, their answers provide us with information on the kind of political participation which this platform enables. The dynamics of co-signership offer insights into the nature of successful petitions and the thematic connection between petitions. The number and frequency of user's co-signing activities offer insights whether the petition system compels a majority of its users to employ it repeatedly and thus use petitions as a regular option of political participation. Based on three variables - co-signing behavior, frequency of platform usage, and common themes between co-signed petitions - we propose a typology of user types that can be identified in the usage data of the German e-petition platform. We hope that this typology might serve to advance the debate on user behavior enabled by e-participation tools.

Why Examine E-Petitions?

E-petitions make for an interesting research object for two reasons. For one, e-petitions are becoming an increasingly popular tool for political participation online, whether as a tool used by governments as an easily quantifiable aspect of e-democracy (Riehm and Trénel 2009), or employed by political activists to

marshal and express popular support for political issues (Mosca and Santucci 2009). This makes it important to understand the dynamics associated with e-petition systems and their usage. Are the high supporter counts of popular e-petitions necessarily an indicator for strong popular support for the topic in question, or are they just a byproduct of network effects connected to the e-petitions platforms? Or as Speth (2007) puts it, do political activists focus too much on the theatrics of their campaigns (i.e. high supporter counts) and lose therefore in the quality of political discussion? This is an important question since popular reception of e-petitions tends to focus on the quantity of supporters of a given cause (see for example Vitzthum 2009; Rath 2009; Schmollack 2010). While this offers activists a very real possibility to put their topics on the public agenda, there is also the danger of creating the 2.0 version of Budge's *signatures industry* (Budge 1996, 114). This shows the importance of understanding how the support of e-petitions is motivated. When political support and political participation are expressed by a simple click, it is necessary to ask what effects these drastically lowered participation costs have for political participation and collective action (for a discussion of the effect of ICTs on collective action see Lupia and Sin 2003; for a critical discussion of the effect of ICTs see Shulman 2008).

This introduces the second reason for studying usage patterns of e-petition systems. Traditional studies interested in the motivations behind the support of petitions would use surveys (for example PPC 2006), interviews (Macintosh, Malina, and Farrell 2002; Riehm and Trénel 2009) or selected case studies (Mosca and Santucci 2009) to find causes for support or to identify common demographical attributes among petition supporters. While common, these approaches are fraught with major problems, one being the high cost of studies of this kind; another being the usual inadequacies of self-reported motivations by actors (Bernard et al.1984). Also demographic attributes - while easy to measure - are not the most accurate predictors for human behavior (Granovetter 1985). The German e-petition system provides researchers with data that allows them to avoid these problems (while losing some of the strengths that the traditional approaches hold). The data provided by the system allow an analysis of the actions of each user of the system, be she petitioner or supporter. While this does not provide us with the exact motivation of her action, it allows us to examine her actual behavior and thus establish typical usage patterns. These patterns can then be discussed with regard to their correspondence with the goals that were expressed by advocates of the e-petition system.

The data in question were created during the interaction of users with the e-petition platform and are available for each individual. This enables a data driven approach to research into patterns of political participation through the German e-petition platform (for a discussion of further effects that data of this

kind will have on the social sciences in general see Savage and Burrows 2007). This corresponds with the "Computational Social Science" approach. The aim of this approach is to "leverage the capacity to collect and analyze data with an unprecedented breadth and depth and scale" (Lazer et al. 2009, 722) to collect digital traces of human interactions with ICTs with the aim to compile these "into comprehensive pictures of both individual and group behavior, with the potential to transform our understanding of our lives, organizations, and societies" (ibid., 721). This contrasts with the practice of studying ICTs for their own sake. Or as Richard Rogers puts it:

> "The issue no longer is how much of society and culture is online, but rather how to diagnose cultural change and societal conditions using the Internet. […] The conceptual point of departure for the research program is the recognition that the Internet is not only an object of study, but also a source. Knowledge claims may be made on the basis of data collected and analyzed by devices such as search engines" (Rogers 2009, 8).

Most studies which follow this approach use these new data to construct social networks and determine network analytical metrics to characterize human interaction (for an overview of this see Newman 2003). In this paper we follow a different approach. We use data on e-petition co-signing behavior and frequency to gain a deeper understanding of how the e-petition platform is used. This corresponds with the approach taken by Barabási (2005) and Malmgren et al. (2009) in the analysis of e-mail usage patterns. In examining different aspects of our rich data set on human behavior, we will use a variety of empirical methods.

In this paper we approach the data from two perspectives. First we look at it with petitions as focus of the analysis. What are the most successful petitions? Are there temporal patterns of co-signatures that predict the ultimate success of a petition? Are there thematic similarities between petitions which share co-signers? The answers to these questions might advance our understanding of the participatory functions the e-petition system fulfills.

In a second step we focus on the co-signers themselves. How many petitions do co-signers sign? Is the co-signing activity mainly concentrated on a few individuals, as known from other internet based phenomena? Do users co-sign petitions in short burst or are there intervals between co-signatures? The answers to these questions will tell us if, through prolonged activity, users accept the e-petition platform as a regular channel of political participation or if they typically use the platform only once and never return. Finally we will group users of the e-petition platform in four distinct user types based on these observations.

As Margetts (2009, 17) states the social sciences have to face a new policy environment online and new data sources. This challenge asks for new methodological and theoretical approaches for the social sciences. This paper is an exploratory attempt at this task. Naturally, the data driven approach chosen by this paper is only one among many approaches to answer this challenge (for an alternative approach based on experiments see for example Margetts et al 2009a; Margetts, John, and Escher 2009b).

The German E-Petition System

In Germany the right of citizens to petition the government is stated in Art. 17 of the *Grundgesetz*:

> "Every person shall have the right individually or jointly with others to address written requests or complaints to competent authorities and to the legislature"(Grundgesetz 2010).

In the German petition system petitions fall in three categories: 1. *Einzelpetitionen* (petitions by single actors); 2. *Massenpetitionen* (petitions which share the same topic and petition text but were submitted by single actors); and 3. *Sammelpetitionen* (petitions that are submitted accompanied by a list of signatures by co-signers). Since the 1990s the number of incoming petitions has remained largely stable around 20,000 *Einzelpetitionen* a year with a few outliers at 15,000 or 24,000 petitions (Deutscher Bundestag 2010a, 98f.). Linder and Riehm (2009, 3) identify two functions for petitions in the German system: a) political participation through requests concerning the *Gesetzgebung* (process of law giving); and b) protection of an individual's rights in the form of personal complaints (for a comprehensive account of the German petition system see Schick 1996). It is important to note that in their original design petitions do not have a role in the formation of public opinion, for example through agenda setting by civic actors.

In September 2005 the German parliament started a two-year trial run of an e-petition system inspired by the Scottish e-petition system. This trial included the possibility for individuals to submit petitions via e-mail or through a newly established petition platform online (https://epetitionen.bundestag.de). On that platform users could access and co-sign other public petitions. Moreover, it was decided that, while all petitions no matter their co-signature count are addressed by the *Petitionsausschuss* of the German parliament, public petitions, which managed to attract at least 50,000 co-signers in the first three weeks after their publication would be guaranteed a public hearing before the *Petitionsausschuss*.

This platform was replaced in October 2008 by a custom built platform (for a detailed discussion of the process that lead to the introduction of the e-petition system in Germany see Riehm, Coenen, and Lindner 2009a, 207-9; for a discussion of the formal procedure following the submission of a petition through the e-petition system and its subsequent publication on the platform see Linder and Riehm 2009, 503-6).

Before moving on it is important to clarify the terminology. In the German e-petition system there is a difference between an *Onlinepetition* (online petition) and an *Öffentliche Petition* (public petition). Under the terminology "online petition" the *Bundestag* treats petitions that have been submitted via the e-petition system but that are treated as normal petitions by single individuals. These petitions are thus comparable to the *Einzelpetitionen* described above. A "public petition" is a petition, which has been submitted electronically to the *Petitionsausschuss* but that is intended for the public by the petitioner and that complies with a set of selection criteria expressed in the "Guidelines for Public Petitions" Deutscher Bundestag 2008a). If these public petitions comply with the criteria they are published on the e-petition platform. Then it is possible for other individuals to co-sign them during a period of six weeks starting with the date of publication. It is also possible to discuss each public petition on a dedicated forum (Riehm, Coenen, and Lindner 2009a, 210). This paper addresses these public petitions.

Germany is not alone in establishing an e-petition system. Other countries with e-petition systems include Scotland (Macintosh et al. 2008), Great Britain (Miller 2008), South Korea (Lee 2005), Queensland Australia (Finnimore 2008), and municipalities in Norway (Lindner and Blümel 2008, 79-100). In addition to countries, non-state and commercial actors use e-petitions regularly to collect support for ad hoc campaigns (ibid. 101-14; and ibid. 115-35). E-petitions are thus clearly one of the most heavily utilized e-participation tools.

Since its introduction the e-petition system in Germany has already produced three highly visible causes célèbres. The first public petition that managed to gain large media coverage and strong public attention was a petition that in late 2008 and early 2009 asked for the guarantee of a basic income (Deutscher Bundestag 2009a). This e-petition was co-signed by 52,973 supporters. This high signature count led to strong public coverage on supporter websites (see for example: Steinheuer and Schlee 2009), popular blogs (see for example: Gullinews 2009), and traditional news media (see for example: Strohschneider 2009; Vitzthum 2009).

The next e-petition that popped into the public spotlight was a public petition against the indexing and blocking of websites (Deutscher Bundestag 2009). This petition was submitted on April 22 2009 and managed to surpass the 50,000 co-signature count in only four days (Dietrich 2009) to become the up

until then most successful e-petition with a total of 134,015 co-signatures. This led to a public hearing on 22 February 2010 (Deutscher Bundestag 2010b) and a massive public discussion of the topic in question and e-petitions in general (see for example: Rath 2009).

If critics thought of the e-petition platform as a system that unduly emphasized internet related topics, they had to revise their views in June of 2010. A petition (Deutscher Bundestag 2010c) initiated by the *Deutscher Hebammen Verband* (German association of midwives) managed to attract 105,300 co-signers online in addition to 80,970 offline (Wolber 2010). This led to a public hearing before the *Petitionsausschuss* (Deutscher Bundestag 2010d). Again this success in numbers was met with strong press coverage (see for example: Kailitz 2010; Schmollack 2010).

In Germany, the introduction of the e-petition system was preceded by a two-year trial period starting in 2005. This trial was accompanied through an evaluation of the *Büro für Technikfolgen-Abschätzung* with a focus on the possibilities and risks connected to employing the internet as a means for the German petition system. In Germany this lead to the very fortunate situation that the early phases of the system are very well documented by the evaluation team (Lindner and Riehm 2009; Riehm 2007a; Riehm 2007b**;** Riehm 2008; Riehm and Trénel 2009) leading to their final report (Riehm et al. 2009). These reports are especially instructive. Still, since their reports only examine the German e-petition system before its recent publicly discussed causes célèbres there remains the necessity for research on the effects these recent successes had on the public perception of the petition system.

Data on German e-petitions

On the e-petition platform *epetitionen.bundestag.de* (accessible at https://epetitionen.bundestag.de) the German parliament publishes public e-petitions. Along with the name of the petition and a numerical ID the platform also lists the names of the original petitioner and the names of co-signers accompanied by the date they co-signed the petition (Deutscher Bundestag 2006).

The analyses presented in this paper are based on data of e-petitions between 14 October 2008 and 19 January 2010 as provided by the e-petition platform *epetitionen.bundestag.de*. This only includes public petitions that were submitted to the new version of the platform that went online in mid-October 2008. Thus this paper does not include data on the trial run from 2005 until 2008. Data on public petitions submitted to the old version of the e-petition platform can be found at the website *DemokratieOnline* (http://www.demokratieonline.de). This data was not included in our analyses since the data sets were not compatible. Another possibility to access data on e-petitions through an

alternative to the e-petition platform is the privately owned service *Deutschland API* (http://www.deutschland-api.de/).

The platform provided us with data on 886 public petitions with at least one co-signature that were published between 14 October 2008 and 19 January 2010. These 886 public petitions form the basis of our analysis.

Public petitions with at least one co-signature	886
Users of the e-petition platform	495,611
Number of co-signatures	1,099,541

Table 1: Overview of data on public petitions between 14 October 2008 and 19 January 2010

A typical data point as provided by the e-petition platform looks like this (the data in this example is fictional):

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Petition 1001: 2008-12-09;"Müller, Michael";"Deutschland /
                          Bayern"
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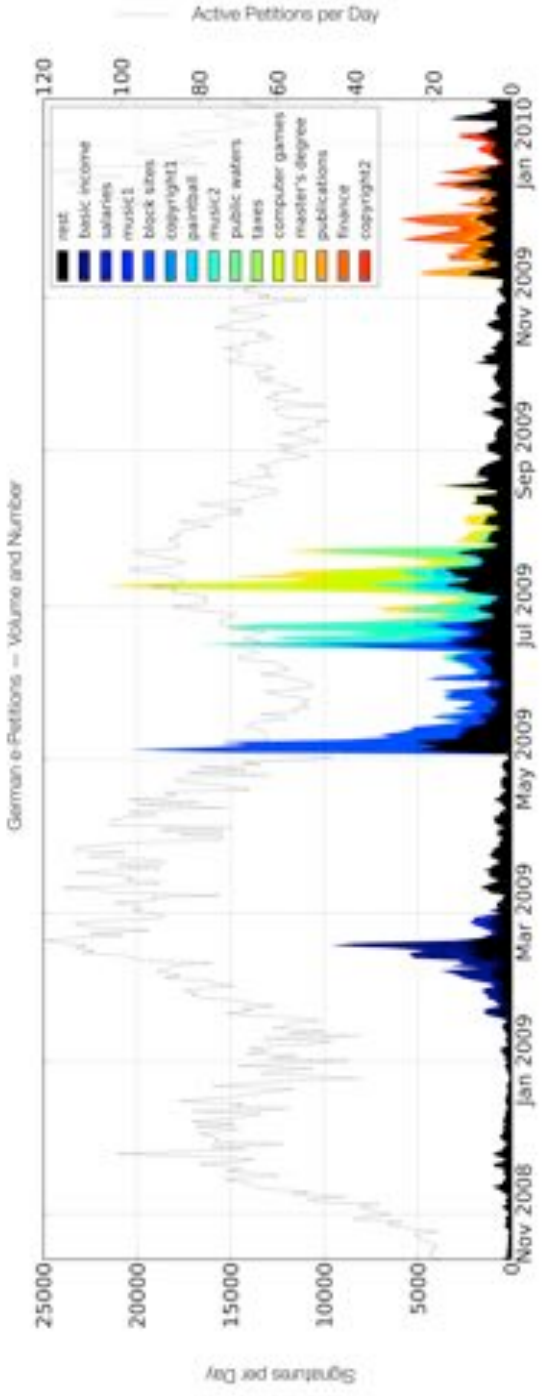
At the beginning we find a unique numeric ID for each petition as provided by the platform. Then we are given the date on which a user co-signed the petition in question. This is followed by the name and state of the co-signer. To anonymize users we converted the unique pairings of name and state into numeric user IDs.

Based on these data we are able to examine usage patterns of the e-petition system. We will start off by analyzing the co-signing dynamics of public petitions. In a second step we will analyze patterns with focus on the behavior of the users of the e-petition system.

Co-Signature Patterns

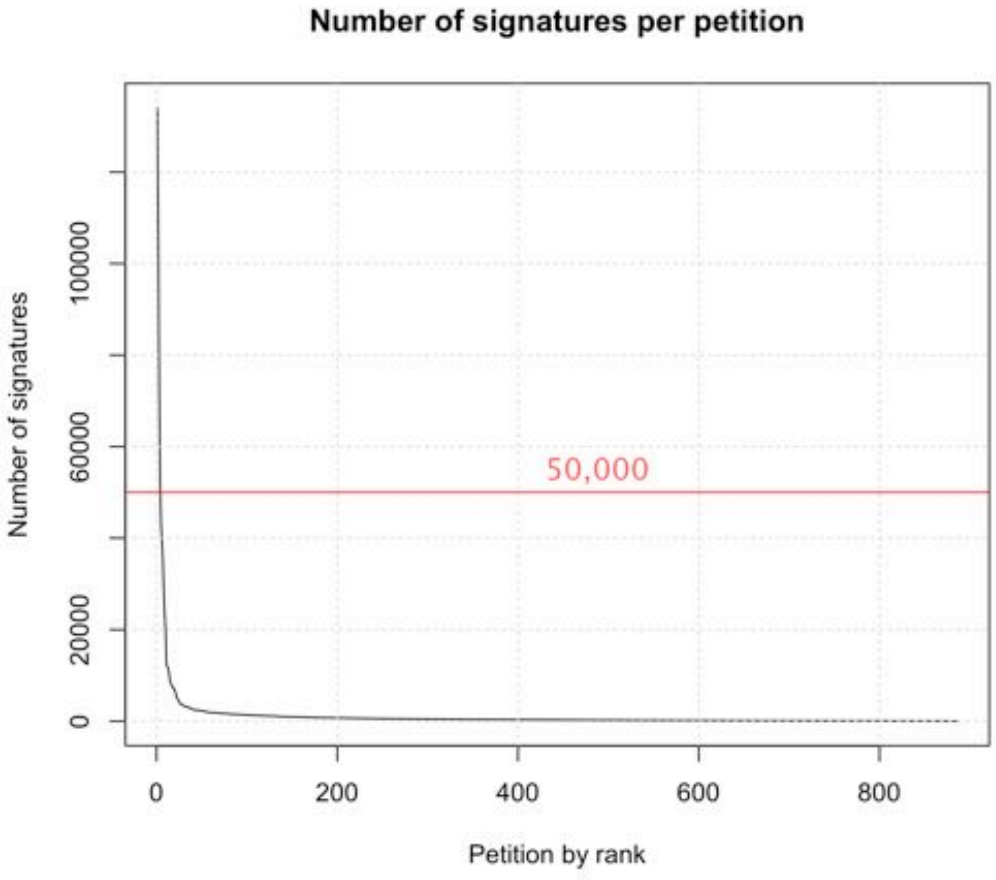
A first step in understanding the usage patterns of the German e-petition system might be the examination of the day-by-day aggregation of e-petition co-signatures as shown in *Graph 1*.



Graph 1: Signatures per day across all petitions

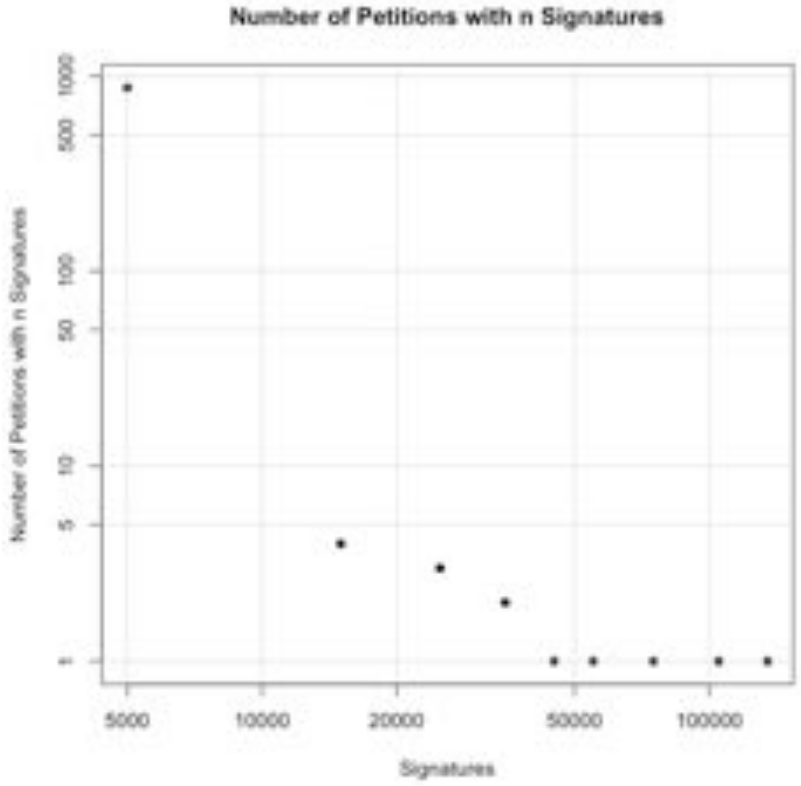
In *Graph 1* we see the aggregate number of co-signatures on each day between 14 October 2008 and 19 January 2010 as a stacked area plot. The black areas of the graph show the aggregate number of co-signatures of all public petitions that attracted less than 10,000 co-signatures during their signing period. The colored areas show the aggregate number of co-signatures for each public petition that managed to attract more than 10,000 co-signatures during their signature period. Each color stands for one of these petitions. The dotted line shows the number of public petitions that were active on each day. As a proxy for this value we counted each petition that on the given day received at least one co-signature.

The graph shows that if we aggregate the daily co-signatures of all petitions that remained under 10,000 co-signatures, the daily sum of these signatures range in the low thousands. Only a few petitions manage to rise above a few thousand co-signatures on a given day. Once such an outlier appears, the daily sum of the co-signatures of the rest (all small petitions) also rises. These observations ask for closer examination.



Graph 2: Number of co-signatures per petition

The preceding graph documents the number of co-signature each petition in our data set managed to attract during the complete run of its signature period. For this graph we ranked the petitions in our data set according to the number of co-signatures they managed to attract, starting with rank one for the petition with the most co-signatures and ending with rank 886 for one of the petitions with only one co-signature. The graph shows that a number of merely fifty petitions managed to attract the vast majority of all co-signatures. At fist the graph above seems to suggest that the distribution of co-signatures per petition could mathematically be described as a power law. The term power law is used to describe phenomena "where large events are rare, but small ones quite common" (Adamic 2002). Mathematically this reads as "the probability of attaining a certain size x is proportional to $x^{-\tau}$, where τ is greater than or equal to 1" (Adamic and Huberman 2002). Recently power law distributions have been identified regularly in data describing internet based phenomena (Albert, Jeoung and Barabasi 1999; Huberman and Adamic 1999; Markovitch and Krieger 2000). This raises the question if we are able to identify the same dynamic in co-signature dynamics. Once we take a closer look at the data, as in the following graph, we see that we lack crucial data points to be able to speak of a power law distribution.



Graph 3: Number of co-signatures per petitions collected in steps of 10,000 co-signatures

In the preceding graph we look again at the number of co-signatures per petition. But instead of *Graph 2*, where we ordered the petitions according to their co-signature count, here we look at the distribution of petitions after we collected them in groups of 10,000 signatures. Thus the first data point reads as: The number of all petitions that managed to attract between one and 10,000 co-signatures (the legend shows mid-points of these "bins"). As pointed out before, this graph clearly illustrates that extremely big events occur very seldom (we find only four petitions that managed to collect more than 50,000 co-signatures) and small events occur extremely often (nearly all the petitions of our data set collected less than 10,000 co-signatures). Still, the data is too scarce to speak of a power law in the technical sense of the word.

The number 50,000 holds special meaning in the German e-petition system. As described above, if a public petition manages to attract more than 50,000 co-signatures in the first three weeks of its signature period, the *Petitionsausschuss* of the German parliament holds a public session in which the petition is discussed. The red line in *Graph 2* marks this number. As before we see that only a very small number of public petitions manage to attract more than 50,000 co-signatures in total. The number of petitions that manage to attract these 50,000 co-signatures in the first three week after their publication is even smaller.

Since highly active petitions are so rare, we are able to present a comprehensive overview: *Table 2* shows all public petitions that were published between 14 October 2008 and 19 January 2010 and managed to attract more than 10,000 co-signatures during their six-week signing period.

ID	Category (as provided by the platform)	Title	Signatures	Skewness
3860	Internet	No indexing or blocking of websites	134,015	0.896
4517	Civil law	Society for musical performing and mechanical reproduction rights (GEMA)	106,575	0.741
4958	Crimes against public order	Petition against the prohibition of action-based-computer games	73,002	2.556
1422	Reform of social insurance	Basic income	52,973	-1.494
5178	Higher Education	Guarantee of a place at university to pursue a Masters degree for successful Bachelor graduates	42,740	0.497
8236	Taxes	Introduction of a financial transaction tax	39,565	0.508

4145	Weapons law	Against a prohibtion of games (i.e. Paintball)	35,827	0.405
4525	Use and administration of public grounds	No further privatization of public waters	28,612	-2.937
7922	Research and science	Free access to scientific publications	23,631	0.744
8308	Law of obligation	No charge in case of timely removal of the reason for cease-and-desist-orders	20,113	-0.291
3827	Civil law	Transparency of the accounting methods of the society for musical performing and mechanical reproduction rights (GEMA)	12,322	-1.043
4006	Copyright law	Approaches to copy protection	11,931	0.175
4724	Income tax	Home office	11,646	-0.162
1471	Care profession	Salaries for trainees	10,244	-0.930

Table 2: E-petitions with more than 10,000 co-signers

In this table we see that from October 2008 to January 2010 only four public petitions managed to attract more than 50,000 co-signatures. Also we see that of a total of 886 public petitions only 14 public petitions attracted more than 10,000 co-signatures.

As described above the German e-petition system holds a special provision for e-petitions that manage to collect more than 50,000 co-signatures during the first three weeks of their six-week signing period. These e-petitions are heard publicly before the *Petitionsausschuss*. Thus the system holds incentives for supporters of a given public petition to marshal support early in the process. The number of co-signatures a petition manages to attract early on might even be a determining factor for the total number of co-signatures a petition manages to attract. A simple statistical metric that informs us whether a petition attracted the bulk of its supporting co-signatures early in the signature period or late is the skewness value. Skewness describes the asymmetry of a distribution. In the words of Hand, Manila, and Smith (2001, 57):

> "A distribution is said to be *right-skewed* if the long tail extends in the direction of increasing values and *left-skewed* otherwise."

We detect a right-skewed distribution if the skewness metric takes a positive value. Negative values indicate a left-skewed distribution. A value of zero would indicate a symmetric distribution. When using this metric on the day by day aggregate of petition co-signatures a right-skewed distribution would be a sign

that the respective public petition received its bulk of support in the first half of its signature period, a left-skewed distribution would be an indicator that the support was collected during the second half of the signature period.

As *Table 2* shows the 14 most successful public petitions have no common skewness value. Eight petitions show positive skewness values and thus collected more co-signatures during the first half of their signature periods than in the second half. For six petitions the opposite is true. Thus early or late support for a public petition does not seem to be a determining factor for its overall number of signatures.

The skewness value can thus only serve as a descriptive metric of the co-signing activities. Still, *Graph 1* clearly shows that there are sudden surges that appear in the system. Suddenly one petition manages to attract a large number of co-signatures. During these surges the number of co-signatures for other petitions seems to rise as well. We seem to witness a co-signature overspill originating from a few very successful petitions and benefitting other, smaller petitions. Our data cannot explain the reasons for the appearance of these extremely successful petitions. For this, a more holistic analysis of petitions would be beneficial. Such an analysis might include the supporter campaigns for petitions be it traditional offline campaigns or online campaigns on websites or social networking sites. Another reason for the sudden success of certain petitions might be found in specific media coverage devoted to them by traditional media outlets. While such a holistic analysis lies beyond the scope of this paper, the data presented here allows for an analysis of the co-signature overspill.

As we saw in *Graph 1* there are three time spans during which a few petitions managed to attract a very high amount of co-signatures. These time spans are in February and March 2009, May to August 2009 and to a somewhat lesser degree in December 2009. Still, during these intervals not only the few outlier petitions manage to attract co-signatures. During these months, regular petitions (below 10,000 co-signatures in total) also attract more daily co-signatures than usual. In *Graph 1* this can be seen by examining the black area of the graph. This area represents the aggregate daily count of co-signatures of such regular petitions. Their volume appears to be higher during the months in which we also find outlier petitions. This can be seen as an indicator of a co-signature overspill from outlier petitions to regular petitions.

To test for this co-signature overspill we used vector autoregression, an econometric model, which after Sims (1980) has become a standard tool for examining interdependencies between time-series. We posed the question: Does an increase in volume of co-signatures for popular petitions (petitions with at least 10,000 co-signatures at the end of their signature period) cause an increase in the volume of co-signatures for standard petitions (petitions with less than 10,000 co-

signatures at the end of their signature period)?[1] To answer this we calculated the F-type Granger-causality as introduced by Granger (1969) for causality in two directions.[2] *Table 3* describes the results of this test while introducing a time lag of three days as suggested by the method. *Table 4* for shows the results of a Wald-type test that tests for causality between the two time-series without the time lag.

Model	F-Test	Time Lag (in days)	p-value
Increase in co-signatures of **high-volume** petitions causes increase in co-signatures of **low-volume** petitions	1.3831	3	2.088^{-10}
Increase in co-signatures of **low-volume** petitions causes increase in co-signatures of **high-volume** petitions	16.4363	3	0.2465

Table 3: Results of the F-type Granger-causality test

Model	Chi-squared	Time Lag (in days)	p-value
Increase in co-signatures of high-volume petitions causes instant increase in co-signatures of low-volume petitions	84.2255	0	$< 2.2^{-16}$
Increase in co-signatures of low-volume petitions causes instant increase in co-signatures of high-volume petitions	same value since the test is not able to check for direction of the causal effect	0	same value since the test is not able to check for direction of the causal effect

Table 4: Results of the Wald-type test

These tables show that an increase in co-signatures of high-volume petitions Granger-causes an increase in co-signatures of low-volume petitions with a time lag of three days. This result is significant. Convincingly, the reverse test is not significant: we cannot show that an increase in low-volume petition activity Granger-causes an increase in high-volume petitions after three days. Moreover, we are able to identify an instant significant relationship between an increase in of

[1] As shown above, the "size" of petitions drops off very sharply, thus rendering the mark of 10,000 a suitable criterion for splitting petitions into two groups. Since there are extremely few data points around this limit, the groups are already well separated within the empirical data.

[2] The tests were performed using the R Package "vars" (Pfaff 2008).

co-signatures in high-volume and low-volume petitions. A direction of this effect is not discernible. Still, these results allow us to answer our question: are there signs of a co-signature overspill from high-volume petitions to low-volume petitions? The results of *Table 3* speak in favor of such an overspill.

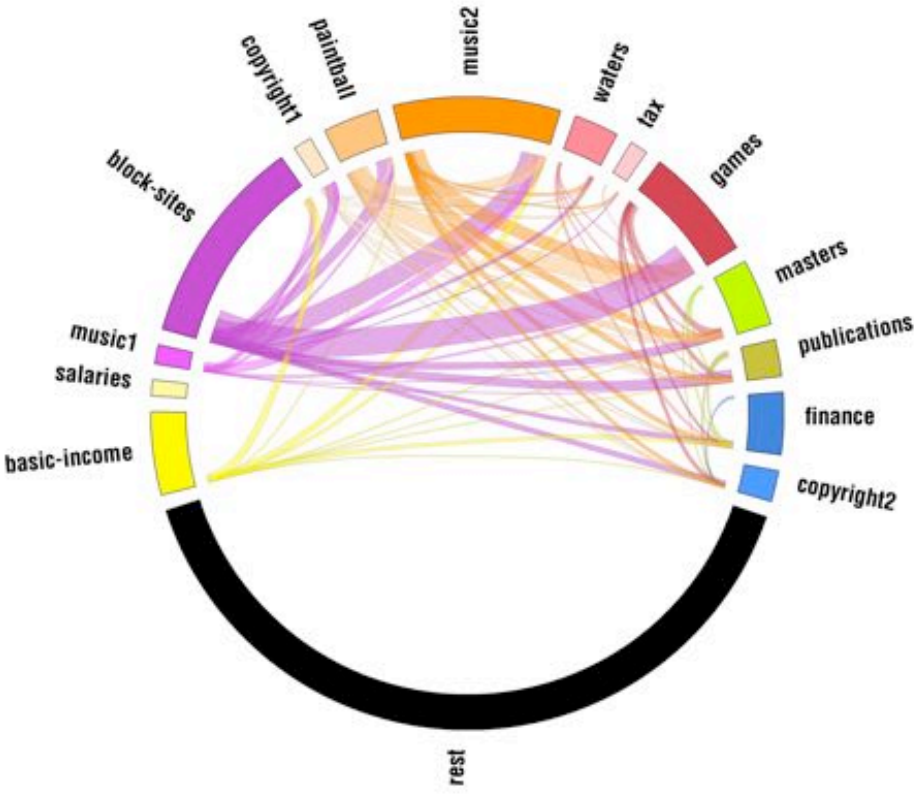
The temporal patterns of high-volume petitions, which we observed in *Graph 1*, might suggest a further phenomenon: shared co-signers between high-profile petitions. Especially if we examine the time between March 2009 and early August 2009 we find a relatively large number of petitions that managed to attract exceptionally high co-signature counts. Indeed in this time span we find the petitions with the highest co-signature counts: petition #3860 "No indexing or blocking of websites" with 134,015 co-signatures, petition #4517 "Society for musical performing and mechanical reproduction rights (GEMA)" with 106,575 co-signatures, and petition #4958 "Petition against the prohibition of action-based-computer games" with 73,002 co-signatures. This temporal cluster of highly successful petitions might be due to the fact that these petitions share co-signers. This intuitive explanation is supported if we look at the number of users that these petitions share.

	#3860	**#4517**	**#4958**
#3860 "No indexing or blocking of websites"	-	19,127 (14,27% of total #3860)	25,565 (19,08% of total #3860)
#4517 "Society for musical performing and mechanical reproduction rights (GEMA)"	19,127 (17,27% of total #4517)	-	14,582 (13,68% of total #4517)
#4958 "Petition against the prohibition of action-based-computer games"	25,565 (35,02% of total #4958)	14,582 (19,97% of total #4958)	-

Table 5: Shared users between petition #3860, #4517, and #4958

As *Table 5* shows, the most popular petitions share a large amount of co-signers. Examining the relationship between petitions through the co-signers that they share might give us a stronger idea how these petitions are thematically connected. *Graph 4* maps the relationship between petitions based on their shared co-signers. As in *Graph 1*, the colored sections represent the fourteen petitions that managed to attract more than 10,000 co-signatures during their six-week signature period. They are arranged clockwise in this circle in the order of their publication date. Starting with petition #1422 “Basic income” of early 2009 and ending with petition #8308 ”No charge in case of timely removal of the reason for

cease-and-desist-orders" of early 2010. The width of bands in the outer ring represents the total number of signatures which a petition attracted, while the lines between the petitions proportionally represent the number of co-signers these petitions share.[3]



Graph 4: Connections between petitions based on the number of co-signers that they share

As before, the visual examination gives us a strong indication of systematic relationships between petitions. Building on this, we examined the patterns of shared co-signatures in detail. Probably because of the data scaling (signatures as

[3] Links are only shown in the true temporal direction, and hence should be read in the form "petitioners from earlier petition (a) also co-signed later petition (b)"

dichotomous data points), cluster analyses provided unsatisfactory results. However, "Association Rule Mining", an approach employed in the large-scale analysis of shopping behavior (Agrawal, Imielinski, and Swami, 1993), presents a suitable alternative. This method assumes distinct binary choices by a set of consumers (users), and seeks stable patterns, so-called "rules" within them. The question posed is essentially: Given a large set of purchased items, can we find stable combinations of goods, which tend to be bought together?

We applied this method to a sample of 100,000 cases from the petition data set and searched for patterns with a confidence level of .95, which are also supported by at least .1 percent of the cases. Association rule mining tends to produce a large number of rules. In line with this tendency, we found 5952 patterns matching these criteria.[4]

A full discussion of these co-signing phenomena goes beyond the scope of this article, but it should be informative to present at least some examples. *Table 6* presents the three patterns with the largest number of occurrences in the data.

Rule	Support	Confidence
{ID #3468, ID #4958} => { ID #3860}	0.01919	0.9667506
{ ID #3468, ID #4517} => { ID #3860}	0.01687	0.9558074
{ ID #3468, ID #4006} => { ID #3860}	0.01387	0.9625260

Table 6: The three rules with the largest number of occurrences in the data

The most frequent pattern is the co-signing of three petitions: ID #3860 "No indexing or blocking of websites", ID #3468 "Against the logging of internet usage", and ID #4958 "Petition against the prohibition of action-based-computer games". This pattern has a confidence level of .967 and is present in 2 % of the cases ("support"). Since we analyzed a sample of 100,000 signatures, this translates to roughly 2,000 cases, or – in the full data set of roughly one million signatures – to roughly 20,000 cases.

This first rule presents a rather strong case for a core group of e-petitioners who are highly active when it comes to matters relating to the internet and its culture. The second and third ones essentially repeat this configuration, but substitute the petition against a ban on computer games with one concerning the regulation of music copyright handling (ID #4517 "Society for musical performing and mechanical reproduction rights (GEMA)", and #4006 "Approaches to copy protection").

[4] The tests were performed using the R Package "arules" (Hahsler, Grün, and Hornik 2005).

To summarize, we somewhat expectedly found that there are many stable patterns of co-signatures within the system, and that a prominent case of such a pattern can be found within a strong group of internet-activists. Albeit a complete analysis is beyond the scope of this paper, these findings might warrant future attention.

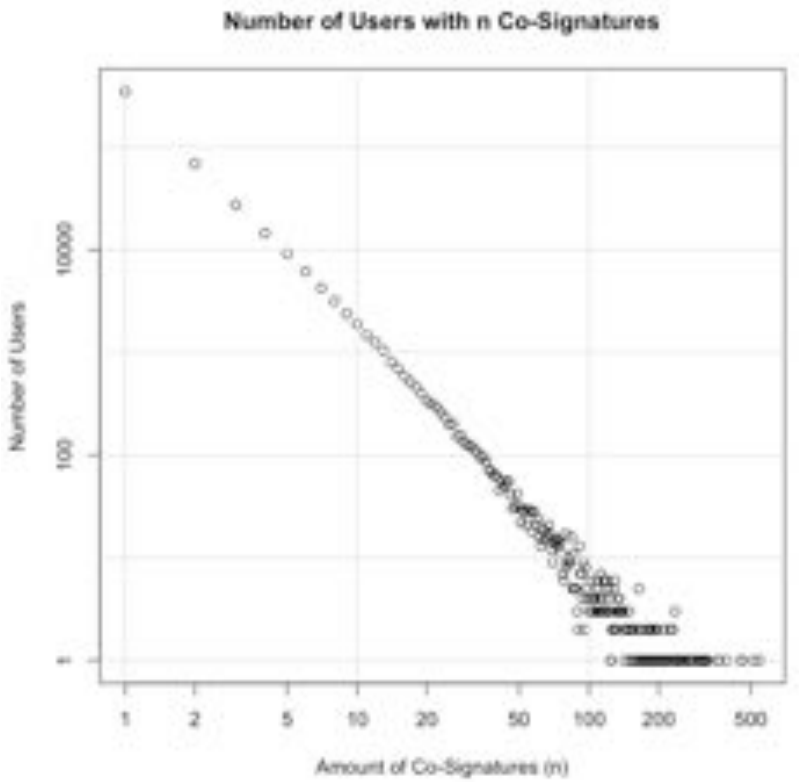
On the one hand these results could be interpreted that these petitions have a strong thematic connection. On the other hand one could interpret these results as an indicator that co-signing activity begets more co-signing by users of the petition system, a question we will address in greater detail in the next section of this paper. But before we move on a short summary of the preceding results might be beneficial.

In this section we showed that a majority of co-signatures falls to an extreme minority of petitions. Also we showed evidence of a co-signature overspill from successful petitions to less successful ones. Finally we showed that there are systematic connections between successful petitions manifested in shared co-signers between petitions.

User Behavior

In the preceding section, we focused on petitions as units of analysis. Here we will analyze user behavior. As *Graph 2* and *Graph 3* showed there are only a very small number of petitions that manage to attract large numbers of co-signers and a very high number of petitions with only a few co-signers. To check for a similar dynamic on the user side seems like a natural next step.

Graph 5 shows a log-log plot of the distribution of the number of users grouped according to the number of petitions that they co-signed. Again, as in the case of co-signatures per petition we find that big events (users who co-signed a large number of petitions) are very rare (as shown in the lower right corner of the graph) while small events (users who co-signed only one or two petitions) are very common (as shown in the upper left corner of the graph). Unlike in the case shown in *Graph 3: Number of co-signatures per petitions collected in steps of 10,000 co-signatures*, here we have enough data points in the distribution to test for a power law. We tested for the existence of a power law by using a method proposed by Clauset, Shalizi, and Newman (2009). We found a Kolmogorov-Smirnov's D of 0.0339 as a goodness of fit for a power law with a coefficient alpha (slope of the fit line) of 2.03. To be able to speak of a power law with a confidence level of 0.99 the Kolmogorov-Smirnov's D has to be lower than 0.0624 (following Miller 1956). Since this is true, the distribution above follows a power law.

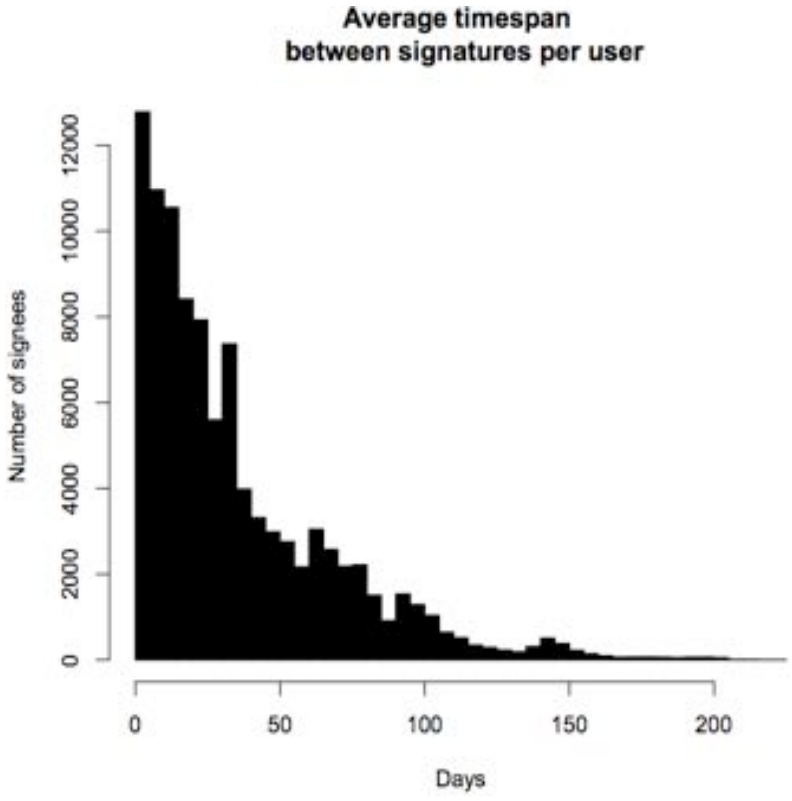


Graph 5: Number of users grouped according to the number of petitions they co-signed

This result shows that there are clear differences in the usage behavior on the German e-petition platform. While a majority of users only co-signs one or two petitions, there exists a minority of users who co-sign up to 500 petitions. Still, these heavy users are too small in numbers as to have a strong effect on the petition system as a whole. While these users clearly use the e-petition system differently from the average user, as a group they are not click-happy enough to outweigh the support expressed by other users. Also, their effect on single petitions is effectively nil, since users can only sign once. Still, these differences in user behavior are a first indicator that it might be valuable to identify user types based on the actual co-signing behavior of users. The amount of petitions users sign might be a first variable to identify user types (i.e. heavy users who sign a high number of petitions and light users who sign only a few petitions).

Another possibility to distinguish between user types through their co-signing behavior is the average time span that passes between their co-signatures. This is an interesting metric since it might give us insight in the nature of the political participation expressed by a co-signature. *Graph 6* shows a histogram of the distribution of users per average time span between their co-signatures. This

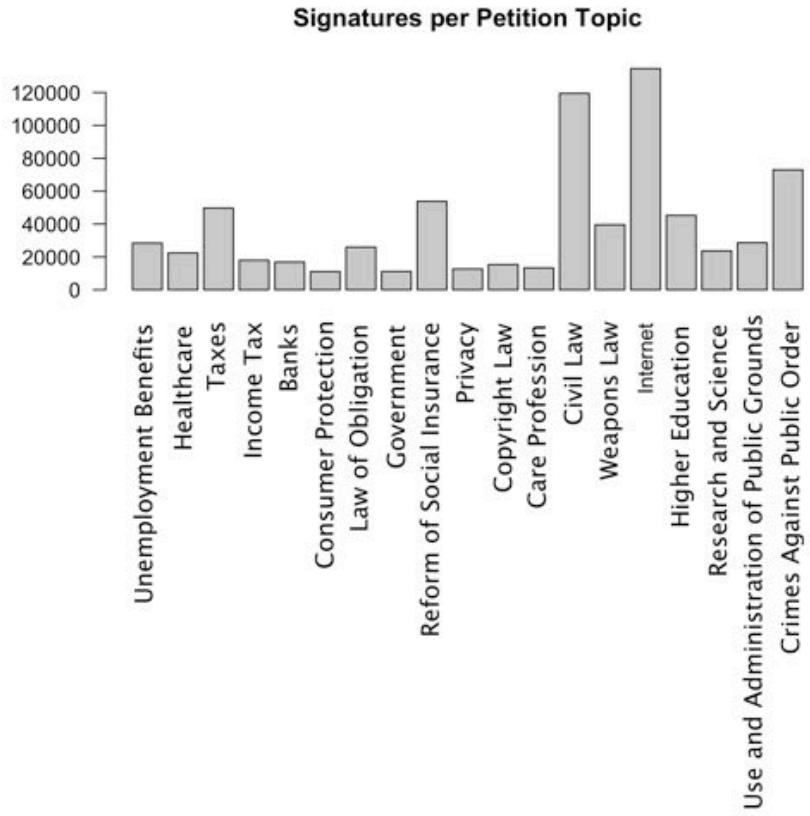
graph shows that for the most part users who signed more than one petition co-signed petitions during a time interval of one to 30 days. Again we find a clear difference in usage patterns. While a large majority of users co-signed petitions in relatively short intervals there are users who let up to 150 days pass between two co-signatures.



Graph 6: Average time span between signatures per user (one-time users of the petition system are excluded)

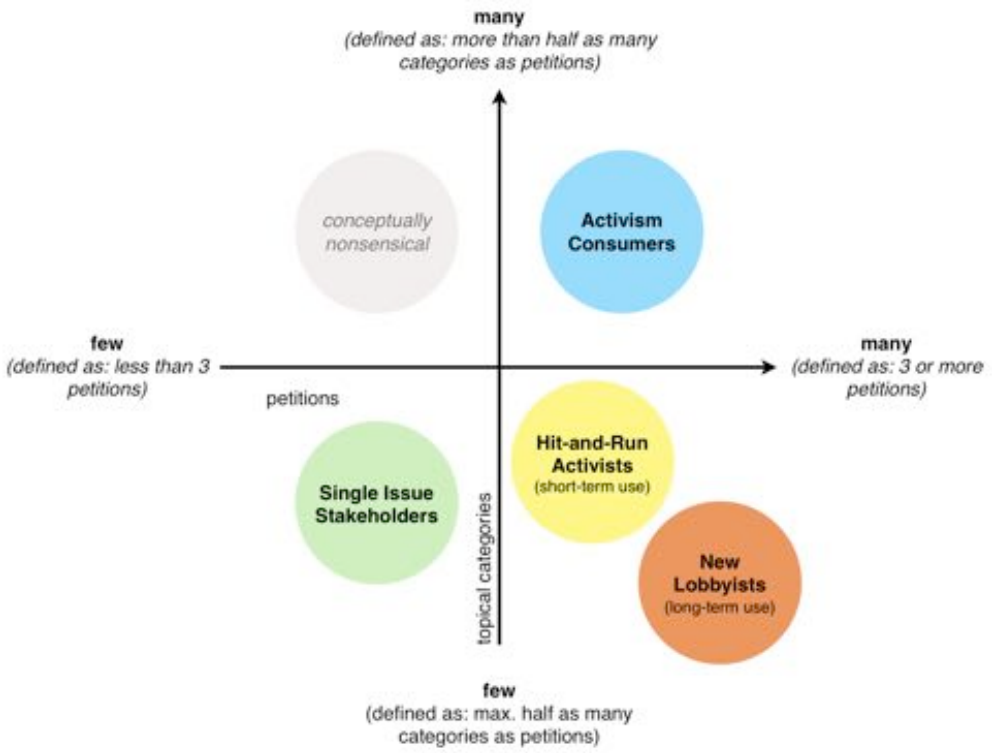
A further possibility to understand usage patterns of the German e-petition system is by examining whether users co-sign petitions that fall in the same topical categories. As described above there is strong evidence that successful petitions are linked by shared co-signers. The German e-petition system groups public petitions in topical categories (i.e. “internet”, “education system”, or “taxes”). *Graph 7* shows the top 19 topical categories. The aggregate count of co-signatures of petitions grouped in these categories surpasses 10,000. While very precise,

these categories are only partially useful to categorize petitions for the purposes of this paper. These topical categories do not map very successfully onto the shared interests of co-signers. One example of the limitations of the categories can be found in the case of the three petitions with the highest co-signature counts. Petition #3860 “No indexing or blocking of websites” has been categorized under the heading “Internet”. Petition #4517 "Society for musical performing and mechanical reproduction rights (GEMA)" is categorized under “Civil law”. While the last petition #4958 "Petition against the prohibition of action-based-computer games" falls in the category “Crimes against public order”. As discussed above these three petitions are clearly temporally and thematically linked (they all deal with usage practices of heavy online users and as shown in *Table 5* share a high number of co-signers). Still, this link is not expressed in the categories provided by the German e-petition system. But, albeit flawed, these categories as provided by the e-petition system help us to understand if users tend to co-sign e-petitions that are topically linked. In future studies we hope to improve on the precision of the categories.



Graph 7: Topical categories containing petitions with an aggregate count of more than 10,000 co-signatures

These three elements, number of co-signatures, frequency of co-signatures, and the spread of an individual's co-signatures over petitions in different topical categories allow for the data driven construction of user types. If one examines the user behavior with focus on these elements it is possible to discern four different groups of users that use the e-petition system differently. We find users who over a long period of time sign multiple petitions that fall in more or less the same topical categories. We find users who over a short period of time sign multiple petitions that fall in more or less the same topical categories. We also find users who sign multiple petitions that fall in many topical categories. We find users who only sign one or two petitions. These behaviors are clearly discernable from the data we presented. To make it easier to identify and discuss these user types we termed them *New Lobbyists*, *Hit and Run Activists*, *Activism Consumers*, and *Single Issue Stakeholders*. *Graph 8* illustrates these user types and our operationalization.



Graph 8: User types based on user behavior

Under the term *New Lobbyists* we collect all users who co-signed multiple petitions, which fell in similar topical categories, and who used the petition system over an extended period of time. The exact operationalization with which

we queried the data read: All users with signatures on three or more petitions. These petitions have to fall in maximal half as many topical categories (defined by the e-petition system) as the total count of that person's co-signed petitions. Also, these users had to have co-signed petitions over a period longer than three weeks. An example of such a user would be someone who co-signed a petition in early 2009 that fell in the category "taxes", again four weeks later co-signed a petition from the category "taxes", and finally signed a petition in June 2009 that fell in the category "civil law". The existence of users showing this type of behavior we take as an indicator that the e-petition system has been accepted as a regular mode of political participation. These users learned about the possibilities associated with the e-petition system and then regularly chose to use public petitions to influence topics in their realm of interest. We take this as an indicator of long-term investment in the e-petition process.

Hit and Run Activists means all users who co-signed multiple petitions, which fell in similar topical categories, but who used the petition system only over a short period of time. The exact operationalization with which we queried the data read: All users with signatures on three or more petitions. These petitions have to fall in maximal half as many topical categories (defined by the e-petition system) as the total count of that person's co-signed petitions. Also, these users had to have co-signed petitions over a period less than three weeks. A possible example for such a user would be someone who on June 12 co-signed a petition in the category "internet", who co-signed another petition on the same day in the category "civil law", and finally one day later co-signed a petition again in the category "civil law" but after this would not return to the e-petition system. For us this behavior suggests users who were attracted by an outside impulse to the e-petition system (i.e. offline campaign event, social media campaigns, or media reports), found petitions in their area of interest, co-signed a few of those but then never returned to the e-petition platform. These users show no long-term commitment to the e-petition platform as a channel for political participation.

Activism Consumers are users who co-signed multiple petitions, which fall under a large group of topical categories, regardless of the timeframe. The exact operationalization with which we queried the data read: users who co-signed three or more petitions and who are not covered by the other rules. This could be a user who co-signed a petition in early 2009 that fell in the category "taxes", four weeks later co-signed another petition this time in the category "internet", and finally co-signed a petition in June 2009 that fell in the category "civil law". This behavior seems to portray users who have no discernible long-term interest in specific political topics but co-sign petitions for co-signing sake.

Under *Single Issue Stakeholders* we collected all users who co-signed only one or two petitions, and did not fall into any of the other categories. The exact operationalization with which we queried the data read: users who co-signed one

or two petitions. This could be a user who in early June 2009 co-signed a petition in the category "taxes" and then again in September 2009 co-signed another petition in the same category. This user type also includes all users who co-signed only one petition. We take this behavior as typical for the "classic" petitioner. This could be an individual concerned by a specific political issue and who tries to remedy this situation by petitioning the institutions in question.

It has to be stated that the specific operationalization which we used clearly is open for debate. There are certainly strong arguments to be made in favor or against specific decisions, which we took. Still, we think this operationalization is useful in illustrating the different user types. These types are discerned by looking at user behavior along the three elements we identified in this section, which we could identify based on number of co-signatures, frequency of co-signatures, and the spread of an individual's co-signatures over petitions in different topical categories. These user types, which are based on data of actual user behavior, might help us to discuss the effects of this behavior on the nature of political participation which they represent. *Table 7* documents these four user types and the number of users in our data set whose behavior corresponded with these user types.

User types	**Corresponding users**
New Lobbyists	269
Hit and Run Activists	235
Activism Consumers	80,278
Single Issue Stakeholders	414,829

Table 7: User types and number of corresponding users

The data shows that the majority of users of the German e-petition system use the system as *Single Issue Stakeholders*. They use the system once or twice to co-sign sometimes topically related e-petitions. Another strong group of users can be identified as *Activism Consumers*. These are individuals who use the system without a strong topical interest. They sign a multitude of e-petitions, which are not topically related. These users co-sign petitions as if shopping around. Much smaller numbers of user can be identified as *New Lobbyists* or *Hit and Run Activists*. There are users who show behavior corresponding to these users types but they are clearly outnumbered.

In this section we identified three elements of user behavior documented by our data which we then used to construct four user types. These elements are the number of a user's co-signatures, the frequency of co-signatures, and the

spread of an individual's co-signatures over petitions in different topical categories. Since behavior of users varies, we were able to build four user types that are grounded in the different behavior users show with regard to these elements. We called these user types *New Lobbyists*, *Hit and Run Activists*, *Activism Consumers*, and *Single Issue Stakeholders*. We showed that the users of the German e-petition system based on their co-signing behavior could be categorized according to this typology.

The Political Click

In this paper we used a research approach informed by the Computational Social Science approach to examine if we could detect meaningful patterns in the transactional usage data of the German e-petition platform. As shown above this was successful.

We showed that only a few petitions attracted the majority of co-signatures. Clearly not all petitions are created equal. Through the data available to us we were not able to show what makes some petitions more equal than others and thus what the reasons for the massively successful petitions were. Still, what could be shown was that there exists a co-signature overspill from successful petitions to less successful ones. We could show a causal relation between a rise in co-signatures for successful petitions and an increase in co-signatures for less successful petitions only a few days later. This is interesting since this result suggests that political participation begets political participation. Outlier petitions draw new users to the e-petition system. These in turn not only participate in the petition they originally came to sign but also sign other petitions. So ultimately the number of co-signatures a petition manages to attract does not solely depend on the issue, the campaigning skills of the supporters, or even media interest. The success of a petition almost always is also dependent on the success of petitions that happen to be active during the same co-signature period.

We also analyzed the behavior of users of the e-petition system if discernible from the data available to us. In doing this we focused on three elements of user behavior: the number of a user's co-signatures, the frequency of co-signatures, and the spread of an individual's co-signatures over petitions in different topical categories. Based on the actual behavior we observed with regard to these three elements we introduced four user types: *New Lobbyists*, *Hit and Run Activists*, *Activism Consumers*, and *Single Issue Stakeholders*. We found that the German e-petition system is clearly dominated by users who fall in the categories *Single Issue Stakeholders* and *Activism Consumers.* Thus most users sign just one or two petitions or sign many petitions from various thematic categories during a short burst of activity after which they never return to the e-petition platform.

In addition to these specific empirical results we are convinced that one of the points most strongly made by this paper is the demonstration of the potential that data like this holds for social scientists. We hope to advance this research in the near future through the incorporation of a longer timeframe of data, a reframing of the topical categories of e-petitions that more closely resembles the actual behavior of co-signers, and finally the examination of viral effects connected to e-petitions on social media platforms like Facebook or Twitter.

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