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Life of the Party: Social Networks, Public Attention, and the Importance of Shocks in the Presidential Nomination Process

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Abstract

We examine the effects of shocks on the invisible Presidential primary in the United States. First, we build on existing models using an algorithm simulating social network shocks. Findings show that positive shocks significantly aid the lead candidate's chances of winning in the invisible primary. Negative shocks, however, are less detrimental to a lead candidate than positive shocks are helpful, as the leader is often able to survive a negative shock and still emerge victorious. Broad empirical tests demonstrate the importance of shocks as well. Beyond the importance of shocks, findings also suggest that Presidential candidate success in the invisible primary owes more to public- than elite-driven factors.

Keywords

political science, social organization, sociology, social networks, invisible primary, presidency, presidential primary

In 1968, the country watched in shock as national media outlets showed the violence that erupted in Chicago during the Democratic National Convention. With incumbent Lyndon Johnson's stunning decision not to seek re-election and frontrunner Robert F. Kennedy's assassination earlier that summer, Hubert Humphrey won the Party nomination without competing in any primaries. Consequently, the Party adopted new reforms in 1972 that incentivized state parties to adopt the primary.

These reforms resulted in a democratizing shift towards public selection of the Party nominee in the 1970's at the expense of party elites, who had more directly controlled state conventions. Yet, elites hesitated to fully democratize presidential nominations, incorporating a series of checks on the masses, such as increasing the number of superdelegates involved in the process. This push-and-pull between democratization and elite control over the nomination process affects how

campaigns approach the invisible primary, or "the organizational building, strategic maneuvering, and resource acquisition that candidates do in the six months to a year before the Iowa caucuses" (Aldrich, 2009, p. 33).

Introduction

While the theory of presidential nominations focuses on momentum (i.e. winning in Iowa provides momentum for New Hampshire which provides further momentum, etc.), the starting point (t_0) from which the momentum in Iowa builds is also extremely important, perhaps best embodied by the "party decides" thesis, which states that elites still exert significant control over the nomination process through endorsements (Cohen et al., 2008). In 2000, through an early strong start in the invisible primary, George W. Bush began the Iowa race about 15–20% ahead of Elizabeth Dole going into the Iowa contest. In a contest between these two plausible candidates, the early strong start during the invisible primary, including earning a rush of early endorsements (538.com), gave Bush a critical lead which helped him to secure the nomination (Aldrich, 2009).

Although elites and circumstances countered the democratizing early effects of the shift to primaries, currently the internet and social media are straining elite control and may be returning some of the power back to the public. With communication systems where the marginal message is free and algorithms can deliver that message to the recipients it predicts are most likely to be receptive, today is an especially important time to study the public effects on the shaping of the invisible primary. After all, Donald Trump never had much overt elite political support in 2016 but he was able to secure the Republican nomination easily with his dedicated base of followers. Certainly, candidates are still working in the invisible primary to position themselves as frontrunner for the state contests and these elite maneuvers remain important. But today, public attention is also important to consider when explaining support for political candidates in the invisible primary (Stiles et al., 2020; Swearingen et al., 2019).

While evidence for the importance and validity of public attention has been established in various political contexts (Ripberger, 2011; Stiles & Grogan-Myers, 2018; Swearingen & Ripberger, 2014; Swearingen et al., 2019), the theoretical rationale requires further explication. We build on our previous theoretical model (Stiles et al., 2020) to more fully explain social networks as drivers of public attention. We modify that model by adding media and shocks and run simulations to examine the effect of messages about candidate preferences operating through social networks on candidate support during the invisible primary. Finally, we provide a broad empirical test which demonstrates the importance of public attention, media attention, and shocks to candidate support during the invisible primary.

Theoretical Framework

In this section, we review key theoretical insights about invisible primaries, emphasizing features which make social network analysis an especially useful approach. Next, we review social network analysis, contextualizing variables from the political primaries' literature using insights from this field. Then, we consider the media and social media as connections between local party structures and personal networks. Finally, we discuss how political shocks can affect the invisible primary, focusing on three of the most frequent shocks—scandals, fundraising reports, and debates— and their impacts on political outcomes.

Invisible Primary

How do candidates compete in something that is invisible? Presidential primary voters do not rely on the typical factors used by voters in the general election, such as party identification, economic

performance, and incumbency (Steger et al., 2012). Further, there is a high level of volatility in voters' preferences during this period, in part because the public shifts its attention from one candidate to another (Steger, 2007). In this difficult environment, candidates must work their networks of elites, gaining support from members of Congress, governors, and other political notables. Elites then signal their support to voters which impacts outcomes (Cohen, 2008). Although some primary contests may deviate from the pattern, a number of scholars find that elite endorsements are predictors of primary outcomes (Dowdle et al., 2016; Steger, 2007; Summary, 2010).

However, when elites do not agree on the candidate, outsiders play a larger role (Steger, 2015). Further, elite division is not uncommon. In one-third of all primary contests since 1980, elites waited to endorse a candidate until after the invisible primary had concluded (Whitby, 2014). In races without a clear frontrunner, then the explanation for outcomes of the nomination contest turns to momentum from winning Iowa and New Hampshire (Steger, 2013). The momentum explanation has strong empirical support in the literature but is not helpful for explaining the invisible primaries that precede them.

Other variables in the primary literature, however, should be considered for the invisible primary. Media attention can prolong candidates' campaigns (Shen, 2008) and when candidates' media attention increases, their vote shares increase as well. Other scholars examine the effects of money on securing the nomination but do not find much empirical support (Adkins & Dowdle, 2005; Mayer, 2003). Dowdle et al. (2016) find support for cash on hand as predictive of the aggregate primary vote but only in models estimated after the New Hampshire primary.

Finally, public attention has been found to predict success in the presidential primary (Swearingen et al., 2019). Public attention is conceptualized as relative attention that people are paying to one issue as opposed to any other issue (Swearingen & Ripberger, 2014). Appropriate to the dynamics of the attention economy, this finding holds up well in models estimated on data previous to the Iowa and New Hampshire, the time period of the invisible primary.

Social Networks

The people you surround yourself with shape how you view the world. Messages and other information travel from person to person within the network arrays of which we are part. Various characteristics of our social networks (e.g., size of network, density of connections, number of ties per node) all shape communication, affecting a variety of attitudes and behaviors, including entrepreneurial activities (Aldrich and Kim, 2007), fertility decisions (Kohler et al., 2001), political participation (Lake & Huckfeldt, 1998), voting in one's self-interest (Sokhey & McClurg, 2012), and volunteering (Wang & Handy, 2014). Social networks are also important in understanding changes in public attention which in turn is predictive of vote share in the invisible primary (Swearingen et al., 2019).

We examine the effects of social networks on candidate preference adoption in presidential primary campaigns. Campaign messaging, like much information in social networks (Monsted et al., 2017), spreads by complex dynamics, dependent on at least two neighbors signaling candidate support. Beyond this floor, however, people have varying degrees of resistance to political messaging. Some voters are even true believers, supporters who will never change their preference no matter how many of their friends disagree. Mostly, however, people have variable but on average low amounts of information about politics. Consequently, they are unable to resist messages if they receive them consistently enough and will adopt the candidate that the messages direct them to (Zaller, 1992).

Given people's susceptibility to repeated messaging and their embeddedness in networks, we adopt a threshold model of candidate preference adoption (Granovetter, 1978; Granovetter &

Soong, 1983) for multiple reasons. The threshold model examines conditions under which cascades of collective action may occur given heterogeneous preferences for action in the population contingent upon how many others act. We update this model in two important ways. First, reflective of political primaries in which voters may have more than one choice, we adjust the model so that nodes may adopt one of a number of candidates or remain undecided. (Como et al. (2016) formally adapt the threshold model for multi-party systems). Second, we adapt the model within a social network framework so that preferences are only communicated to nodes (which represent individuals) through edges (or ties) in the network. This adaptation is standard in social network analysis but should be noted as a departure from Granovetter (1978) who used the example of a group of people milling about a public place where the actions of any would affect the preferences of all.

Since preferences have been constrained to travel through networks, network structure is consequential, affecting outcomes through several dynamics, including density, size, and average degrees. We employ a Barabasi model of network formation and evolution wherein nodes show preferential attachment to nodes which already have more connections (BarabaÃsi et al., 2002; Barabási & Albert, 1999). This tendency has been empirically observed in a range of networks (e.g., a scientific publishing network (BarabaÃsi et al., 2002) and on Twitter (Cha et al., 2012)).

In a political primary, several factors affect network dynamics in a way that is distinct from a general election. First, primaries have low salience and so the size of the network of influence is smaller (Rolfe, 2013). In a lower salience election, information is also likely to be more limited, which results in less ability to resist messages (Zaller, 1992). Second, social networks tend toward homophily or sameness (Santoro & Beck, 2018). However, this network characteristic may be less true in a primary network. It is reasonable to expect that voters who disagree may be less likely to exit a social network during a primary. Instead, they may remain in the social network in anticipation of the general election. With a network built primarily for the contest to follow, with exit less likely, and with low information, messages traveling through social networks during primaries can be highly persuasive.

Media

The media has gone through drastic changes in the last generation. Traditional media (such as newspapers, legacy print and broadcast sources) in interaction with social media can cause significant swings in mass behavior. For example, King et al. (2017) conducted an experiment wherein 48 media outlets published stories approved by the authors and on dates randomly assigned by the authors. They found that publication of these stories led to a 62.7% increase in broad policy discussion around that topic on social media in the treatment week, assuring us that a changed media environment nevertheless exerts significant agenda-setting power.

The type of message and elite context may influence engagement, however. On social media, fake news travels faster and farther than on legacy print and broadcast news publishers' media sites (Martens et al., 2018). While countervailing media and unified social elites can mitigate the effect of media bias, media with anti-status quo messages have an advantage over more traditional media (Siegel, 2013). This tendency is exacerbated when foreign governments use social media to depict the United States in divisive ways. For example, the Russian Internet Research Agency (IRA) produces newsfeeds significantly more likely to stress crime and identity danger in their English-language newsfeeds (Ehrett et al., 2021).

Since most media consumers get at least some of their news from social media, we must consider the dynamics of mass media outlets in a social media context. First, communication is mostly one-way as mass media outlets (e.g. BBC) do not typically follow users that follow them. Unlike most social media users, their purpose of joining the network is not to build their

relationships but to act as broadcasters. While broadcasters are critical for disseminating news stories, evangelists (aka influence makers or opinion leaders) also play an important role in bringing the news to parts of the network structure who do not receive initial broadcasts (Cha et al., 2012). There is also a celebrity effect on social media beyond their large numbers of connections, as messages from celebrities are more likely to be re-posted than non-celebrities (Zhang et al., 2017).

Mass user characteristics may also influence transmission of social media messages. For example, a disproportionate number of users who share stories on Twitter are white and male, biasing the story selection to the interests of those groups (Reis et al., 2017). However, King et al. (2017) found that user posts on their news stories were relatively evenly distributed across party, gender, and region. There is also evidence that network members who send messages to members of the network are more likely than observers or those who do not use social media to change their opinion to agree with the majority sentiment (Maruyama et al., 2014).

Shocks

Previous work showed how voters remain undecided if the frontrunner does not have enough initial and unswayable support to convert the network. Initial support, or seeds, is voters that support a candidate at the beginning of the race and provide a favorable network context. Another critical kind of support is true believers, who never switch support from a candidate regardless of network activity or neighbor support. Even with strong initial support, support must be reinforced through the network or preference decay will result (Stiles et al., 2020). In this environment, a shock could tip the balance and allow costly delays for the frontrunner or even result in an upset.

Shocks are "unavoidable, high salience changes or events" (Fieldhouse et al., p. 31) that create uncertainty and cannot easily be managed or explained away. They can also cause voters to re-evaluate their voting behavior in ways that regular politics do not. A severe enough shock can cause volatility in party systems and even lead to dealignment (Fieldhouse et al., 2019). Shocks could raise (or lower) resistance to a candidate, requiring more (or less) candidate support from neighbors. Many shocks have a temporary effect, so over a few iterations, nodes will adopt close to their initial resistance levels to candidates (hence the particular utility of an October surprise in the general election). Other shocks doom the candidate (e.g. Gary Hart) or partially rewire networks (e.g. Donald Trump's ascendancy in the Republican party drew some ardent supporters and caused other long-time Republicans to exit).

While shocks could take on practically infinite forms and effects, there are nevertheless some potential shocks that take place fairly often and have effects that are consistent with the stage of the primary process. In the beginning stages of the invisible primary, a positive shock can raise a candidate's stature as winnability is important to voters. A negative shock could take a candidate out as this is the winnowing phase of the primary. As the primary becomes visible, the first few contests can be shocks as winnowing persists. In this paper, we are guided in our conceptualizing of shocks by considering three of the more common types, a scandal, a positive fundraising quarter report and debates.

A scandal consists of evidence or perception of misbehavior that is covered in the media and upon which other candidates often try to capitalize (Nyhan, 2009) through negative campaigning (Nyhan, 2015; Spurlock, 2013). Scandals dominate media coverage of a campaign (Nyhan, 2015; Puglisi & Snyder, 2008; Spurlock, 2013) and are often accompanied by a spike in public attention (Ellis et al., 2017). They can be particularly harmful to candidates when there is a slow news cycle (Nyhan, 2015).

A positive fundraising report is a positive shock for the candidate. While most studies of the effects of fundraising on campaigns find that money only matters on the margins (Gerber &

Morton, 1998; Jacobson, 1985), there has been insufficient focus on the importance of fundraising early. Since party and incumbency effects are not usually relevant to primaries, fundraising may be the most reliable predictor of outcomes (Bonica, 2017). A positive report signals strength and winnability to other candidates, media, and donors, potentially causing more contributions, media coverage, and sometimes even a winnowing of the competition. These changes could in turn lower voters' thresholds for that candidate, making him or her more likely to win their vote.

Debates can also produce a shock for candidates' campaigns, either negative or positive depending on candidate performance and voter evaluation. Since candidates are competing with each other on the same stage, the shock can be positive for one candidate and negative for another (e.g., after a heated political exchange such as between Joe Biden and Kamala Harris in 2020). While debates do not make much of a difference in the general election (Holbrook, 1996), primary debates matter more in terms of voters' evaluations and preferred candidate. McKinney and Warner (2013) found that 60% of debate viewers changed their candidate evaluations and nearly a third changed their voting choice as a result of primary debates.

Methodology

In the methods section, we extend a previous model of primary candidate support to incorporate shocks. Next, we use the revised model to simulate primary contests, compare our simulated results to the previous model, and more generally to examine the robustness of our expectations. Finally, we provide a broad empirical test of the model using data from recent primary seasons. Details on each method are provided within each section.

Simulations of Invisible Primary Messaging Through Social Networks

A Barabasi–Albert (BA) graph structure is used to model the social network among voters. A BA graph is scale free (meaning the underlying structure of the network does not change if the size of the network changes) and exhibits preferential attachment (new nodes that enter a network prefer to attach to nodes that already have large numbers of connections). We use this type of graph structure to model supernodes (nodes with many connections) and because this kind of structure is empirically common (Barabási & Albert, 1999). Each node represents a voter and an undirected edge between nodes represents a bidirectional influencing relationship between voters. Two nodes connected by an edge are referred to as neighbors. The graph of 1000 nodes is grown by creating nodes with 10 edges each that are preferentially attached to existing nodes with high degree (all data, simulated and empirical, can be accessed at https://github.com/lseiter/lifeoftheparty).

The simulation involves a set of three candidates. Each voter has a threshold for each candidate, which is the minimum number of neighbors who must prefer a candidate in order for the voter to switch their preference to that candidate. The simulation depicts a series of time intervals in which voter preferences are updated based on voter thresholds and current neighbor preferences. If multiple candidate thresholds are met for a particular voter, preference is given to the candidate meeting the lowest threshold, or a random choice in the event of a tie. The simulation continues to update voter preferences based on candidate thresholds until preferences stabilize.

As previously mentioned, *seeds*, *true believers*, and *decay* affect the voter preference model (Stiles et al., 2020) and we include these parameters in our model. A voter with an initial preference for a candidate is referred to as a seed. The seed proportion for Candidate 1 varies from 0.18 to 0.22, while candidates 2 and 3 each had an equal seed proportion of 0.15. Figure 1 shows that a sizable lead as given by initial seed proportions within the social network is critical for a candidate to overcome not just other candidates, but to sway the undecided voter. A true believer's threshold is set such that their candidate preference will never change, while an adherent's

threshold allows a change in candidate preference. Figure 1 also shows that as the proportion of true believers decreases from 1.0 to 0.6 for a candidate, their chance of being overcome by an undecided voter increases.

In this section, we extend the original voter threshold model to incorporate shock by adjusting voter thresholds for a given candidate for some period of time. Our initial implementation of shock adjusts the threshold for Candidate 1 for a specified number of time intervals. The shock amount is given as a proportion of neighbors for which to adjust voter thresholds. Positive shock decreases the threshold for Candidate 1, making it easier to become the preferred choice, while negative shock increases the threshold. The middle row of Figure 2 shows the base case scenario of no shock, that is, the results from Figure 1. The top row shows the impact of negative shock, causing voter preference to shift away from Candidate 1, while the bottom row shows the lead for Candidate 1 increasing due to positive shock. Note that positive shock has a greater impact than an equal amount of negative shock. In the majority of cases negative shock primarily results in an increase of undecided voters, although candidates 2 or 3 may gain some ground. This effect is best exemplified by the right column: with no shock, Candidate 1 wins 70% of the time (at 0.18 seed proportion) or 100% of the time (at 0.20 seed proportion or higher).

Yet, a shock in either direction changes the dynamic. A positive shock for Candidate 1 increases their winning percentage to 90% at 0.18 seed proportion, while a negative shock decreases their winning percentage to 50%. The beneficiaries of the negative shock are Candidate 3 (from winning zero percent of the time to winning 10% of the time) and undecided (from 20% to 30%). In the event that multiple thresholds are met, the algorithm implements a bandwagon effect, shifting the preference toward Candidate 1 if the threshold for positive shock, and away from candidate 1 in the case of negative shock.

The results in Figure 2 demonstrate the possible effects of a scandal (negative shock) or a strong fundraising report (positive shock). In these situations, the thresholds are adjusted for only one candidate as these events directly envelop that one campaign. The other candidates are indirectly affected by these shocks inasmuch as they can take advantage of Candidate 1's miscue or mitigate Candidate 1's success.

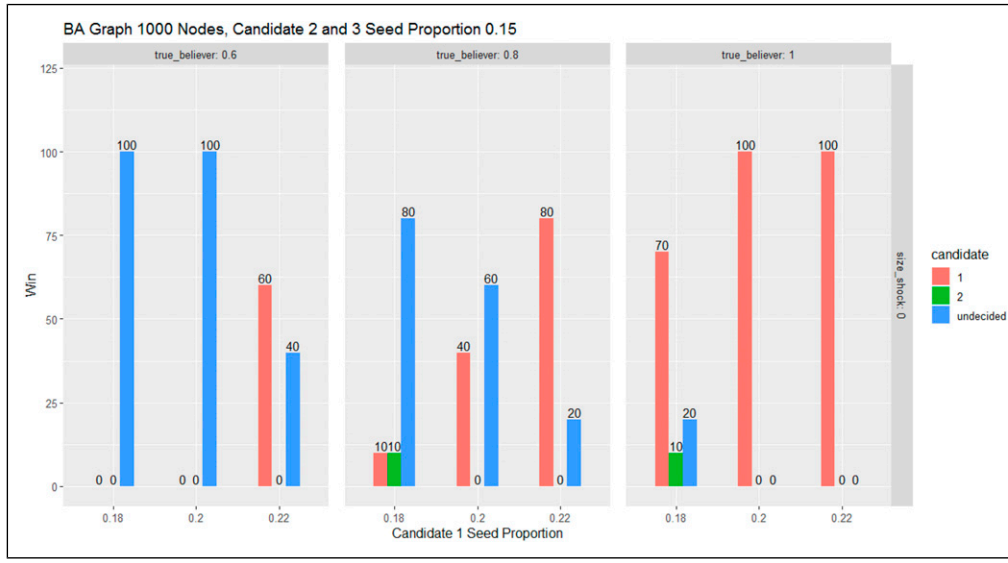

Figure 1. Voter threshold model.

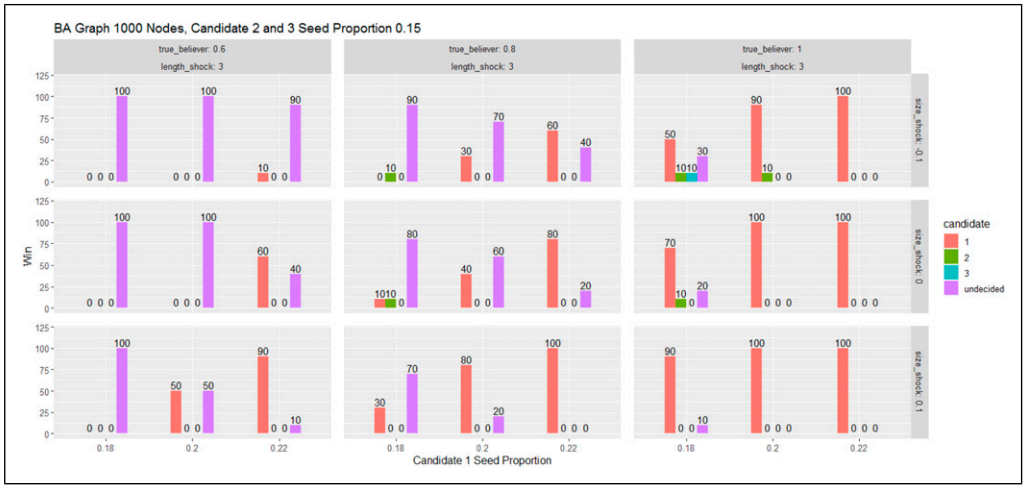

Figure 2. Effect of shock on voter preference.

Of course, not all shocks occur independently from one another. In a debate, one candidate may experience success while another struggles. We consider such a situation in Figure 3, where Candidate 1 received a negative shock and Candidate 2 was given a correspondingly positive shock, meaning the thresholds for Candidate 1 were increased and those for Candidate 2 decreased. This variation results in a shift of voter preference to Candidate 2 in the case of negative shock, while little impact is observed with positive shock. Shock length was also varied, with longer intervals resulting as expected, shifting preference away from Candidate 1 with negative shock and toward Candidate 1 with positive shock. This happens in all three columns, but again, note the far right column: A positive shock for Candidate 1 increases their winning percentage (at 0.18 seed proportion) from 50% to 86%. Also note that under a negative shock, Candidate 1 does not see much change in their winning percentage (50% to 52%), but Candidate 2's winning percentage increases from two percent to 12%.

Broad Empirical Test

We next move to a broad empirical test of our hypothesis that shocks affect the state of a presidential pre-primary period. Before getting into the methodological details, we first lay out an important caveat. We do not yet have network-specific data complete with nodes and shocks. Instead, we take a general approach that focuses on aggregate-level candidate support (see Swearingen et al., 2019). We still expect to see shocks, but instead of being within an individual's network and being realized by a network's level of support for a candidate, the shocks are seen in a candidate's overall standing in the race. For example, a candidate who has raised significant money at the fundraising deadline might reduce thresholds and result in greater support for that candidate within a network while also resulting in higher support for the same candidate overall.

To test this, we examine major-party candidate pre-primary polling support by week from 2008 to 2020 as measured by realclearpolitics.com. Using a pooled cross-sectional time series model (with the PLM package in R 4.0.0), we regress polling support with a variety of explanatory variables that are associated with broad support: media attention[1], fundraising[2], endorsements[3], and public attention[4]. Since there is a temporal dynamic involved with shocks—they may not be felt immediately—we include one-week lags for each of these four variables.

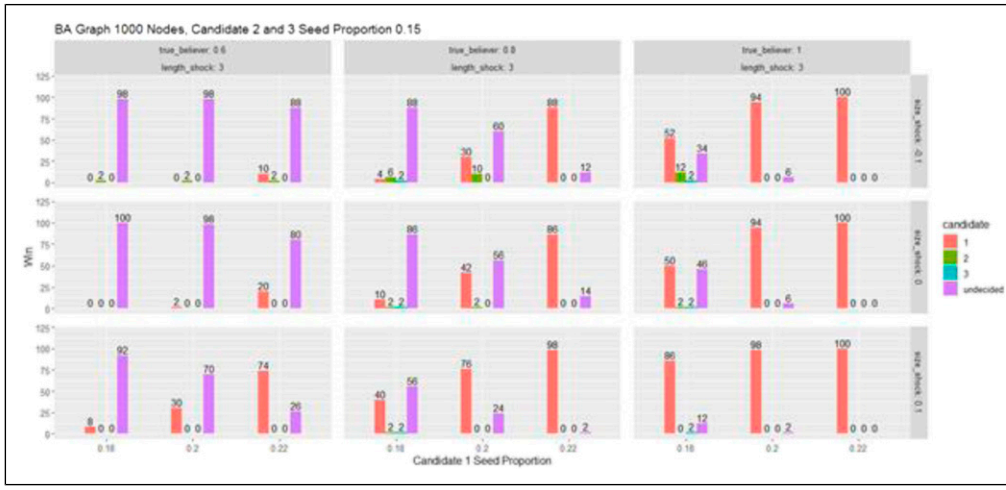

Figure 3. Inverse directional shock on candidate 2.

Table 1 provides partial coefficients for the variables of three models. Model 1 includes only the four key variables detailed above; Model 2 adds a one-week lag for each; Model 3 incorporates an interaction between donations and the FEC filing deadline. The F-statistic indicates an overall level of statistical significance for each ($p < .001$). Due to the presence of heteroskedasticity in all three models, robust standard errors are included. Because of the lagged variables, the *n* decreases from 2813 in Model 1 to 2731 in Models 2 and 3.

The results of Model 1 suggest that three of the four broad measures of shocks are statistically significant factors of a candidate's weekly polling numbers. Media attention, public attention, and

Table 1. Factors affecting candidate polling support, by week, 2008–2020.

	Model 1	Model 2	Model 3
Elite-Driven measures			
Share of endorsements	0.05 (0.03)	0.04 (0.06)	0.04 (0.03)
Share of endorsements (lagged)	—	0.14* (0.06)	0.09*** (0.02)
Share of media attention	0.11*** (0.01)	0.05 (0.04)	0.01 (0.02)
Share of media attention (lagged)	—	0.09 (0.05)	0.01 (0.01)
Public-Driven measures			
Share of public attention	0.08*** (0.01)	0.05*** (0.01)	0.02* (0.01)
Share of public attention (lagged)	—	0.07*** (0.02)	0.03** (0.01)
Donations ($100,000)	0.03*** (0.01)	0.02** (0.01)	0.002 (0.004)
Donations (lagged)	—	0.03*** (0.01)	0.01* (0.003)
Other			
Polling (lagged)	—	—	0.77*** (0.01)
Adj. R^2	0.10	0.16	0.68
F	95.55***	77.93***	654.21***
Breusch–Pagan test	573.2***	512.4***	36.63**
N	2813	2731	2730

Dependent variable is a candidate's weekly polling support. Robust standard errors used.
***$p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

donations are positive and statistically significant, while endorsements are not significant (although $p < .1$). Despite three of the four variables reaching statistical significance, they do not share equal substantive significance. For media attention, the average candidate received just over three television media mentions in a week (Table 2). Multiplying this by the partial coefficient (0.11) suggests that the typical candidate is expected to gain roughly one-third of a percent in a given week. But what about a candidate that gets considerably more attention than the typical candidate? A candidate in the top five percent of media mentions is expected to add 1.57% to their poll standing. The substantive effect of public attention is even greater: a candidate at two standard deviations above the mean is expected to add 2.59% to their weekly polling share. Candidates raising two standard deviations more than the average candidate are expected to add one-quarter of a percent to their polling.

Models 2 and 3 add more nuance to the original model. Model 2 adds lagged indicators (1 week) for the explanatory variables. Substantively speaking, the expected effects of the lagged variables are similar to the unlagged variables in Model 1, except that media attention is no longer statistically significant. That is, candidates with exceptional public attention are expected to receive nearly an additional two percent. Candidates with a significant bump in fundraising are expected to receive an additional one-quarter of a percent in polling support. Finally, unlike in Model 1, the lagged number of endorsement points is significant: the typical candidate is expected to receive a 0.14% boost, but those that receive a spike in endorsement points are expected to add 0.65% in polling support.

Model 3 includes a lagged polling indicator, since it makes sense to expect a candidate's share of the polling in a given week to be at least partially explained by their previous week's polling. Indeed, we see that this is the case, as a candidate is expected to receive about 77% of their previous week's support, *ceteris paribus*. Adding the polling lag also increases the adjusted R-squared from the previous models (0.68). Like Model 2, the lagged indicators are statistically significant, except for media attention. Substantively, candidates who receive a significant influx of endorsements are expected to increase their polling support by 0.42%; those with a similar rise in public attention are expected to gain just under one percent in the polls; and those with a spike in fundraising are expected to gain less than 0.1% in the polls for each $100,000 they bring in to their campaign.

Discussion

Taken collectively, the results from these models suggest that shocks can change a candidate's polling position. Those who receive a significant increase in money, media attention, and public

Table 2. Descriptive statistics.

Variable	Mean	Median	Std. Deviation	Minimum	Maximum
Polling	**7.11**	**2.2**	**11.14**	**0**	**64**
Polling (lag)	**7.13**	**2.3**	**11.17**	**0**	**64**
Public attention	**7.32**	**2.0**	**12.53**	**0**	**100**
Public attention (lag)	**6.95**	**2.0**	**11.35**	**0**	**100**
Endorsements	**0.46**	**0**	**2.08**	**−1**	**33**
Endorsements (lag)	**0.46**	**0**	**2.09**	**−1**	**33**
Media attention	**3.18**	**1.0**	**5.54**	**0**	**48**
Media attention (lag)	**3.03**	**1.0**	**5.16**	**0**	**48**
Donations ($100k)	**5.66**	**1.40**	**1.42**	**−0.05**	**289.33**
Donations ($100k) (lag)	**5.51**	**1.42**	**1.35**	**0**	**289.33**

All monetary figures are adjusted for inflation (2016 dollars).

attention are expected to increase their share of polling. Moreover, it is possible that these shocks do not occur immediately, but over a span of a week or two. Broadly speaking, this implies that there is hope for candidates who start the pre-primary period with low polling numbers. One textbook example of a shock during the invisible primary is when California Senator Kamala Harris confronted former Vice President Joe Biden about busing during a Democratic primary debate in June, 2019. Prior to that moment, Senator Harris's public attention was consistently less than 10% of the field's peak and her polling was around seven percent. In the immediate aftermath of that exchange, however, her attention spiked at 59% of the field's peak and her polling doubled. While her success in garnering public attention and polling support waned in subsequent weeks, this example illustrates the concept of shocks used in this manuscript.

Conclusion

Shocks matter in the invisible primary. A positive shock for a candidate increases their winning percentage. This is particularly true for the frontrunner, as they can effectively shut the door on their competitors during this time frame if these types of shock are present. This is consistent with previous literature from Aldrich (2009), who argues that if a candidate can move first in the Invisible Primary, they can get 15–20% of the vote and seem unbeatable to the opposition.

Negative shocks are a slightly different story. Our findings suggest that the frontrunner can survive negative shocks - a disappointing debate, fundraising quarter, gaffe, or perhaps even a scandal. This is evidenced by Candidate 1 still winning roughly half the time even at 0.18 seed proportion (in both Figures 2 and 3). Yet, our findings underscore a nagging truth of presidential primaries: it is very difficult to overcome the frontrunner. They can afford a slip up or two, Whether a bad fundraising quarter, or a bad debate performance. Why? In part it is because shocks tend to be short-term events that die off over time; other stories soon surpass the negative shock in salience. In addition, the negative shock may simply move voters to being undecided rather than supporting another candidate. Note that in Figure 2, when a negative shock for Candidate 1 occurs, the winning percentage increases for Candidate 3 and the undecideds. In Figure 3, Candidate 2 is aided by a corresponding positive shock (for instance, Candidate 2 had a stellar debate performance at the expense of Candidate 1).

Finally, our broad empirical examination suggests that shocks, operationalized as an increase in attention on a campaign, can increase a candidate's standing in the polls. However, it is important to note that this effect is limited to public attention and not media attention. While further analysis needs to be conducted, this finding suggests that candidate success is more public-driven than elite-driven. An increase in public attention is associated with a larger increase in support than either media attention or elite endorsements. In an era with large candidate fields and an emphasis on small-dollar donations, this finding could have large implications for the immediate future of presidential primary campaigns.

This paper extends important research into social networks and presidential primaries, but still has its limitations. Our goal is to simulate the real possibilities of a presidential primary campaign and there is still work to be done. Further research should address both the external and internal dynamics of social networks. For instance, how do underdog candidates emerge as viable threats to the frontrunner? We see this happen repeatedly during presidential primaries, such as Bernie Sanders' upstart campaign in 2016 or Rick Santorum's in 2012. What about activist endorsements within a social network? In an era of social media influencers, how do prominent individuals signal support and maximize their influence?

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(1) Media attention is measured as a candidate's number of TV news mentions. The data comes from the Vanderbilt TV News Archives.

(2) Fundraising is measured as a candidate's fundraising receipts from the given week, in 2016 dollars. Donations and loans from the candidate are not included. The data comes from the FEC.

(3) Endorsements are measured as a candidate's total endorsement points in a given week. Since not all endorsements are equal, we weight them differently, where gubernatorial endorsements are worth 10 points, senatorial endorsements are worth five points, and House member endorsements are worth one point. Data for 2016 comes from fivethirtyeight.com, while the data for 2008 and 2012 come from Democracy in Action.

(4) Public attention is measured as a candidate's share of the Google Trends score vis-à-vis their direct opponents (Ripberger, 2011). The candidate in the race with the highest number of Google searches during the invisible primary has a score of 100; all other weekly scores are standardized to that share. See Swearingen et al. (2019) for more details on this measure.

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