E-Petitioning and Online Media: The Case of #BringBackOurGirls

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ABSTRACT

E-petitioning, a genre of technology-based collective action tools, makes it possible for members of the public to address government decision makers directly with their requests for action. In this paper we use time series analysis to explore the effects of Twitter and other forms of online media on the accumulation of signatures in e-petitioning. We explore the case of “Bring Back Our Girls,” a Change.org petition initiated in spring 2014 following the abduction of 276 female students from a school in Chibok, Nigeria by heavily armed members of an Islamic extremist group. The petition targeted government leaders around the world. We found evidence that tweeting and

certain forms of online media are related to the likelihood of individuals signing an e-petition, providing evidence of a hybrid media system in which diverse forms of online media behave with diverse logics and impacts in their effects on e-petitions.

CCS CONCEPTS

• **Applied Computing-E-government Social and professional topics**→**Computing/technology policy** • **Government technology policy**

KEYWORDS

E-petitioning; time series analysis; policy agenda setting; media agenda setting; Change.org; Bring Back Our Girls

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1 INTRODUCTION

Since the earliest diffusion of the Internet, scholarly attention has explored the potential of new media to support public political participation as it has been traditionally defined [19]. Indeed, individuals now turn to the Internet as the “first port of call for information on almost any subject” [24] creating the foundation

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for informed and directed political action. However, the more recent social media developments of Web 2.0 have made it possible to create novel forms of collective action and participation, which have become the subject of increasing scholarly attention. “Collective action” takes place when individuals take private interests and desired actions into the public sphere. Once the public/private boundary is crossed by at least two people “in conjunction with a public good, collective action has taken place;” such activity lies at “the heart of the new forms of technology-based collective action...” [7].

The Internet has become a locus for collective action fostering “widespread spontaneous political activity” [35] as well as more systematic and long-term mobilizations with a substantial online element [18]. Social media sites like Facebook and Twitter as well as blogs, and online discussion forums are just a few of the Web 2.0 applications that enable massive numbers of people, strangers in many cases, to mobilize or participate online by calling attention to issues via tweeting, retweeting, or signing electronic petitions (e-petitions) [25].

Within the social media milieu, e-petitioning is a new genre of technology-based collective action tools that makes it possible for members of the public to address government decision makers directly with their requests for action. Electronic petitioning platforms like We the People (<https://petitions.whitehouse.gov>) and Change.org make petitioning easy for initiators as well as potential signers. Such systems enable users to target governments with calls for action. Because it is a quick, easy, and accessible way to mobilize large numbers of people to engage in collective action, e-petitioning has been referred to as “Protest 2.0” [31]. Individuals can participate in political action online without having to be part of a larger organized effort, interest groups, or groups with other “well-defined membership boundaries” [4]. E-petitioning has the potential to create a sense of collective identity among loosely coupled advocacy groups [38, 34] that can transcend national boundaries.

Indeed, such was the case in Change.org’s petition to “#Bring back our girls” which was initiated in spring of 2014. On Monday, April 14, 2014, 276 young female students from the Government Girls Secondary School in Chibok, Borno State, Nigeria were abducted by heavily armed men. It was later determined that the abductors were part of Boko Haram, an Islamic extremist group based in Northeastern Nigeria, whose name means “Western education is forbidden”. Shortly after the story broke, it was learned that the girls were to be sold as slaves into marriage.

Two weeks later, on May 1, 2014, Ify Elueze, a young Nigerian girl, created a petition on Change.org entitled “All World Leaders Bring Back Nigerian’s 200 Missing School Girls #BringBackOurGirls”. By May 7, 2014, one week after the petition was created, it had registered over 250,000 signatures and ultimately garnered 1,104,440 signatures by its ending date of May 15, 2015, over a year later, from individuals in many countries around the world. The incident gained global media attention

particularly when then First Lady of the US, Michelle Obama, raised public awareness through Twitter by posting a picture of herself holding a sign that read #BringBackOurGirls, sharing the hashtag campaign with over 3.9 million followers.

Figure 1: Michelle Obama’s Tweet

Figure 1 is Michelle Obama’s post of this picture on May 7, 2014 with this message. As is apparent, the First Lady’s post on that day was retweeted 75,000 times.

Although e-petitions are now a ubiquitous form of online collective action, very little is known or understood about the processes by which they accumulate signatures to become successful and potentially efficacious in motivating responses from decision makers. In this paper, we inquire about the processes by which e-petitions accumulate signatures through the analysis of a case study that has relevance for all nationally sponsored e-petitioning platforms. We draw on two prominent theories of agenda setting as the foundation for our analyses. *Policy agenda setting theory*, developed by public administration scholars, focuses on the conditions under which topics compete for attention and are acted upon by government decision makers. Policy agenda setting theory acknowledges the role of media in drawing public attention to and generating support for particular issues and moving them to the forefront of decision makers’ priorities, but media have not been the subject of extensive treatment. On the other hand, *media agenda setting theory*, the product of communication scholars and subject of more than 400 studies by 2004 [26], focuses on how policy domains come to be seen as important by the public. Traditionally, media agenda setting attributes the salience of issues for the public to the attention that media producers devote to them. Recently, however, the dynamics of a new media world suggest that such traditional agenda setting processes have been upended. Scholars are now examining the ways in which online and social media, with content generated by individual users, may play a substantial role in establishing issue salience.

We examine the dynamics of Change.org’s “Bring back our girls” petition history by exploring the effects of online and social media on signature accumulation over time. We look specifically at the effects of tweet generation as well as the effects of other media circulated online that cover the incident itself, as well as cover the petition campaign. Our overarching research question is: **To what extent are various forms of online media related to**

signature accumulation in Change.org's "#Bring back our girls" petition campaign? In the following sections of the paper we discuss the theoretical bases for expecting that social and other online media may be related to petition signature accumulation; explain our data collection, research methods, and strategy for data analysis; present the results of our analyses; discuss our findings and their limitations and consider the implications of this research for the government sponsored e-petitioning platforms.

2 POLICY AND MEDIA AGENDA SETTING

Although not all e-petitions address policy issues, many of them certainly do. The historic right of citizens to petition their governments may be the only option through which citizens can use their own words to make a request to decision makers about an issue or action of their choosing that is unmediated by pollsters, political party, traditional news media, or researchers. Although typically addressing policy making within national contexts, policy agenda setting theory describes processes by which public problems come to be noticed and addressed in the public sphere that may be similarly applied to international issues that attract world-wide interest.

2.1 Policy Agenda Setting

Some researchers have conceived of the policy making process as a set of stages through which problems are recognized, attract public concern, are addressed by potential solutions, and then fade from public attention [14]. Others have depicted the process as one in which a "policy window" fortuitously emerges from ongoing streams of problems, politics, and competing policies, which, when favorably aligned, make it possible to take action [24]. Key to both conceptions is the recognition that policy actions arise in *both* ongoing stable cycles of decision making, as well as in response to unforeseen circumstances that satisfy compelling needs and public demand. Agenda setting theory as developed by Baumgartner and Jones [1, 3, 4, 5] depicts policy making processes from the perspective of complex adaptive systems; the processes are characterized by dynamic interaction within an environment encompassing both stability and change. Stable policy systems are marked by allegiance to the status quo, by the bounded rationalities of political actors, by the difficulties of marshaling change in political systems of checks and balances, and by institutional structures limiting access to the policy process and are characterized by powerful political and ideological understandings that resist alternative interpretations [20, 4, 5]. "Negative" feedback induces long periods of stability and incremental change [1], enabling policy systems to operate at "equilibrium" until something happens in the environment, a "focusing event" that compels the attention of the excluded or the disinterested, unleashing new interests and alternative interpretations with the potential to undermine the status quo. This sequence of triggering event and subsequent attention functions as "positive" feedback, helping an issue to gain access to the political agenda, potentially leading to major policy changes that disrupt or "punctuate" the equilibrium. But such events do not inevitably subvert policy monopolies, since access to the agenda does not guarantee major change [40]. Challenging groups may be checked by powerful institutional and macro-political forces; such counter-mobilizing moves can function as "negative" feedback, which may reassert system equilibrium [4].

The policy agenda thus reflects the attention paid to particular issues, which can be increased by "focusing events" that can "cause issues to shoot high onto the agenda in a short period" [4]. A focusing event "is sudden; relatively uncommon; can be reasonably defined as harmful or revealing the possibility of potentially greater future harms; has harms that are concentrated in a particular geographical area or community of interest; and that is known to policy makers and the public simultaneously..." [9]. Focusing events can be framed as indicators of policy failure by issue advocates in an attempt to broaden and mobilize their audience and move their issue to the forefront of the political agenda. On the other hand, status quo groups may well respond with counter-mobilization in an effort to preserve their interests.

2.2 Information and Media

More recently, policy agenda setting theorists have considered how information affects the attention processes at the heart of the theory. Indeed, the idea of punctuated equilibrium has morphed into a more general theory of government information processing, since problem identification is fundamentally dependent on information flows [21]. However, policy makers are incapable of attending to all information; their processing is "disproportionate" tending generally toward stability and under-reaction until "a scandal or crisis erupts...and they scramble to address the issue" [21]. In such processes, media can amplify and weight some information over others, prime audiences with certain interpretational predispositions at the expense of others, and contribute to positive and negative feedback cycles. Focusing events might trigger increased news coverage, which then further stimulates the attention of the public and decision makers [41] in a complex positive feedback cycle. Advocates can take advantage of media priming by selecting news frames that suggest policy problems to the public or new attributes of a problem that can change the focus of decision makers. While several media dynamics are conceived in this work, there are few attempts to test them.

As Wolfe, Jones, and Baumgartner [41] note, contemporary policy agenda setting is fundamentally a theory about the "politics of attention and attention dynamics in a political system" largely influenced by media, which "plays a role in allocating attention". It is relevant to consider how media functions to amplify attention by increasing news coverage or by introducing or emphasizing compelling frames, particularly following focusing events, contributing positive feedback to policy systems. Media can also function as an "alternative venue" that is used by advocates to increase the salience of an issue [41].

2.3 Media Agenda Setting

The dynamics described above are familiar to those doing research in media agenda setting theory, which, in its traditional form, explores the processes by which newspapers and television communicate the salience of particular topics to members of the public, who use such cues to organize their ranking of issue priorities. Using a list of the "most important" issues during periods of national elections, the earliest media agenda setting research compared the attention that newspapers and television devoted to covering these issues (as measured in column inches, frequency of articles, news story time, etc.) with a ranking in order of importance of the same issues compiled by survey respondents

[26]. Cross-lagged correlations were used originally to index the extent to which media and the public's ranked issue priorities overlapped. By extension, this research established the strength of this function of mass communication to "set" the agenda for topics of discourse in public life. Acknowledging that correlational analyses could not establish causality, experimental and longitudinal studies have also contributed to the view that the media sets the agenda as a straightforwardly causal process [26, 28].

The diffusion of Internet and social media, with their multiplication of news sources for the public, has raised questions about the continuing ability of newspapers and television news to set the public agenda. Some of the earliest research exploring agenda setting in the online context documented the continuing ability of traditional news sources to create issue salience for topics pursued in online bulletin board discussions [33]. However, that same research also made it apparent that the time lag for traditional media coverage and the creation of subsequent issue salience for the public, found in prior research to be 1-2 months, was now reduced to approximately one week [33].

More interesting questions related to online agenda setting, as [35] put it, focus on whether the Internet simply adds more channels to traditional agenda processes multiplying the effects of traditional media, or if online media and social media channels and dynamics might "reverse" such effects. This would mean online media essentially cue traditional media to cover the issues and attributes in discourse that appears online, either in online news media reporting or in the postings of social media "producers" [11]. The latter represents a fundamental change in traditional media processes, since scholars of both media and policy agenda setting agree that traditional media favors the topics, information, and interpretations of government officials [6, 27, 41], while ignoring other voices. Reverse agenda setting would suggest the possibility of altering the ratio of government voices to other voices in media in ways now beginning to be explored.

2.4 Transitioning to a Hybrid System

The net effect of initial studies of online agenda setting depict a media system in considerable transition. Tran's [39] review of 26 studies appearing in the communication literature between 2002 and 2014 found evidence that major online news sites, such as MSNBC and Yahoo News, are affected by and in turn affect the agendas of legacy media such as newspapers and network television. Similarly, the mainstream media drive the content of political blogs, but at times blogs also set the agenda of traditional media. Increasingly such studies use time series analysis with Granger causality to probe lagged time series collected for each type of media content and causal directions. Scholars are now attempting to identify conditions that may account for varying effects. For example, agenda setting differences between traditional and online media may be driven by precipitating events in the environment. For example, Sayre et al. [36] investigated the extent to which YouTube videos may have led or followed traditional news media in covering specifics of California's Proposition 8 story. Using time series analysis and Granger causality tests, they found that before the election (through which Proposition 8 became law), mainstream California newspaper coverage predicted news coverage in a variety of news outlets indexed in Google news (online news sources) together with the

production of YouTube videos addressing the topic. However, after the election, as the California Supreme Court prepared to rule on the constitutionality of Proposition 8, the proliferating production of YouTube videos addressing the topic predicted news coverage in both mainstream California newspapers as well as online news sources. The authors speculate that YouTube video production increased in order to express viewpoints of their producers that were not finding expression in the mainstream press.

Agenda setting effects between traditional and online media may differ on the basis of issue. This was amply illustrated by Newman [29] who compared one year of traditional media issue coverage to social media discussions (discussion boards, tweets, blogs) over 29 issue topics, using time series analysis and Granger causality tests. They found a variety of media dynamics operating simultaneously; for 18 of 29 issues, social media "Granger-caused" (see explanation later in text) higher levels of attention in traditional media, while for 11 of the 29 cases, traditional media Granger-caused social media attention. Six cases revealed reciprocal Granger causation.

Finally, researchers have suggested that the effects of online agenda setting may vary on the basis of the characteristics of particular social media. For example, Jungherr [22] has argued that Twitter is used in ways that are characteristically different from other media; while users often tweet news stories from mainstream media suggesting traditional agenda setting effects, Twitter use is also characterized by special dynamics, logics, and content stemming from users' motivations to use the medium to inform, mobilize, and cultivate media attention for their topics. This suggests that Twitter's idiosyncratic logic supports Chadwick's [12] description of what he calls the "hybrid media system," which is comprised simultaneously of new and old media, relatively speaking, each with idiosyncratic media logics defined by their "technologies, genres, norms, behaviors, and organizational forms" [12]. Chadwick [12] suggests that media researchers explore how the logics of newer and older media practices interact with each other, identifying distinctive differences between older and newer media, and noting where older distinctions may be disappearing. Such tasks are particularly important at this point in time, which is clearly one of transition in the world brought on by the diffusion of digital media. We were particularly interested in understanding the differences in logic between Twitter, online media that represents traditionally static information such as news, and dynamic online media that represents the temporal voices expressed in blogs, discussions, and other forms of social media. Drawing upon this suggestion, we propose to explore the use of Twitter and two different forms of online media as they affect the popularity of one particular e-petition. We focus special attention on electronic petitioning, since it is a vehicle for the public to express public policy interests and desires to government officials.

3 ELECTRONIC PETITIONING AND SIGNATURE ACCUMULATION

While electronic petitioning systems may be new, citizens' rights to petition their governments are not. Dating back to the 13th century, the right to petition has long since been a way for people to communicate with local, national, or parliamentary governments. Facilitated by advances in information and communication technologies (ICTs), e-petitioning now serves as

a mechanism for citizens to participate in government policy-making process in the United States as well as in Great Britain, Germany, Scotland, Australia, and Norway. In addition, proprietary e-petitioning services such as Change.org, Moveon.org and many others provide private platforms that make petitioning easy for initiators as well as signers. Change.org prompts initiators to specify the target for a petition, such as governments at all levels, corporations, and virtually any entity that petitioners choose to address for action. Change.org also prompts petition initiators to disseminate information about their petitions using social media such as Facebook and Twitter, and enable users to move seamlessly into these platforms to do so.

There have been no systematic efforts to track the extent or success of e-petitioning activity, but there is little doubt that signing e-petitions has become a popular political and social activity among Internet users. The 2011 Oxford Internet Institute Survey (the last OII survey to track e-petition signing) shows that signing digital petitions is an increasingly popular activity in Great Britain, with Internet users who have signed a digital petition increasing from 7% in 2009 to 14% in 2011 [16]. According to data provided by the Pew Internet and American Life project [37], 17% of American adults have signed a petition online.

It is difficult to discern the extent of e-petitioning on proprietary platforms such as Change.org, the relevant platform in this research. The most popular of all private petitioning platform, Change.org has to date registered more than 178 million users, who sign more than an average of 1000 new petitions initiated daily. Success or “victory” is defined by the user upon the creation of a petition and is viewed in terms of concrete actions taken by the petition target to address the petitioner's request or meeting signature thresholds established by the petitioner. Change.org claims over 20,505 “victories” in 196 countries, interpreted as a petition achieving its targeted action or a petitioner-set signature goal [13]. Change.org's “victories” range across numerous contexts, government and other, and across a variety of actions. Our efforts to categorize 236 recent US targeted petition “victories” indicate approximately 30% target requests to US government agencies at a variety of levels, not including petitions directed at law enforcement agencies or schools [15].

At this time, very little is known about the conditions under which e-petitions attract signatures. We know that the ability of a petition to meet its target signature threshold is heavily determined by the rate of signature accumulation during the initial day of the petition's life [18, 42]. We also know that signature accumulation is related to certain linguistic and semantic aspects of the petition itself [17]. It makes sense to expect that collective action on the Internet in the form of tweets and the use of other online media will be involved in stimulating the accumulation of e-petition signatures. However, we know of no research that has explored the relationships between petition signature accumulation and online media of any kind.

We focused on the Change.org petition created on May 1, 2014 by Ify Elueze, a young Nigerian woman, entitled “All World Leaders:

Bring Back Nigerian's 200 Missing School Girls #BringBackOurGirls” (BBOG) exploring the relationships between signature accumulation over time and a variety of new media forms that appeared during the same period of time. We distinguished between tweets and other forms of online media, and, regarding the latter, we also distinguished between static news-oriented online media (including online mainstream news sites, other news sites, magazine sources, and websites) and dynamic social media (including blogs and other social media platforms such as Pinterest, YouTube, and discussion forums). Thus, our first two research questions asked:

RQ1: What is the relationship between tweets related to the BBOG petition over time and signature accumulation over time?

RQ2: What is the relationship between static online media and dynamic social media over time and signature accumulation?

We also sought to understand the impact of two additional factors: (a) online and social media produced by individuals or organizations with a special interest in African or Black news or social issues, and (b) whether or not the online media specifically mentioned the BBOG petition. We inquired about whether online items with these characteristics affected the numbers of accumulating signatures. Thus, we asked:

RQ3: What is the relationship between online media showing evidence of special interest in African/Black social issues, and online media specifically mentioning the BBOG petition and signature accumulation over time?

4 RESEARCH METHODS

4.1 Data Collection: Signatures and Tweets

Our data consisted of signatures collected from the Change.org website through its API and Twitter data collected from the Twitter API. The BBOG petition was created on May 1, 2014 with an end date of May 15, 2015, more than a year later. There were a total of 1,104,440 signatures of which 194,219 (or 17.5%) were publicly available in our dataset. The date range for the 194,219 public signatures was from May 1, 2014 to October 27, 2014. The goal for “victory” was 1.5 million signatures (which was never achieved). Our analysis focused on 189,082 public signatures registered between May 1 and June 5, 2014.

Twitter data was collected from the Twitter API from May 2, 2014 (the day after the BBOG petition was created) to October 18, 2014 using the following query: “All World Leaders Bring Back Nigeria's 200 Missing School Girls #BringBackOurGirls”. This query consists of the exact phrase that is, by default, tweeted out to user/signer's followers when they click on the Tweet button from the Change.org petition site. This query was chosen so we could obtain all of the tweets that came from a user who signed the BBOG petition and tweeted it for their followers to sign as well as other individuals simply tweeting about the BBOG issue. Our data set consisted of 4520 tweets of which 1662 are retweets. There were 4096 unique users; 151 users tweeted more than once generating a total of 575 tweets. 4489 out of the 4590 of the tweets used

English as their language (users can choose the language they would like to use in the settings of their profile account). 101 are non-English which include French, Korean, Japanese, and Vietnamese. However, a majority of the non-English tweets contained just the title of the BBOG petition and the petition URL.

Figures 2 and 3 present maps that present the BBOG petition signatures and the BBOG petition tweets geographically. The darker the color, the higher concentration of signatures (Figure 2) or tweets (Figure 3). The signature map includes all of the publicly available BBOG petition signatures in our dataset that we have location data for which is 126,630 out of 194,219 (65%). The tweet map includes 1908 of 2262 (84%) of the original tweets from those who both signed and tweeted the petition information to their followers from the Change.org e-petitioning site. Figure 4 does not include retweets or tweets from individuals who circulated the petition URL but may or may not have signed the petition. Our analysis focused on 4430 tweets generated between May 1, 2014 and June 5, 2014; 2262 of these tweets emanated from those who had signed the petition and used the petitioning platforms to tweet to their followers. The remaining 2168 tweets were retweets or tweets that had obtained the petition URL in other ways.

Figure 2. BBOG Petition Signatures

Figure 3. BBOG Petition Tweets

4.2 Online and Social Media: Collection and Coding

Online media items related to the BBOG and the related e-petition were collected using Google Advanced Search in a retrospective search of the web. We used the search terms “Nigeria”, “school”, “girls”, “change.org”, and “petition” in consecutive searches by day beginning with May 1, 2014 and ending with June 5, 2014. In all cases, the search specified English language items, from any region of the world, with terms appearing anywhere in the page, and in any format. The coding process was carried out by several authors and an undergraduate assistant. All items obtained from the search process were organized in a spreadsheet and then examined and coded by a single individual. First, the coder examined the relevancy of the link. Items that did not refer to BBOG at all were dismissed. All items that were relevant were then coded for the following variables: media type, inclusion of a reference to the change.org petition, and whether the item was generally related to African or Black issues. Links that were controversial or difficult to code were later examined, discussed, and coded with unanimous agreement by 2 other authors together with the original coder. Media type was the only variable that encountered controversy in some instances. Whether or not the content referred to the Change.org petition or whether or not the content source was generally about Black- or Africa-related issues was nearly always apparent.

Each link was coded as one of the mutually exclusive categories of media type: mainstream online news, other online news, online magazine, blog, social media, non-governmental organization websites, discussion forums, or other. Mainstream online news referred to popular news and television organizations in the U.S. or abroad, such as the New York Times, Canadian Broadcasting Corporation, Fox News, Huffington Post, etc. Less familiar sources of news were categorized as “other news”. When any doubt about the media type category was identified, other authors discussed and agreed on the best category code for this variable. Each link was coded 1 or 0 for the appearance of any reference to the BBOG change.org petition (in addition to any reference to the BBOG event or topic), and also coded 1 or 0 if the source of content (e.g. the magazine or the news site) was from Africa or generally about Africa or Black-related issues. The date when the content appeared online was captured during the search process.

The search process produced a total of 661 items that were coded as described above. We created two variables to explore the effects of different types of online media. The first, Static Online Media, consisted of 353 items that included all online news media (mainstream and other, 212 items) as well as online magazines (37 items) and non-governmental websites (104 items). The second, Dynamic Social Media, consisted of 302 items including all blogs (255 items), along with other online petitions, discourse forums, Pinterest postings, YouTube videos, etc. (a total of 47 items). A total of 6 items did not appear to fall into any of these categories, so they were omitted from analysis, yielding a total of 655 total online media items.

4.3 General Analytic Strategy

Time series analysis explores the relationships between 2 or more time series of 36 days each; we explored a time series for (1) petition signatures (the dependent variable in all cases), (2) tweets containing links to the petition URL, (3) Static Online Media items referencing the abduction of the Nigerian schoolgirls and (4) Dynamic Social Media items referencing the abduction of the Nigerian schoolgirls, (5) a series of media items mentioning the Change.org petition (from both Static or Dynamic items), and (6) items from both Static and Dynamic item sources that seemed in particular to address African/Black topics. All of our analyses were conducted using the Stata statistical package.

A time series regression analysis begins with tests exploring the characteristics of the data, which help to determine the choice of regression model for analysis. First, we tested each series for stationarity, which assumes that the mean, the variance, and the autocovariance of the series are constant over time [10]. We used the Augmented Dickey-Fuller test (with 7 lags), which is commonly recommended to detect stochastic, trend, and deterministic non-stationarity. If the series involved in an analysis are both stationary, it is appropriate to use standard OLS regression techniques.

Following OLS regression, we tested for another assumption of time series data, which is that the error terms corresponding to different points in time are not correlated. A correlated error term generally indicates imprecision in collection and measurement of data and/or that variables have been left out of the model [30]. We used the Breusch-Godfrey test to determine if there was evidence of correlated error terms.

With evidence of serial correlation, the use of an autoregressive distributed lag regression model is recommended [32]; this model includes on the right side of the equation, a lag for the dependent variable, each independent variable, and a lag for each independent variable; the procedure generally removes the error correlation. We tested to insure there was no further evidence of error autocorrelation using the Portmanteau Q statistic.

Finally, we tested for Granger causality using Stata's VAR Granger tests, in an effort to discern which of our time series "granger caused" the other. The idea of Granger causality is predicated entirely on statistical grounds. According to [10], Granger causality enables the analyst to determine whether a variable X helps one to predict Y "over and above the ability to predict Y on only the basis of Y's past history".

Figure 4 – Frequencies of Tweets and Signatures by Day

Figure 5 – Frequencies of Diverse Online Media by Day

5 RESULTS

Figures 4 and 5 present graphic illustrations of each of the time series that figure in our analysis. Figure 4 graphs the frequency of petition signatures as well as the frequency of tweets. Figure 5 graphs the frequency of each media time series, including Static Online Media, Dynamic Social Media, items that mentioned the Change.org petition, and items from sources that appeared to be principally concerned with African or Black issues. Although the 2 figures present data at different scales, they both reveal considerable spikes in frequency for each time series between days 5 to 10 of the petition's history and then considerable attenuation beginning at roughly day 17.

5.1 Research Question 1

The analysis of RQ1 explored the relationship between e-petition signatures and tweets. We found both time series were stationary for all 3 causes of non-stationarity, and proceeded to regress signatures on tweets, using standard OLS regression techniques. The analysis produced a significant equation ($F(1,34) = 472.82, p < .01$). However, the Breusch-Godfrey test indicated the presence of correlated error terms at the 4th lag.

Thus, our analysis proceeded with an autoregressive distributed lag regression model (ADL) utilizing lagged versions of the independent and dependent variable. The model tested was: $y = a_0 + a_1Y_{t-1} + B_1X_t + B_2X_{t-1} + e_t$. The model yielded a significant $F(3,31) = 158.87, p < .01$ ¹. The Portmanteau Q test indicated there was no remaining residual correlation. Only the coefficient for

¹ R-squared values are not typically reported in time series analysis since they index the extent to which the regression analysis fits the observed data, rather than the

more common concern of time series analysts, which is to assess the extent to which the analysis accurately forecasts future values in a series.

tweets was significant (38.68, $p < .01$), suggesting that each additional tweet yielded slightly over 38 additional BBOG petition signatures. We tested for Granger causality (using 1 lag), finding that tweets granger-caused signatures (Chi square (1) = 36.47, $p < .01$) and that signatures also granger-caused tweets (Chi square (1) = 56.17, $p < .01$).

5.2 Research Question 2

RQ2 addresses the relationship between signature accumulation and all 655 collected online media items related to BBOG, divided into Static Online Media and Dynamic Social Media. Following the procedure outlined above, we first examined the stationarity of Static Online Media, and Dynamic Social Media. We found that each variable was stationary around a deterministic trend, which means the series would become stationary once the trend is eliminated. We examined the line graphs for both variables as well as the autocorrelation functions, which suggested the data was characterized by a linear trend, with items decreasing in frequency with the passage of 36 days of data collection.

We thus proceeded to “de-trend” the data by regressing both variables on the time unit of “day,” and then examined the residual de-trended variables for stationarity. We computed Dickey-Fuller tests on the newly created de-trended variables and found that both variables were now stationary. We then regressed e-petition signatures on the newly created de-trended Static Online Media and Dynamic Social Media variables, producing a significant $F(2, 33) = 13.41$, $p < .01$, and a significant coefficient for the de-trended Static Online Media variable. However, Breusch-Godfrey tests (7 lags) again revealed the presence of autocorrelated residuals.

We thus moved to the ADL model, which in this case was $y = a_0 + a_1Y_{t-1} + B_1X_t + B_1X_{t-1} + B_2X_t + B_2X_{t-1} + e_t$. This analysis produced a significant $F(5, 29) = 10.82$, $p < .01$. The Portmanteau Q test indicated there was no remaining residual auto correlation. The coefficient for the lagged signature variable was significant (.52, $p < .01$) as well as the coefficient for the de-trended Static Online Media variable (1238.40, $p < .01$) suggesting that every new static online media item produced a daily increase in signatures of 1,238. We tested for Granger causality, however there was no evidence of significant Granger causation.

5.3 Research Question 3

The last research question considered the effects of two additional time series that we expected might be related to the accumulation of petition signatures; specifically they were a time series consisting of online items related to the kidnapping that explicitly mentioned the Change.org petition (Petition Mention) and a time series consisting of items related to the kidnapping from sources that appeared to emphasize African or Black issues (Afri/Black). Examining the two time series, we found that each was stationary; we proceeded to examine each time series independently.

Following our standard procedures, we regressed signatures on the time series of items mentioning the Change.org petition,

producing an equation with a significant $F(1,34) = 53.07$, $p < .01$. The Breusch-Godfrey tests (7 lags) again revealed the presence of autocorrelated residuals. We thus turned again to the ADL model, $y = a_0 + a_1Y_{t-1} + B_1X_t + B_2X_{t-1} + e_t$ which used lagged values of the dependent and independent variable.

The resulting equation produced a significant $F(3, 31) = 34.61$, $p < .0$ and two significant coefficients. The coefficient for the lagged signature value was .47 ($p < .01$) was significant as well as the coefficient for Petition Mentions (1364.83, $p < .01$) suggesting that each item that mentioned the Change.org petition produced a corresponding increase in petition signatures of approximately 1365 per day. The Portmanteau Q test indicated there was no remaining residual auto correlation.

We tested for Granger causality finding that the Petition Mention series granger-caused signatures (chi square=3.85, $p=.05$); however the reverse was not true.

We then turned to the time series of items related to the abduction that appeared to emphasize African/Black issues. We regressed signatures on the Afri/Black time series; however, the resulting regression equation was not significant. The Breusch-Godfrey tests (7 lags) again indicated the presence of substantial autocorrelation. We thus turned again to the ADL model, $y = a_0 + a_1Y_{t-1} + B_1X_t + B_2X_{t-1} + e_t$ which used lagged values of the dependent and independent variable. The model produced a significant equation with $F(3,31) = 11.98$, $p < .01$; however, the only significant coefficient was for the lagged signature variable. This suggested that the Afri/Black time series made no significant contribution to the analysis. We thus dropped this time series from further analysis.

We conducted one final analysis to assess the inter-related effects of the significant time series items on signature accumulation. Realizing that a standard OLS regression would produce autocorrelated residuals, we proceeded directly to the ADL model, $y = a_0 + a_1Y_{t-1} + B_1X_t + B_1X_{t-1} + B_2X_t + B_2X_{t-1} + B_3X_t + B_3X_{t-1} + e_t$, assessing the contributions of the time series for tweets, de-trended Static Online Media, and Petition Mentions to predicting the signature accumulation time series.

This produced a significant $F(7,27) = 104.86$, $p < .01$ and two significant coefficients. The coefficients for the tweet time series (30.03, $p < .01$) and for the Petition Mention time series (352.28, $p < .05$) were each significant. However the de-trended Static Online Media time series was not. The Portmanteau Q test indicated there was no remaining residual autocorrelation. We tested for Granger causality, finding a substantial array of effects, as presented in Table 1.

Table 1 suggests, as one would expect, that both the tweet time series and the time series of items mentioning the petition granger-cause the time series reflecting signature accumulation over time. On the other hand, we also see that the signature time series granger-causes tweets as well as items mentioning the

petition, suggesting that reciprocal causation is at work. The Static Online Media do not granger-cause signatures, however they do granger-cause tweets and the items that mention the petition. Finally, signatures granger-cause the static online media time series, suggesting that the signature ebb and flow is related to degrees of coverage in the static online media.

Granger Cause (Chi square)	Effect on Time Series
Tweets (41.64)**	Signatures
Petition Mention (4.04)*	Signatures
Signatures (52.55)**	Tweets
Static Online Media (5.91)*	Tweets
Signatures (5.40)*	Static Online Media
Signatures (6.87)**	Petition Mention
Tweets (7.62)**	Petition Mention
Static Online Media (6.10)**	Petition Mention

** p < .01, * p < .05

Table 1: Granger Causation between Time Series

6 DISCUSSION

The data reveal a complex pattern of dynamic associations between the various media time series related to the accumulation of signatures in the case of Bring Back Our Girls. On the one hand, it is not surprising to discover a relationship between the time series for tweets and the time series for signature accumulation. The speed and ease of tweet dissemination are the basis for viral effects, giving rise to the common sense expectation that the dissemination of tweets with the Change.org petition URL would have a discernible effect on petition signatures. On the other hand, it is quite useful to observe empirical support for this expectation, which had not been available prior to this analysis.

It seems counterintuitive, however, to observe that signature accumulation is also related to the tweet time series. That is, until one appreciates the consequences of the Change.org platform feature that allows petition signers to immediately notify their followers, via Twitter and Facebook, about their signatures and to provide them with information that enables their followers to sign as well, should they be so inclined. Thus, petition signatures are capable of generating tweets, and empirically do so, according to our analysis. It is notable that this reciprocal causation persists across our analysis, even in the presence of other social media.

Our analysis of static online media and dynamic social media, however, gives rise to some surprising findings. Recall that the Static Online Media time series we analyzed consists primarily of news items, magazine items, and items on the websites of non-governmental organizations. This includes items related to the abduction carried by online mainstream sources such as *The Guardian*, CNN, ABC News online, the *Daily Mail*, and the *Washington Post*, which are likely to have substantial viewerships, as well as legions of other smaller and more specialized news carriers. In contrast, the items included in “dynamic social media”

consist principally of blog posts, which, although difficult to tell for sure, seem unlikely to command viewerships comparable to the news sources and thus unlikely to wield large effects. Indeed, that static online media affect the generation of tweets suggests that these media are very relevant to the process of petition signature accumulation. However, note also that signature accumulation affects the production of static online media items, which suggests that news organizations may choose to cover an issue that is related to a petition that is being signed with considerable frequency.

The absence of a relationship between the African/Black source time series and signature accumulation is difficult to explain. While 113 or 17% of the 655 online items were posted by sources that appeared to emphasize either African or Black issues, which would seem to be a natural constituency for the BBOG petition, this time series was unrelated to signature accumulation. On the other hand, the time series of items mentioning the petition itself was highly related to signature accumulation, with an effect that persisted in regressions with other media. That signatures and tweets also granger-caused petition mentions further supports the possibility that the continuing development and success of the petition itself and tweets about it was noticed by those writing about or covering the BBOG issue.

Thus it appears that with respect to e-petition signature accumulation in the case of BBOG, the various types of online media behave differently, supporting Chadwick’s [12] notion of a “hybrid” media system, at least insofar as such as the media system affects this particular case of online collective action. Admittedly, one limitation of our analysis is the absence of two substantial traditional media, namely television and traditional hard-print newspapers. Given international cable news networks, there is every reason to believe that mentions of the BBOG event and petition on television would contribute substantially to e-petition signature accumulation, although this is a relationship that needs to be documented. However, the role of traditional newspapers is substantially less clear. In future research, it is worth exploring the performance of traditional newspapers in contrast to online news counterparts and in contrast to the myriad other online sources of news to which the Web has given rise.

Our analysis is also partial given that we were able to access only those Change.org signatures whose owners chose to make them publicly available. There is no a priori reason to believe that non-publicly available signatures would conform to a different frequency distribution than those publicly available. But clearly there is an unavoidable, but considerable, amount of missing signature data in our analysis.

Although Change.org is a private e-petitioning platform, what we learn from this case has implications for government sponsored platforms in terms of illustrating potentially related media dynamics. As we write, We the People (WtP, an e-petitioning platform created by the Obama White House and continued by the Trump Administration, has now registered over 475,000 signatures supporting a petition calling upon President Trump to

release his tax returns. The e-petition was the recent subject of a *New York Times* editorial, as well as a topic for myriad other news stories. The WtP platform similarly supports the ability of a petition signer to disseminate information about that signature to followers on Twitter and Facebook. Thus WtP, and other nationally sponsored e-petition platforms, may be characterized by similar media dynamics. It would seem useful for government to understand the dynamics of signature accumulation and cultivate the ability to forecast the future of petitions of interest. Time series analysis of e-petition signature accumulation presents the promise of such forecasting ability. Of course, governments may choose to ignore petitions initiated by the public even when signature accumulations are high; however, such actions run the risk of breeding cynicism and distrust on the part of the public that is, on the one hand, invited to express their policy preferences, and, on the other hand, ignored after having done so.

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8 REFERENCES

- [1] Baumgartner, F.R. and Jones, B. D. 1993. *Agendas and Instability in American Politics*. University of Chicago Press, Chicago, IL.
- [2] Baumgartner, F.R. and Jones, B. D. 2001. Policy dynamics. Report – prepared for delivery at the Annual Meeting of. *the Midwest Political Science Association*. (Apr. 2001).
- [3] Baumgartner, F.R. and Jones, B. D. 2002. Positive and negative feedback in politics. *Policy Dynamics*. 3-28. The University of Chicago Press. Chicago, IL.
- [4] Baumgartner, F.R. and Jones, B. D. 2009. *Agendas and Instability in American Politics*. University of Chicago Press, Chicago, IL.
- [5] Baumgartner, F.R. and Jones, B. D. 2015. *The Politics of Information: Problem Definition and the Course of Public Policy in America*. The University of Chicago Press. Chicago, IL.
- [6] Bennett, W.L. 2005. *News: The Politics of Illusion*. Pearson, New York.
- [7] Bimber, B., Flanagan, A.J. and Stohl, and C. 2005. Reconceptualizing collective action in the contemporary media. *Communication Theory*, 15:365–388.
- [8] Bimber, B., Stohl, C. and Flanagan, and A.J. 2009. Technological change and the shifting nature of political organization. *Routledge Handbook of Internet Politics*. Chadwick, A. and Howard, P. eds. 72–85.
- [9] Birkland, T.A. 1998. Focusing events, mobilization, and agenda setting. *J. Public Health Policy*. 18, 53–74.
- [10] Steffensmeier, J.M., Freeman, J.R., Hitt, M.P. and Pevehouse, J.C., 2014. Time series analysis for the social sciences. Cambridge Univ. Press.
- [11] Bruns, A. 2009. Blogs, A.B. and Wikipedia, Second Life. *and Beyond: From Production to Prodsusage*. Peter Lang, New York, NY.
- [12] Chadwick, A. 2013. *The Hybrid Media System*. Oxford University Press, Oxford, UK.
- [13] Chang.org. 2017. <https://www.change.org/impact>
- [14] Downs, A. 1972. Up and down with ecology – the “issue-attention cycle.” *The Public Interest*. 28, 38–50.
- [15] Dumas, C., Harrison, T.M., Hagen, L. and Zhao, X. (In press). What do people think? E-petitioning and policy decision making. In A. Paulin, L. Anthopoulos, and C. Reddick (Eds.), *Beyond bureaucracy: Towards sustainable government informatisation*. Springer.
- [16] Dutton, W.H. and Blank, G. 2011. Nest generation users: The internet in Britain. Oxford internet survey 2011. Report, University of Oxford.
- [17] Hagen, L., Harrison, T.M., Uzuner, O., May, W., Fake, T., Katragadda, S. 2016. E-petition popularity: Do linguistic and semantic factors matter? *Government Information Quarterly*. DOI = <http://dx.doi.org/10.1016/j.giq.2016.07.006>
- [18] Hale, S.A., Margetts, H. and Yasseri, and T. 2013. Petition growth and success rates on the UK No. 10 Downing Street website. *Proc. 5th Annual ACM Web Science Conference*. 132–138.
- [19] Harrison, T.M. and Falvey, L. 2001. Democracy and new communication technologies. In W. B. Gudykunst, editor, *Communication Yearbook 25*, pages 1–43. Lawrence Elbaum, Mahway.
- [20] Jones, B. D. and Baumgartner, F. R. 2005. *The politics of attention: How government prioritizes problems*. Chicago: University of Chicago Press.
- [21] Jones B. D. and Baumgartner, F. R. 2012. From there to here: Punctuated equilibrium to the general punctuation thesis to the theory of government information processing. *Policy Studies Journal*, 40(1):1–20.
- [22] Jungherr, A. 2014. The logic of political coverage on twitter: Temporal dynamics and content. *Journal of Communication*. 64, 239–259.
- [23] Kingdon, J. 1984. *Agendas, Alternatives, and Public Policies*. Little, Brown and Co. Boston, MA.
- [24] Margetts, H.Z. 2009. The Internet and public policy. *Policy & Internet*. 1, 1–21.
- [25] Margetts, H.Z., John, P., Hale, S.A. and Reissfelder, and S. 2013. Leadership without leaders? Starters and followers in online collective action. *arXiv*. 1308, 237 (Feb. 2013).
- [26] McCombs, M. 2004. *Setting the Agenda: The Mass Media and Public Opinion*. Polity Press.
- [27] M. McCombs. *Setting the Agenda: The Mass Media and Public Opinion*. 2014. Polity Press, Cambridge, UK, second edition.
- [28] McCombs, M., Holbert, R.L., Kousis, S. and Wanta, and W. 2011. *The News and Public Opinion: Media Effects on Civic Life*. Polity Press, Cambridge, UK, second edition.
- [29] Neuman, W.R., Guggenheim, L., Jang, S.M. and Bae, S.Y. 2014. The dynamics of public attention: Agenda- setting theory meets big data. *Journal of Communication*, 64:193–214.
- [30] Ostrom, Jr., C. W. 1990. *Time series analysis regression techniques*, 2nd ed. Newbury Park, CA: Sage.
- [31] Petray, T.L. 2011. Protest 2.0: Online interaction and aboriginal activists. *Online Media, Culture & Society*, 33(6):DOI: 10.1177/0163443711411009.
- [32] Pickup, M. (2015). *Introduction to time series analysis*. LA, CA: Sage.
- [33] Roberts, M., Wanta, W. and Dzwo, and T. 2002. Agenda setting and issue salience online. *Communication Research*. 29, 4, 452–465.
- [34] Rolfe, B. 2005. Building an electronic repertoire of contention. *Social Movement Studies*. 4, 1, 65–74.
- [35] Saebo, O., Rose, J. and Nyvang, and Y. 2009. The role of social networking services in eParticipation. *Electronic Participation, Lecture Notes in Computer Science*. Springer-Verlag. 46–55.
- [36] Sayre, B., Bode, L., Shah, D., Wilcox, D. and Shah, and C. 2010. Agenda setting in a digital age: Tracking attention to California proposition 8 in social media, online news, and conventional news. *Policy & Internet*. 7–32.
- [37] Smith, A. 2014. *Civic engagement in the digital age*. Engagement.aspx.
- [38] Strange, M. 2011. Act now and sign our joint statement! what role do online global group petitions play in transnational movement networks? *Media, Culture & Society*, 33(8):1236–1253.
- [39] Tran, H. 2014. Online agenda setting: A new frontier for theory development. *Agenda Setting in a 2.0 World*. T.J. Johnson, ed. 204–229. Routledge, New York, NY.
- [40] True, J.L., Jones, B.D. and Baumgartner, and F.R. 2007. Punctuated-equilibrium theory: Explaining stability and change in public policymaking. Sabatier, P. ed. *Theories of the Policy Process*. Westview Press, Boulder, CO, second edition.
- [41] Wolfe, M., Jones, B.D. and Baumgartner, and F.R. 2013. A failure to communicate: Agenda setting in media and policy studies. *Political Communication*. 30, 2 (2013), 175–192.
- [42] Yasseri, T., Hale, S.A. and Margetts, and H.Z. 2014. Modeling the rise in internet-based petitions. Available in arXiv [physics.soc-ph] as 1308.0239v3