

The Negativity News Cycle: The Empirical Relationship Between News Media and Political Advertising*

Paul B. Ellickson, Simon Business School, University of Rochester

Mitchell J. Lovett, Simon Business School, University of Rochester

Ron Shachar, Arison School of Business, Interdisciplinary Center †

November 2019

Abstract

Negative campaign advertising and aggressive news media coverage are now dominant features of the U.S. political landscape. We empirically examine the interaction between news media coverage and campaign decisions to go positive (speaking only about themselves) or negative (speaking also about the opponent) in their advertising. Using data from the U.S. House of Representatives elections of 2000, 2002, and 2004 covering 498 races over the 70 days leading up to election day, we provide evidence of a negativity news cycle in which the news media and candidates push each other toward negativity. We find that the media amplifies negative advertising more than positive. News media coverage intensifies in response to candidate negativity, and candidates go more negative in response to an increase in media coverage. Candidates also respond to one another's shifts toward negativity, but not toward positivity, and only do so when media coverage is intense. Finally, we explore forces that limit the negativity news cycles and show that ad tone exhibits assortative matching, persistence, and diminished negativity at the end of the race.

Keywords: Advertising, Politics, News Coverage, Earned Media, Competition, Dynamics, Panel Data

*We thank Wes Hartmann and the attendees of seminars at Ben Gurion University and Tel Aviv University as well as at sessions at the Marketing Science Conference, Marketing Dynamics Conference, and the IVth Conference on the Economics of Advertising for helpful comments and suggestions. Ron Shachar acknowledges partial support from the Israel Science Foundation number 1495/12.

†Paul B. Ellickson is the Michael and Diane Jones Professor of Marketing and Economics, at the Simon Business School, 500 Wilson Blvd., NY, 14627, tel: (585) 273-1491, paul.ellickson@simon.rochester.edu. Mitchell J. Lovett is an Associate Professor of Marketing at the Simon Business School, 500 Wilson Blvd., NY, 14627, tel: (585) 276-4020, mitch.lovett@simon.rochester.edu. Ron Shachar is a Professor at Arison School of Business, Israel, tel: +97299602408, ronshachar@idc.ac.il.

1 Introduction

Negative campaign advertising and aggressive news media coverage are now dominant features of the U.S. political landscape. Over the past two decades, negative advertising has grown to become the dominant tone of political advertising (Fowler, Franz, and Ridout 2016).¹ At the same time, candidates have increasingly leveraged free or “earned” news media coverage in amplifying their negative attacks. Donald Trump’s 2016 campaign is the most notorious example of the latter (Confessore and Yourish 2016), though it has clear antecedents in the earlier “Swiftboat” ads, which targeted John Kerry but garnered large amounts of news media coverage that rebroadcast the ad and its message repeatedly (Romano and Vandehei 2004). It is estimated that then-candidate Trump in 2016 leveraged news media coverage of his attacks to generate a dramatic \$2 billion in free media coverage (Confessore and Yourish 2016). These anecdotes are suggestive of an important interaction between these two dominant features of political campaigns.

In this study, we empirically examine the interaction between news media coverage and campaign decisions to go positive (speaking only about themselves) or negative (speaking also about the opponent) in their advertising. We find evidence of a negativity news cycle in which the news media and candidates push each other toward negativity. The cycle is characterized by the actions of the news media (covering the race more intensely) and candidates (choosing to go negative) mutually reinforcing each other to produce persistent negativity. The reinforcement is founded in the news media’s strong preference for amplifying negative advertising as opposed to positive and operates through two feedback loops. First, the news media coverage intensifies in response to candidate negativity and candidates go more negative in response to an increase in media coverage. Thus, the news media is directly involved in the first feedback loop between news media and candidate negativity. Second,

¹Political advertising is estimated to have been at least 70% negative in the 2010 Congressional races and as much as 90% negative in the 2012 U.S. presidential race. See <http://www.washingtonpost.com/wp-srv/special/politics/track-presidential-campaign-ads-2012/> downloaded on July 10, 2014 for the Presidential data and <http://mediaproject.wesleyan.edu/2010/11/01/an-uptick-in-negativity/> downloaded on the same date for congressional.

candidates respond to one another's shifts toward negativity, but not shifts toward positivity. Importantly, this asymmetric reaction only occurs when the news media is paying close attention to the race. Thus, the news media facilitates the second feedback loop (between the two rivals' negativity).

We study the way that news media coverage shapes the negativity of advertising in the context of congressional races for the U.S. House of Representatives in 2000, 2002, and 2004. These races allow us to provide a systematic examination of many repetitions of campaigns and, as a result, leverage variation in the intensity of media coverage and the candidates' decisions to go negative. We collect data related to 498 candidates' advertising campaigns across 249 races over the 70 days leading up to the election. We present a series of analyses that document the foundational features and mutual reinforcement that underpin the negativity news cycle. We then explore the impact of forces that could limit these feedback cycles. We evaluate how these mitigating forces balance against the drivers of the cycle to characterize data patterns that arise in equilibrium. We then examine whether these data patterns have empirical analogues in our setting.

We begin by considering two foundational features of the negativity news cycle that to our knowledge have not previously been documented. First, we examine the detailed content of more than 1000 news articles and establish that news coverage of campaign ads is heavily biased towards echoing negative advertising. This slanted coverage means that, when the news media coverage is attending to the race, the messages in negative ads are rebroadcast at a much higher rate than positive ads. We then show that news media coverage increases following a shift toward negative advertising by at least one of the campaigns, but that no such increase in attention follows a shift toward positive advertising. Thus, news media attention and coverage is slanted toward negative advertising. These features establish one direction of the feedback loop between media and unilateral candidate tone choices.

We then turn to the other direction of this feedback cycle—candidate reaction to the news media. We provide both descriptive and causal evidence that campaigns intensify their

negativity in response to higher media attention. We leverage the media holding company ownership of local newspapers to make our strongest causal claims. Changes in such ownership can lead to changes in the editorial policies governing the newspapers' news coverage. These editorial policies can either encourage sensationalist coverage to attract an audience or discourage political coverage to avoid alienating the audience, two sources of exogenous variation. We use media ownership changes (and the implied editorial policies) as an instrument to identify the effect of news media coverage on the negativity of campaigns. Because news media attend to negative ads more than positive, this slanted amplification should generate an incentive for campaigns to go negative when news media coverage intensifies. Our analysis reveals that campaigns do respond to higher news media coverage with higher rates of negativity. This finding completes the first feedback loop that is between the news media coverage and candidate negativity, and it establishes a direct role of media in shaping candidate negativity.

This direct role of media leads candidates, independent of one another, to respond to higher media coverage by going more negative. We next examine whether candidates respond to one another's shifts toward negativity or positivity and whether the news media plays an indirect role in these candidate interactions. We first evaluate whether candidates are more likely to go negative in response to their opponent going negative than they would be otherwise. The data indicate a significant relationship for the reaction to a rival's shift toward negative ads, but not for a corresponding shift positive. Hence, candidate reactions are asymmetric and occur only for shifts toward negativity. This result suggests that an aggressive action increases the marginal value of an aggressive *reaction*, but that accommodation does not beget accommodation.

We then evaluate two potential roles that the news media might play in this candidate interaction. First, we examine whether the previously described direct role of the news media can explain away the candidate interaction. Such an explanation is plausible because media coverage could lead *both* candidates to go negative, generating a spurious correlation

between candidate actions. However, we find that, even after controlling for the direct effect of news media coverage, candidate interactions remain significant. Second, we examine an indirect role for news media by testing whether the strength of the candidate interaction depends on the intensity of media coverage. We find that without news media coverage, there is no evidence that candidates react to one another's tone changes at all. Yet, with media coverage, the candidate interaction is strong, doubling the propensity for candidates to go negative. This suggests that the news media plays two pivotal roles—a direct role that increases the unilateral benefit of going negative creating a feedback loop between the media and candidates, and an indirect role where the news media opens a second feedback loop between the candidates themselves.

These two feedback loops form the key drivers of the negativity news cycle. We next examine offsetting forces that could mitigate the mutually reinforcing cycle. We consider three such mitigating forces related to the finite length of the race, limited negative content, and incentives for candidates to strategically delay the use of that negative content. We provide intuitive arguments and (in a web appendix) a theory model demonstrating that, when considering this balance, a negativity news cycle can produce equilibrium ad tone decisions with three additional salient features. First, negativity news cycles should lead candidates to match tones more often than not, leading to assortative matching in strategies. We examine the data and indeed find that candidates share the same tone more often than not. Second, the candidates should persist longer when both are negative than for other ad tone strategy pairs (e.g., positive-positive or positive-negative). We find that the average length of spans when both campaigns go negative is significantly longer than any other ad tone strategy pair and that the level of period to period persistence when candidates both go negative is higher than other ad tone strategy pairs. Third, in some circumstances the negativity news cycle leads candidates to be incentivized to use, and possibly use up, their best negative content during a negativity news cycle. These incentives results from the direct or indirect role of media amplification of messages that could include pressure to respond

to opponents during an extended exchange. Such exchanges lead to the possibility that candidates could run out of negative content towards the end of the race. Consistent with this possibility, we find that despite a slow and long march upward during the bulk of the campaign, negativity actually declines at the end of some races, enough that a statistically distinguishable decline is apparent. Thus, ad tone exhibits assortative matching, persistence, and diminished negativity at the end of the race, all of which are consistent with equilibrium behaviors in a world of negativity news cycles.

Our results portray a world in which news media coverage plays an important role in shaping the tone choices of campaigns. We argue that this role is fundamentally about rebroadcasting and magnifying the effects of the messages contained in negative advertisements. Our investigation focuses on congressional races, where many repetitions exist, but, given recent events, our conclusions seem likely to hold in Presidential contests as well. It is also possible that the kinds of dynamics we demonstrate in this paper also apply to social media, an increasingly important feature of modern political campaigns.

This work relates to the literature on negative political advertising. While several studies have examined the effect of negative advertising on voters (Che et al. 2007; Wang, Schweidel, and Lewis 2018; Gordon, Lovett, Luo, and Reeder 2019), very few studies, particularly empirical ones, focus on candidates' decisions to go-negative and the factors that affect these choices. The exceptions are on factors such as front-runner status (Harrington and Hess 1996, Skaperdas and Grofman 1995, and Theilman and Wilhite 1998), the quality of the candidates (Polborn and Yi 2006 and Hao and Li 2013), the incumbency status (Kahn and Kenney 1999), and prior knowledge of the candidates and the budget allocated for advertising (Lovett and Shachar 2011). In contrast, here we focus on the role of media in shaping tone decisions.

Because we study how advertising can shape news media coverage, this study is also related to the marketing literature on paid and earned media (Stephen and Galak 2012; Lovett and Staelin 2016) and their interaction (Lovett, Peres, Xu 2019). In particular, our

finding that negative advertising leads to greater news media coverage, but that the same is not true for positive advertising, suggests that incorporating content differences in the study of paid and earned media is critical. Content differences in advertising has been a recent area of interest (Anderson and Renault 2006, Mayzlin and Shin 2011, Kuksov, Shachar and Wang 2013, Anderson et al., 2016; Liaukonyte, Teixeira, and Wilbur 2015).

The structure of the paper is as follows. We introduce the data and setting in section 2. We turn to foundational assumptions of how news media cover campaigns in section 3. In section 4, we examine the campaign reaction to increased news media coverage. In section 5, we take up candidate reactions to one another in negativity and the role that media plays in these interactions. In section 6, we discuss equilibrium behaviors implied by the negativity news cycle. Section 7 concludes.

2 Data and Setting

Our analysis focuses on U.S. Congressional (House of Representatives) races held in three election years: 2000, 2002, and 2004. Because our focus is on political advertising, we set the timeframe of our analysis to be the 70 days leading up to Election Day (Labor Day is the traditional kickoff point for electoral advertising campaigns). To simplify the analysis, we include only those races with two major parties that also each advertise on at least one day in the 70 day period. This results in 249 races and 498 candidate/campaign level observations.

We develop the data used in our analyses from multiple sources. The two main data series relate to advertising and media coverage pertinent to each election. We also introduce a range of other measures which are primarily used as controls.

2.1 Advertising Data

To capture the strategic tone of advertising decisions, we assemble a dataset of daily, candidate-level ad choices, coded by tone. The main advertising data consist of daily time series tracking

each candidate over our 70 day sample frame. The data are based on a methodology developed by the Campaign Media Analysis Group (CMAG) that records every ad on broadcast TV and some cable channels in a storyboard format. The CMAG data include advertising for all candidates in the races taking place in the top 75 Nielsen designated media areas (DMAs) in 2000 and the top 100 DMAs in 2002 and 2004.

The raw CMAG data contain thousands of unique advertisements. This information is coded by the Wisconsin Advertising Project (WAP) along various dimensions. Central to our study, the data include information on who the ad supports, when it was aired, and what tone it took. The original tone categories are “promote,” “attack,” and “contrast.” We follow the prior literature (Lovett and Shachar 2011) and code each ad as either negative (contrast or attack, to reflect at least some discussion of the opponent) or positive (promote).

Candidates do not always advertise, especially at the beginning of the election cycle. In particular, while candidates show no ads 53% of the time, 85% of these ad-free days occur before the candidate airs their first ad of the campaign. After airing the first ad, days without ads are infrequent (only 15% of days). For our empirical analyses, we treat the tone on these empty days as matching the prior active tone.² Candidates sometimes also show more than one ad creative. For example, on 25% of days the candidate airs both some positive and some negative ads. To handle all cases, we aggregate within day, treating candidates as having three possible strategic positions when airing at least one ad: positive (all positive ads), negative (all negative ads), or mixed (some positive and some negative ads). We note that the composition of ads within days that are mixed is tilted towards negative (60 percent negative), and that of all days on which a candidate airs an ad, 41 percent are only positive ads, 30 percent only negative, and 29 percent mixed.

²In particular, for the analysis in subsection 5.2 we need to code the tone for any day after the first ad was aired. For days without ads we assumed that the tone remained as in the last advertising day. We have tested robustness against alternative approaches (e.g. dropping cases with no advertising) and find qualitatively similar results.

2.2 Data on News Media Coverage of Candidates

To quantify the degree of media attention focused on a given race (and/or candidate), we assemble a dataset of news articles (print or digital) that discuss the race and/or its participants. To do so, we collected a count of the number of articles about each candidate on each day of the race in the 70 days leading up to the election date using the search functionality of newslibrary.com. This web-based resource includes detailed news data from local newspapers, which represent a significant part of the media coverage for U.S. House Races. Using a variety of queries, we recorded the total number of articles in local newspapers pertaining to each candidate on a given day.³

Although we collect candidate specific measures of media coverage, we also develop race level measures for reasons that will become clearer later. To distinguish periods of higher media coverage from lower (within races), we construct a binary variable termed *media high* that is equal to one when media coverage is in the highest quartile for that race. This variable then provides a within-race metric capturing periods of intense media attention.

2.3 Data on Media Holding Companies

A clear threat to identification of the distinct channels through which the negativity news cycle operates is the (implicit) simultaneous equation system that underlies it. To address the resulting endogeneity concern, we leverage the ownership structure of media holding companies as a potential source of exogenous variation in coverage due to shared editorial policies. In this section, we briefly describe the data on ownership, and in section 4 we discuss the construction of the instruments based on this measure that operate theoretically through the editorial policies that shape coverage.

In the United States, a small number of large media holding companies own a large proportion of local newspapers. We collect information about the structure of these media holding

³To bolster the precision of our measure (i.e., to ensure all relevant articles are included) we used various alternative spellings for each candidate in the search tool.

companies from historical information drawn from news articles and websites. We examine the top eleven media holding companies, which include Gannet, CNHI, Lee Enterprises, Ogden, Boone, Landmark, Paxton, Knight Ridder, News Media Corp, Hearst Newspapers, and Pulitzer, Inc. For each entity, we identify the districts that are covered by the newspapers owned by the media holding company. Some districts have multiple newspapers held by one or more media holding companies. We treat any district that has a newspaper held by a media holding company as potentially under an editorial policy due to that media company. Of the 249 races we study, 147 are covered by at least one newspaper controlled by a media holding company.

2.4 Other measures

In some analyses, we also include controls for geographic differences, demographic composition, and candidate characteristics across races. The list of control variables includes race (percent white in congressional district), education (percent bachelors degree or higher in district), income (mean household income in district), closeness of the race (close or not prior to 70 days before election), election year (off election year or not), incumbency status (incumbent or open seat), frontrunner status (frontrunner or not prior to 70 days before election), party (Republican or not), and whether the candidate faced the same opponent previously (same opponent or not). All but two of these variables are constructed based on publicly available information from the U.S. census and federal election commission. The closeness and frontrunner measures use the congressional scorecard from the Cook’s Political Report.⁴

Beyond these measures, we engage in an additional data collection effort related to the slant in media coverage about advertising. The related additional measures are detailed below.

⁴This scorecard (used in previous research) provides an indicator of both the closeness and which party is ahead. We use the last scorecard available prior to the 70 days before the election date. The closeness measure is coded so that if Cook’s Political Report rates a race as a “Toss-up,” we code it as close, otherwise not close.

2.5 Temporal Patterns of Negativity and Media Attention

In lieu of presenting overall summary statistics, we begin by exploring some of the basic patterns in the time series and cross sectional dimensions of the electoral data. Starting with the temporal components, we first examine how candidate negativity and news media coverage co-vary over the 70 days leading up to each election. The left panel of Figure 1 presents the proportion of days that are negative or mixed (i.e., contain at least one negative ad). Two aspects of this time series stand out. First, the clear overall trend progresses steadily from low to high. Campaigns generally start on a positive note, but become more and more negative as the election nears. This finding is consistent with Goldstein and Freedman (2002). Second, the upward trend appears to flatten at the end, perhaps even reversing course. We return to this inflection in section 6.4. For now, we simply draw attention to the steady growth of negativity over the cycle.

Turning to the temporal pattern of media coverage, the right panel of Figure 1 presents the time series for daily (black solid line) and weekly (red dotted line) news media coverage averaged across races. As with negativity, news media coverage clearly increases over time, though with a more marked acceleration in the last twenty days of the contest.⁵ Thus, the basic time series patterns suggest that media coverage and candidate negativity are at least correlated, though this conclusion is not yet causal. We later evaluate this relationship in more detail to establish the ordering and causal pathways.

Finally, the time pattern of news media coverage also reveals substantial daily variation even after averaging across races. We will return to these intra-week patterns in section 4.

In Figure 2, we present one selected race to illustrate the within-race, over-time pattern in negativity and media coverage. From this example, we can see that both candidates ‘went negative’ for much of the race, interrupted by shorter periods of asymmetry (beyond the initial positive period). Further, each negativity cycle was initiated in close proximity to an

⁵Since the focus of our study and analysis is on time-variation within a campaign, we scale the media coverage measure (for each race) by the total number of articles about the two candidates over the full 70 days before the election. This approach (a) focuses on daily variation in news coverage, and (b) eliminates race specific effects in media coverage.

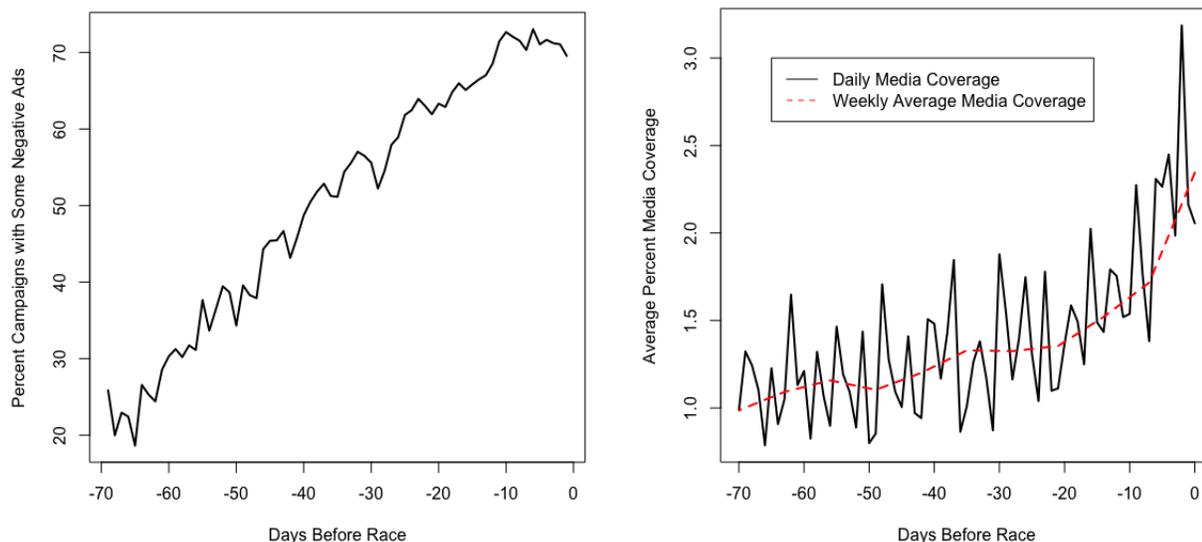


Figure 1: Time patterns in advertising negativity and news media coverage. Left panel contains average percent of campaigns with at least one negative ad on the day. Right panel contains average daily (black solid line) and weekly (red dotted line) news media coverage. Day 0 is election day.

increase in media coverage. Although this pattern is not intended to be fully representative of other races (our empirical analyses that follow include the complete set of races), this illustration is suggestive of the kind of role that news media coverage might play.

2.6 Cross-sectional Aspects

Another way to slice the data is to focus on the overall level of negativity in each race as it relates to the quantity of media coverage. As noted above, we view media ownership as a plausibly exogenous source of variation in media coverage, providing a potential path through which to unpack this complex relationship. Following Arnold (2006), we argue that, independent of the specific conditions of individual congressional races, some newspapers focus more intensely on conflict-oriented political coverage than others and, even among those who are interested in such coverage, variation exists in the negativity of that coverage. The role of media holding companies in driving coverage can manifest itself in various ways.

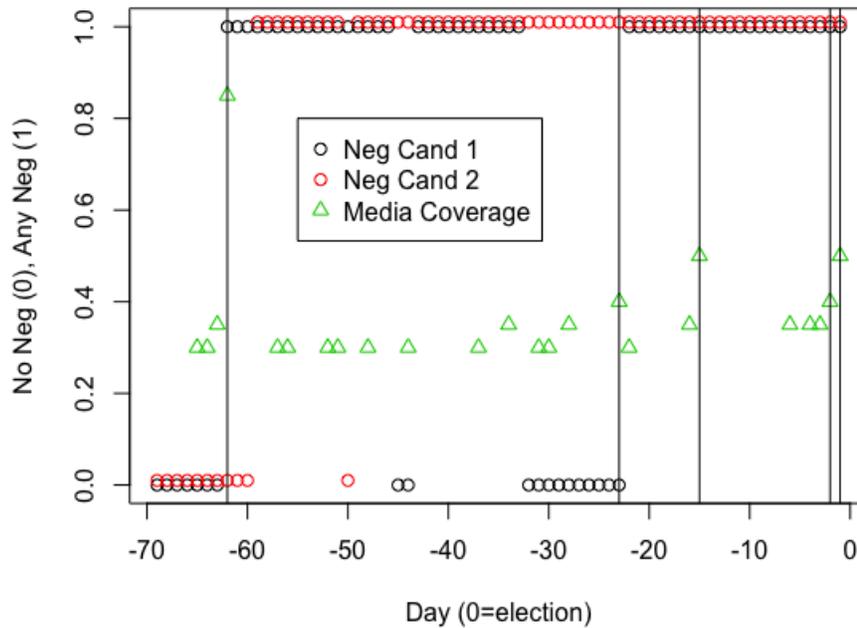


Figure 2: Time pattern of negativity and media coverage for selected race (2000 FL District 8). Circles represent candidate tone choice. Vertical lines represent very intense news media coverage. Triangles indicate relative intensity of news media coverage.

First, for operational reasons (e.g. lowering costs) media conglomerates may centralize some of the news reporting, and, as a result, leave relatively little space for local news, including local political news. This would lead to lower attention to the political campaigns in the districts they cover. Second, some of these holding companies project an overall editorial policy on the newspapers that they own. Consider, for example, the sensationalist focus of newspapers in the Murdoch portfolio. Indeed, Eshbaugh-Soha (2010) find that the tone of local newspaper coverage of presidential races depends on the corporate ownership.

If ownership materially impacts race coverage, then candidates should respond to these tendencies by using more or less negative ads to take advantage of the amplification this coverage would provide. In this case, we should find that overall race negativity varies based on media ownership patterns, or more generally, that media ownership is a significant predictor of overall tone. To explore this possibility, we run a regression on the average

negativity of advertising (as a fraction of overall expenditures) using the newspaper holding company ownership structure as the focal explanatory variable. We include district and year fixed effects and also control for closeness. Even with these controls, the average negativity of advertising varies greatly across holding companies ranging from 55.7% to 35.3%. The media holding company dummies lead to a significant increase in model fit ($\chi^2 = 16.3$, p-value < .05) and despite noisy estimates for the individual media holding company dummies, some differences are significant, such as between the highest and lowest coefficients ($\chi^2 = 10.4$, p-value < .01). This evidence suggests that the editorial policies about political coverage that are reflected in media ownership play a meaningful role in the negativity choices of candidates. This surprising result provides new evidence on the role of media ownership and initial support for news media’s inclusion in the negativity cycle.

3 The Role of Media: Volume and Slant

Having provided some initial suggestive evidence of a role for media, we now aim to establish two key features of media coverage that enable this role. First, we show that media attention increases when races turn more negative; volume follows tone. Second, we show that media outlets selectively amplify negative messages more than positive ones. Later, we establish that this selective amplification has important implications for the strategic interaction between rival candidates: media provides the link that perpetuates the cycle of negativity. To the best of our knowledge these aspects of media behavior have not received a systematic statistical investigation in the extant literature.⁶

⁶While multiple authors have speculated on the role of media, e.g., Haynes and Rhine (1998) and Geer (2012), West (2018) appears to be the closest and evaluates the negativity of TV news coverage of presidential advertising on *CBS Evening News* from 1972 to 2008. He found that 66% of the ads discussed were negative and argues the bias could arise from media focusing on the “horse-race” instead of the substantive policy issues.

3.1 Candidate Negativity Drives Media Attention

Central to our conception of the negativity news cycle is the notion that media attention is triggered by conflict. Aggressive behavior by one candidate creates a compelling narrative that is further fueled by rival reaction. Here we examine the first part of this cycle: media attention. In particular, we look at whether media coverage is higher after at least one of the candidates shifts toward negative advertising.⁷ In order to cover both tone choices, and draw attention to a key asymmetry, the analysis also includes cases in which one of the candidates shifts toward positive advertising, as explained below.

Since we are interested in the news media reaction to a *change* in the tone of a campaign, we focus on cases where change is salient by conditioning on states in which rival tones initially match. In particular, consider cases in which, on day $d - 2$, the two candidates used the same tone (either positive or negative) and one day later, $d - 1$, at least one of them changed tone. If both candidates in $d - 2$ are positive then if either changes tone in $d - 1$, the race becomes negative. If both candidates are negative at $d - 2$, then if there is a change in tone at $d - 1$, the change is toward positive. Our dependent variable is the percent of race news media coverage on day d . Accordingly, our baseline independent variables are (i) Switch Negative, an indicator variable for the event that either candidate shifts negative on day $d - 1$, and (ii) Switch Positive, which indicates a shift toward positive on day $d - 1$. We also control for a time trend, day of week dummies (including an intercept) and estimate the coefficients from ordinary least squares. For this analysis, we have 5,216 three day sequences.

The results for the baseline (simplest) model are presented in the first column of Table 1. The positive and significant coefficient (0.24 with t-stat=2.84) on Switch Negative at $d - 1$ reveals that media attention indeed increases following a switch from positive to negative tone; this estimate is consistent with the news media responding to candidate shifts toward negativity. Notably, we also find that a switch in the opposite direction (from negative toward positive) is neither economically nor statistically significant.

⁷Note that Geer (2012) demonstrates a similar pattern with presidential election data.

In the remaining columns, we examine the media reaction to a switch toward negativity in the event that negativity either intensifies further (due to the other candidate also going negative) or softens (due to one or both candidates switching back to positive, i.e., not persisting in going negative). If negativity intensifies, we would expect media coverage to accelerate even more, and when it softens we expect it to increase less. In columns (2)-(4) we add to the model of column (1) indicators for the tone on day d . We will focus discussion on the Switching Negative cases, since no coefficients are significant for the Switching Positive cases.

We begin with cases where negativity softens. In column (2), the estimates indicate that when both candidates switch back to positive, the media coverage is lower as expected (-0.731 with t-stat=-2.15). In column (3) we break out the extent that candidates soften on negativity (one or both candidates switch back to positive). If both switch back to positive then the media coverage is markedly lower (-1.30 with t-stat=-3.11) than if only one player switches back to positive (-0.64 with t-stat=-2.34). Column (4) shows that when negativity deepens (both candidates go negative), the media coverage is much more likely to be intense (0.85 with t-stat 3.31). In all three columns, we also find the main role for the initial switch toward negativity (Switch Negative at $d-1$). Collecting these results together, we have shown that 1) media coverage responds rapidly to a campaign airing negative ads, 2) if the campaigns do not persist with the negativity, it is likely that the media coverage will not increase, and 3) if the other campaign also goes negative, the news media coverage is even more likely to intensify.

3.2 The Media Favors Candidate Negativity

We next examine whether the media amplifies negative messages more than positive. This investigation requires additional data on media content. We conducted a detailed manual data collection aimed at characterizing the tone of ads that newspapers articles cover.

Since this procedure was entirely novel to this study, we describe it here in some detail.

Table 1

| | <i>Dependent variable:</i> | | | |
|-------------------------|----------------------------|---------------------|----------------------|--------------------|
| | % of Race Media Coverage | | | |
| | (1) | (2) | (3) | (4) |
| Switch Negative at d-1 | 0.239*** (0.084) | 0.285*** (0.087) | 0.854*** (0.258) | 0.170* (0.089) |
| . . . And Both Pos at d | | -0.731** (0.340) | -1.301*** (0.418) | |
| . . . And One Pos at d | | | -0.638** (0.273) | |
| . . . And Both Neg at d | | | | 0.683** (0.272) |
| Switch Positive at d-1 | 0.033 (0.091) | 0.036 (0.095) | 0.356 (0.269) | -0.007 (0.096) |
| . . . And Both Neg at d | | -0.029 (0.295) | -0.349 (0.388) | |
| . . . And One Pos at d | | | -0.364 (0.286) | |
| . . . And Both Pos at d | | | | 0.363 (0.284) |
| Time Trend | Y | Y | Y | Y |
| Day of Week FE | Y | Y | Y | Y |
| Observations | 5,216 | 5,216 | 5,216 | 5,216 |
| R ² | 0.544 | 0.545 | 0.545 | 0.545 |
| Adjusted R ² | 0.543 | 0.543 | 0.544 | 0.544 |

Note:

*p<0.1; **p<0.05; ***p<0.01

To cleanly identify media mentions specifically about advertising, we focused attention on the 50 races in our overall sample that exhibited the most news media coverage. For each race we search newslibrary.com for local news articles that contain either of the candidates names and the term “ad*”, which nests additional terms like “advertising” and “advertisements”.⁸ Each such search produces an ordered list of articles for each race from which we randomly selected articles to examine manually. This random selection provides a representative sample that is feasible to analyze given the manual process that is required.

We start from a sample of 1119 articles across the 50 races. Two judges evaluated each of the articles. The evaluations involved classifying the article’s topic (e.g., about advertising) as well as measuring the main variable of interest—whether the article discussed advertising that mentioned the competition (i.e., exactly matching our definition of negative advertising). Out of all cases, these independent evaluations were in agreement 87.71% of the time. The discrepancies were then resolved by joint re-evaluation.

Part of the judgment related to whether the article was relevant to our study. Considerable effort was taken to avoid evaluating the tone of non-advertising content (e.g., a campaign speech) and to ensure that the evaluation was specifically about ads in that race (many articles cover multiple local races). Specifically, the articles were filtered for four conditions. First, that the article mentioned political advertising. Second, that the political advertising was on TV. Third, that the TV ads were aired by the candidates or the party (i.e., not independent groups or political action committees (PACs)). Fourth, that the TV ads could be identified as positive, negative, or both. We coded up to 10 articles per race that met these criteria. The minimum, median, and maximum number of articles used to evaluate tone per race are 1, 4, and 10, respectively. Through the selection process described above, our final sample includes 41 races and 197 articles.⁹

⁸We tried various alternative terms to add, and found the term “ad” provided a large degree of precision that other terms (e.g., “media”) did not, while avoiding too small of a sample (e.g., “advertisement”). We also found that most articles that covered advertising in a race mentioned both candidates.

⁹This number may appear small. Our filtering criteria are quite strict in the sense that we require the content of the articles to clearly indicate that they are about political advertising on TV by the candidate or party. There are many more articles that could be construed as about advertising, but we throw them out

Returning to the current empirical question (whether the media focuses on negative messaging), we construct two outcome variables for each race: (1) the percentage of articles about negative advertising (vs. positive advertising) out of all the ads that were covered by the news media, and (2) the proportion of total advertising spending by the two major parties that is spent on negative ads. The percent of advertising spending that is negative is calculated using the 70 days leading up to the election for each of the relevant races and comes from the CMAG/WAP advertising data. The two variables are positively and significantly correlated ($\rho = 0.34, p\text{-value} = 0.03$), providing face validity to our manual data collection effort.

Our main empirical exercise then examines whether the proportion of media coverage is slanted more toward negative messaging than the corresponding proportion of advertising. We prefer this relative comparison because it corrects for the overall tendency to use negative advertising in a race, and the fact that the races we select have high media coverage and also higher negativity. The relevant question is then whether the media promotes negative messages at *higher rates* than that at which they are broadcast by the *candidates themselves*. Figure 3 presents the average percentage of of ad spending that is negative on the x-axis and the average percentage of articles that mention ads that are negative (as opposed to positive) on the y-axis. In the figure it is easy to see that most races (the circles) fall above the 45 degree line. News media coverage is much higher for negative than positive advertisements even after controlling for the overall level of negativity. Aggregating the data, the mean difference between the percent of media coverage of negative advertisements and the percent of negative advertisements is 28.16% (t-stat= 5.71; p-value< .001), and 83% of the races have news media coverage of advertising that is more negative than the advertising. This result clearly indicates that news media coverage slants heavily toward negative advertisements.

because they do not specifically indicate so. We also analyzed the data with less strict filtering and found similar conclusions.

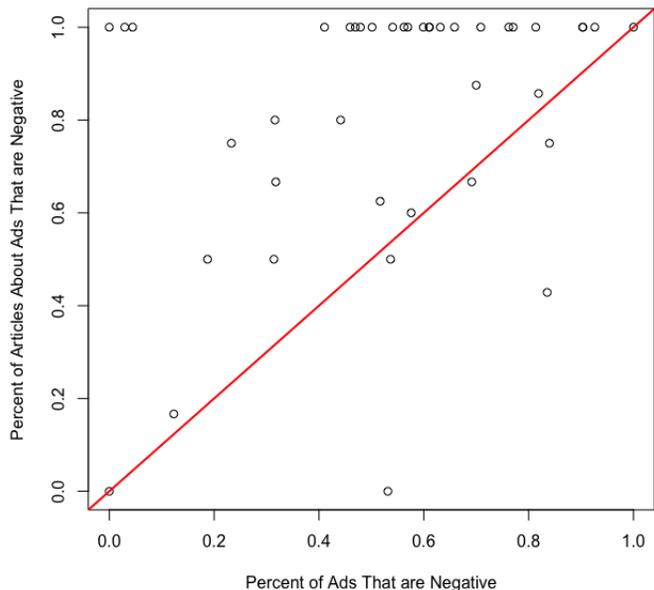


Figure 3: Percent of Coverage About Negative Ads vs. Percent of Ads that Are Negative

4 Do campaigns respond to higher news coverage?

Having examined the media’s response to campaign behavior, we now turn to the reciprocal relationship: how candidates respond to media attention. In the previous section, we presented evidence that the news media cover negative ads more intensely and respond with greater coverage when campaigns shift negative in tone. This suggests that campaigns have increased incentives to air negative ads when media coverage is higher. In this section, we explore the implication of these increased incentives by examining the degree to which candidate choices are influenced by the media’s tastes and actions.

4.1 Daily seasonality: Candidates Target the Media

We begin by arguing that the specific patterns underlying the daily variation in news media coverage we observed in panel (b) of Figure 1 are consistent with an active role of media. Note that commercial advertising exhibits daily ‘seasonality’ in spending arising from the fact that the composition of television audiences varies systematically across the days of the

week. In particular, during the weekend TV audiences tend to be smaller, leading to lower spending on advertising. However, and key to our argument regarding political advertising, we suggest that the weekend is when members of the news media are likely to pay particular attention to TV broadcasts, tuning in to weekend political talk shows such as “Meet the Press” on NBC, “Face the Nation” on CBS and “This Week” on ABC. Ads aired on the weekend might find their way into the discussions in these talk shows as well as be directly seen by newspaper staff, whose interest in this intense political coverage is probably higher than the general public. Thus, the weekend reflects a time when news media attention is high, yet public attention is lower. As a result, the weekend serves as a way to tease out the incentive to speak to the news media versus directly to voters. In other words, we ask whether negative ads at least partly target the media.

Figure 4 presents the negativity of advertising by day of week. We include the average percentage of negativity by day of week for the last 30 days and the 40 days prior to that (along with confidence intervals). We split the time periods in this way because of the large initial positivity as discussed above. The pattern of daily seasonality is clear for both periods ($\chi^2 = 326.3$ and 180.6 respectively for the late and early periods, with p-values $< .001$). Saturday and Sunday are indeed the highest negativity days. Although descriptive in nature, this finding is consistent with the idea that higher media attention leads to higher negativity.

4.2 How media attention increases negativity

We now turn to a more direct test of the impact of media attention on the candidates’ choice of tone. Our earlier descriptive time-series (section 4.1) and cross-sectional (section 2.6) evidence suggested that news media might play a role in shaping candidate tone choices. We now present a more formal causal test using an instrumental variable approach that exploits the direct influence of media holding companies documented in section 2.6.

As noted earlier, the simultaneous equation structure of the negativity news cycle raises

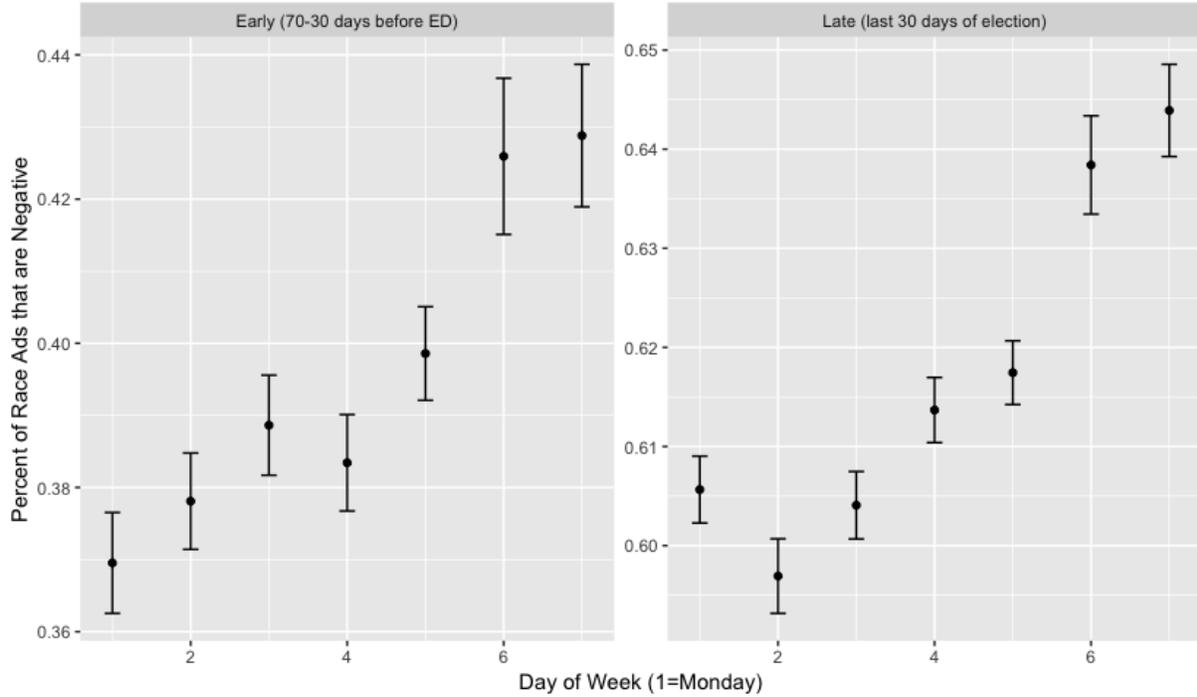


Figure 4: Percent of advertising spending with negative ads by day of week in the early and late race.

obvious endogeneity concerns (due to both simultaneity bias and correlated unobservables). Measurement error may also be an issue. To address this host of concerns, our empirical approach combines an IV strategy with a rich set of included control variables. Our control variables include three sets of regressors—controls for the most recent tone decision, for market characteristics, and for time effects. The most recent tone decision indicates whether the candidate previously went negative, mixed, or positive as compared to whether the candidate didn’t advertise. The market characteristics controls include demographic variables for the percentage white, percentage with bachelors, and the mean household income in the district, race variables for whether the race is in an off-presidential election year, an open seat, or is considered competitive, and candidate variables for whether the candidate faces the same opponent or is the frontrunner, an incumbent, or the Republican. The time controls include dummies for day of week and time in the race (five 10-day increments, with the 30 earliest days lumped together).

Our main source of exogenous variation in the news media coverage is based on the

pattern of ownership of the local newspapers. In order to identify the effect of coverage on negativity, we need variation in the news coverage that is clearly exogenous to the level of negativity and that cleans any measurement errors in the news media coverage. The editorial policy of the local newspapers provides such variation. Media holding company ownership patterns affect the editorial policy of the included newspapers, but are plausibly exogenous since a) the media holding company ownership occurs prior to the campaigns, and b) the ownership of local newspapers is not expected to directly influence campaign decisions, but rather influence the newspaper's coverage of the campaigns and their advertising through the coverage.

To begin, we examine whether the intensity of the news coverage of the race relates to the presence of a media holding company in the district. Consistent with the first stage of the two-stage least squares, we use a linear probability model. We regress *media high* (i.e., intense coverage) on a set of dummy variables, one for each of the media holding companies, along with the same set of controls discussed above. Table 2 presents the results of a regression with no media holding company dummies in column (1) and with all of them in column (2). We find that nine of the eleven media ownership dummies are significant at a 0.05 level. The total set of dummies improves model fit significantly over the model without them (Partial F-stat=140.8). This analysis demonstrates that the structure of the ownership of the newspapers is indeed related to the intensity of news media coverage.

The variation in estimates across media holding companies suggests that their editorial policies vary greatly, with some having more intense coverage of politics than others. The media companies that appear to have the editorial policies with the most intense news media coverage of political races are Lee Enterprises, New Media Corps., Paxton, and Ogden. In contrast, the least intensive coverage is Pulitzer, Landmark, and Knight-Ridder. However, the large variation, suggests directly inserting these dummies as predictors may create noisy estimates. Instead, we form a dummy variable, *Avoid Politics*. This dummy variable takes a value of 1 in geographies that do not have any newspapers owned by the media holding

companies with editorial policies to intensely cover politics.

As expected, and column (3) indicates, these media holding companies have significantly less intense coverage than the average and the partial F-statistic for model improvement is 88.4. In columns (4) and (5), we test robustness against excluding the three and five most intense coverage media holding companies from the *Avoid Politics* set. The results are similar in magnitude and remain significant at the 0.05 level. These results indicate that the first stage of our two-stage least squares analysis establishes that our instrument is sufficiently strong (i.e., meets the relevancy condition).

With the first stage regression establishing relevance of our instrument, we shift to the effect of news media coverage on candidate negativity. Table 3 column (1) presents a model in which we ignore endogeneity and use OLS to directly regress candidate negativity on the intense media coverage variable. We find that news media coverage has a small, positive, and significant effect of 0.004 (se 0.002). Column (2) reports the 2SLS results when using the media holding company ownership variable, *Avoid Politics* based on the eight least intense media holding companies. The effect of news media coverage on campaign negativity is larger in magnitude (0.046, se 0.014) than the estimate from column (1) and is statistically significant (p-value<0.01). Such an increase in the effect after accounting for endogeneity is consistent with measurement error bias (that attenuates the true effect size) dominating the simultaneity bias (that would increase the effect size). The 4.6 percentage point increase in the probability to go negative when news media coverage is intense indicates that there is a direct effect of news media coverage on candidate negativity. Columns (3) and (4) present robustness tests under the alternative *Avoid Politics* definitions. In both cases the results are quite consistent with the main specification of column (2). We turn now to the strategic nature of candidate interaction.

| <i>Dependent variable:</i> | | | | | |
|----------------------------|--------|----------------------|----------------------|----------------------|----------------------|
| Intense Media Coverage | | | | | |
| | (1) | (2) | (3) | (4) | (5) |
| MHC_Gannet | | -0.094*** (0.006) | | | |
| MHC_CNHI | | -0.088*** (0.007) | | | |
| MHC_Lee.Enterprises | | 0.161*** (0.011) | | | |
| MHC_Ogden | | -0.060*** (0.011) | | | |
| MHC_Boone | | -0.127*** (0.017) | | | |
| MHC_Landmark | | -0.190*** (0.008) | | | |
| MHC_Paxton | | -0.028*** (0.010) | | | |
| MHC_Knight.Ridder | | -0.142*** (0.012) | | | |
| MHC_New.Media.Corp | | 0.010 (0.015) | | | |
| MHC_Hearst.Newspapers | | -0.027* (0.015) | | | |
| MHC_Pulitzer.Inc | | -0.277*** (0.017) | | | |
| Avoid Politics | | | -0.137*** (0.005) | -0.123*** (0.005) | -0.133*** (0.005) |
| Media Holding Companies | None | All | 7 Avoid | 8 Avoid | 6 Avoid |
| Time Controls | Yes | Yes | Yes | Yes | Yes |
| Day of Week FE | Yes | Yes | Yes | Yes | Yes |
| Market Char. Controls | Yes | Yes | Yes | Yes | Yes |
| Partial F-stat | | 140.77 | 88.39 | 101.57 | 91.11 |
| Observations | 33,592 | 33,592 | 33,592 | 33,592 | 33,592 |
| Residual Std. Error | 0.494 | 0.484 | 0.490 | 0.491 | 0.490 |

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 2: Results from First Stage of Two-Stage Least Squares Analysis

| | <i>Dependent variable:</i> | | | |
|------------------------|----------------------------|----------------------|----------------------|----------------------|
| | Candidate Going Negative | | | |
| | (1) | (2) | (3) | (4) |
| Intense Media Coverage | 0.004** (0.002) | 0.046*** (0.014) | 0.039** (0.015) | 0.036*** (0.014) |
| Previously Negative | 0.882*** (0.003) | 0.877*** (0.003) | 0.878*** (0.004) | 0.878*** (0.003) |
| Previously Mixed | 0.053*** (0.003) | 0.048*** (0.004) | 0.049*** (0.004) | 0.050*** (0.004) |
| Previously Positive | -0.014*** (0.003) | -0.017*** (0.003) | -0.016*** (0.003) | -0.016*** (0.003) |
| Instrument? | None | 7 Avoid | 8 Avoid | 6 Avoid |
| Time Controls | Yes | Yes | Yes | Yes |
| Day of Week FE | Yes | Yes | Yes | Yes |
| Market Char. Controls | Yes | Yes | Yes | Yes |
| Observations | 33,592 | 33,592 | 33,592 | 33,592 |

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 3: Analysis of intense media coverage effect on campaigns going negative.

5 Candidate Interaction: Media as Conduit

The previous section provided empirical evidence that candidates respond to increased news media coverage by shifting negative in tone. In economic terms, this suggests that media coverage increases the marginal value of candidates to adopt a negative tone, independent of one another’s choices. Positive messaging enjoys no such effect. Together, sections 3 and 4 present evidence that the news media and candidates reinforce each others’ actions to cover races intensely (media) and go negative (candidates). This establishes an empirical foundation for the first feedback loop driving the negativity news cycle.

We turn now to the more complex relationship that exists between candidates, examining whether a similar complementary force applies to rival actions, i.e., that the rival’s actions change the incentive to go negative. We find that not only does the incentive to go negative depend on the news media, but also the rival’s actions. In contrast, the choice to adopt a positive tone does not depend on the rival’s actions. In game theoretic terms, adopting an aggressive (negative) tone is a strategic complement, while adopting a non-threatening (positive tone) is strategically neutral. We then examine the role of media in moderating this strategic interaction. Doing so, we find that negativity is a strategic complement only when media is engaged. This finding supports the second feedback loop—that media coverage enables a mutual reinforcement of candidate negativity. Finally, we present a series of falsification tests to argue for the uniqueness of the media’s role.

5.1 Analysis framework

For this analysis, we will use a similar approach to that of section 3.1. We evaluate the dependency of tone changes on prior tone changes of the opponent and apply logistic regression (an alternative linear probability model yields the same qualitative conclusions). Our sample for this analysis includes only those observations that immediately follow periods in which the two candidates adopted the same tone (be it positive or negative). This sets a common

starting point from which to evaluate subsequent changes. Consider the following illustrative case. On day $d - 2$, the two candidates air positive messages. On the following day, $d - 1$, the focal candidate stays positive, but the rival candidate switches tone (airs a negative ad). We examine whether the focal candidate is more likely to then switch tone on day d .

Because our focus is now on candidate interactions, our regressors focus on the actions of the candidates on $d - 1$ and the dependent variable captures the tone choice of the focal candidate on day d . Specifically, the regressors are *focal_stay* and *focal_stay*rival_switch* where *focal_stay* is an indicator variable for the event that the focal candidate does not change tone on $d - 1$ while *rival_switch* is an indicator variable for the event that the rival switches tone on that day, $d - 1$. The dependent variable is *focal_switch*, an indicator variable for the event that the focal candidate switches tone on day d . Our focus for the candidate interaction is on the coefficient of the interaction variable *focal_stay*rival_switch*. A positive sign implies that the candidate is more likely to match the opponent’s action.

The full regression reported in Table 4 is more involved than the intuition laid out above, but the basic structure is the same. Here is a brief description of the key additional elements in this table. First, we pool together the cases in which on day $d - 2$ the two candidates adopted a positive tone with the cases in which both aired only negative ads. As a result, the variable *rival_switch* can be either *rival_switch_negative* or *rival_switch_positive*. Second, to account for possible confounds, we include a large number of controls for differing time trends and election and market characteristics, which we describe in detail below.¹⁰

As noted above, we include a large number of controls to account for possible alternative explanations, e.g. that the tendency of candidates to move together in the negative direction might be due to some market characteristic. Our controls include variables for day of week effects, time trends, time since last switch,¹¹ as well as a host of contest and market variables

¹⁰Two technical notes on the setting of the estimation. First, any switch in tone (e.g. switching from positive to mixed or positive to negative) is counted as a switch in the analysis. Second, since it is not clear a priori how many days it takes for a candidate to switch tone following a switch by her rival, we also estimate the model allowing a two, three, or four day lag between the day in which the rival switched and the one in which the focal candidate might change tone (or not).

¹¹The rationale behind the inclusion of the “time since last switch” variable relates to the wear-out effect

listed in subsection 2.4. Furthermore, (a) since our previous descriptive results indicate that candidates become more negative over time, we allow the time trends to depend on the tone adopted by both candidates on day $(d - 1)$, and (b) in order to let the controls to have the greatest potential impact, we also allow these negative vs. positive trends to differ for incumbents, open seats, and off-year elections (which were selected as the only significant interactions with the time trends among all of our control variables). Note the results below are not sensitive to the inclusion (or exclusion) of these control variables (e.g., none of the parameters change from significant to insignificant) and that the coefficients on the control variables are reasonable.

5.2 The Complementarity of Aggression

In this subsection, we examine how candidates respond to one another’s tone changes. The estimates, reported in the first column of Table 4, shed new light on the nature of negative advertising competition. First, after a candidate switches tone and becomes more positive, the focal candidate does not tend to respond by also going positive. Specifically, the coefficient on *focal_stay*rival_switch_positive* is 0.213 (se 0.398), which is statistically insignificant and relatively small in magnitude. This suggests there is no candidate interaction when shifting toward positive advertising. Further, we note now that in each of the models presented subsequently, these effects of positive reaction are neither significant nor large.

Second, whereas candidates do not move together with their rival changes tone to positive, they do move together when the rival becomes more negative (0.769 with se 0.353 in column (1)).¹² To illustrate the magnitude of these effects, we consider the probability across

of advertising.

¹²The substantive findings corresponding to the model in column (1) are also robust for lags of 2, 3, and 4 days between the rival switch and the focal candidate response. For positive switches the coefficient varies widely, ranging from -0.312 (for a lag of four days) to 0.724 (for a lag of two days), but none of them are significantly different from zero at a p-value less than 0.05. The coefficient for two lags is the largest (and only positive coefficient other than the one in Table 4) and achieves a p-value<0.10. The result for negative switches also holds irrespective of the length of the lag. Furthermore, the coefficient of *focal_stay*rival_switch_negative* is quite stable across the lags, ranging from 0.815 to 0.892 and consistently significant with a p-value<0.05.

our cases that switched to negative. We change all of these cases to have no rival switch and compare the predicted probability under this counterfactual against the predicted probability under the actual rival switch toward negative. With no rival switching, the average probability of the focal candidate switching tone is 0.039 with the interquartile range being between 0.024 and 0.049. With the rival switching to be negative, the average probability increases to 0.080 and the interquartile range is 0.051 to 0.100. The probability increases by 106% on average and the increases range from 92% to 115%. Thus, the point estimate represents a large relative increase in probability of switching to negative after the opponent does so.

These estimates demonstrate that there is a clear time dependence between candidates in the dynamics of tone in political campaigns. The sign of this finding indicates that going negative by opposing candidates is a strategic complement. We now consider the multiple paths by which this apparent interaction could occur to isolate the role of news media coverage on candidate negativity interactions.

5.3 Media as Conduit

Candidates might respond to one another for reasons entirely unrelated to news media coverage. For instance, when one candidate goes negative, the other candidate may feel she needs to react, or risk lending credence to the attack. In fact, anecdotes attribute some election defeats to a failure to quickly respond to withering attack ads. For example, the 1988 Dukakis' campaign waited weeks to respond to the notorious 'Willie Horton' ads, which centered on a policy connected to Dukakis that furloughed a criminal, who subsequently murdered another victim during the furlough. In the 2004 Presidential race, John Kerry took two weeks to respond to the Swift Boat attack ads that falsely accused him of lying about his wartime heroism. In both cases, these unanswered attacks have been credited with significant harm to the candidates' Presidential bids. If these anecdotes are to be believed, an attack without a convincing response is more effective at harming the opponent. Note that this response to negative ads has no analogue for positive ads, because these ads only highlight the focal

| | <i>Dependent variable:</i> | | | |
|---|--------------------------------|---------------------|--------------------|---------------------|
| | Focal Candidate Change in Tone | | | |
| | (1) | (2) | (3) | (4) |
| Focal stay*rival switch negative | 0.769** (0.353) | | 0.755** (0.353) | |
| Focal stay*rival switch positive | 0.213 (0.398) | | 0.219 (0.398) | |
| Shift Negative*media high | | 0.481*** (0.185) | 0.476** (0.185) | 0.410** (0.192) |
| Shift Positive *media high | | 0.097 (0.226) | 0.100 (0.227) | 0.034 (0.234) |
| Focal stay*rival switch negative*media low | | | | 0.290 (0.531) |
| Focal stay*rival switch positive*media low | | | | -0.064 (0.495) |
| Focal stay*rival switch negative*media high | | | | 1.300*** (0.491) |
| Focal stay*rival switch positive*media high | | | | 0.913 (0.662) |
| Tone Time Trends | Yes | Yes | Yes | Yes |
| Time Since Change | Yes | Yes | Yes | Yes |
| Day of Week FE | Yes | Yes | Yes | Yes |
| Market Char. Controls | Yes | Yes | Yes | Yes |
| Media Direct Effect | No | Yes | Yes | Yes |
| Observations | 5,182 | 5,182 | 5,182 | 5,182 |
| Log Likelihood | -978.225 | -977.049 | -974.974 | -973.303 |
| Akaike Inf. Crit. | 2,048.451 | 2,046.097 | 2,045.948 | 2,046.607 |

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 4: Logistic Regressions on Candidate Interaction and the Role of News Media Coverage.

candidate's positive traits (creating no need to respond). This interpretation suggests that the effects shown in section 5.2, in which rival switches in tone lead to higher candidate negativity, could be a causal strategic response. A conceptual model illustrating this relationship is presented in Figure 5 panel (a).

We also explore three alternative conceptual models in which the media plays important, but distinct roles in shaping candidate negativity. The first two (panels b and c) include a direct (causal) role for news media coverage, consistent with the direct impact of media coverage on candidate negativity documented in section 4. Panel (b) shows the conceptual model where the news media has a direct effect on both candidate and rival negativity, but rival negativity does not affect candidate negativity. Note that empirically under this conceptual model it is possible to measure a direct candidate interaction when not including the media effect, but that once the media effect is included the candidate interaction would no longer be present. Panel (c) shows the conceptual model where there is both a direct news media effect and a direct candidate interaction.

The final panel (panel d) adds an additional, indirect (moderator) role for the news media, in addition to its direct role. This indirect role involves the media acting as an amplifier for candidate messages. In the anecdotes provided earlier, in which Dukakis and Kerry failed to respond in a timely manner to attacks, the lack of reaction occurred *while* the news media prominently recycled the negative messages targeting these campaigns (e.g., Sabato 2005). This amplification by the news media could represent a critical indirect role of media in driving candidate interactions. In particular, the news media might act as a source of validation for the negative attacks of rivals or as a simple avenue of expanded reach and message repetition. In either case, in the absence of a response from the candidate to the rival's attack, the media involvement makes the opponent's message stronger. However, if the candidate instead responds to these attacks, the added media effect is diminished. Hence, if news media indeed acts as an amplifier or validator, then the *presence* of intense news media coverage implies that campaigns have a greater need to respond to their rival's negative

advertisements. In panel (d) of Figure 5, we show the complete model that depicts this additional role for news media coverage in shaping candidate interactions. This model adds one arrow to what is shown in panel (c). This arrow represents a “moderator” relationship or one that affects the size of the relationship it intersects. Thus, this additional relationship captures the potential for news media coverage to affect the strength of the influence of rival negativity on candidate negativity. In the extreme, there could be no direct candidate interaction without intense media coverage, which captures the potential indirect role of media.

To explore these four possible conceptual models and evaluate what, if any, role media plays in this system, we use a series of regressions that adjust the analysis in column 1 of Table 4. Because this analysis set-up differs from that of section 4, we begin by documenting in this data setting the direct effect of news media coverage on candidate negativity. To do so, we introduce two variables for media coverage—one for cases when the both candidates started positive (*Shift Negative*media high*) and one when both candidates started negative (*Shift Positive*media high*). To evaluate the direct media effect in the absence of candidate interaction, column (2) of Table 4 introduces the media coverage variables (*media high*) and drops the rival switching variables. The media coverage measure has a positive and significant coefficient for shifts toward negative with a magnitude of 0.481 (se 0.185), but insignificant and small (-0.097, se 0.226) for shifts toward positive. Media coverage has a direct effect on candidate negativity. Thus, the direct effect replicates in this more constrained analysis design.

Whether the conceptual model of panel (b) or panel (c) is supported empirically requires us to include both the rival switching variables and the media high variables as direct effects in the same regression. If the coefficient for rival switching continues to be significant after including the media coverage variables, then panel (c) is supported over (b). We now examine this possibility in column (3) of Table 4. The findings clearly support a role for candidate interaction beyond what media coverage induces itself. First, the news media coverage direct

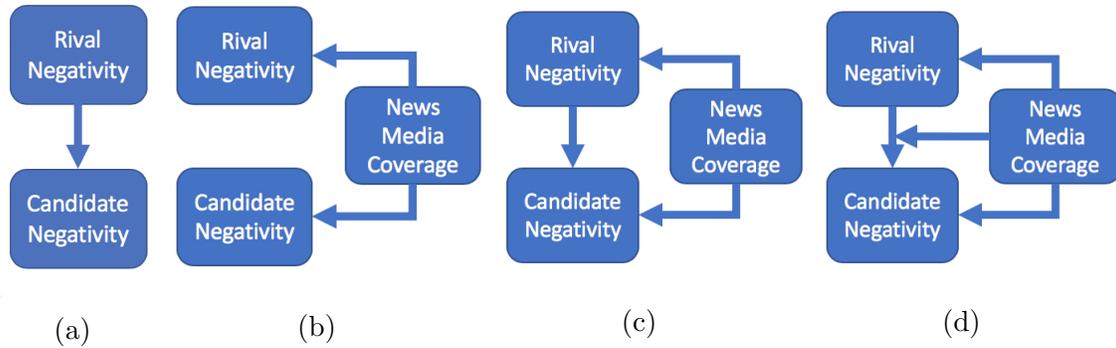


Figure 5: Conceptual Models for Candidate Interaction and Role of News Media. Panel (a) shows direct candidate interaction. Panel (b) shows no candidate interaction and instead only direct effects of news media. Panel (c) shows both a direct effect of News Media and the direct candidate interaction. Panel (d) shows both a direct and indirect role of news media along with the direct candidate interaction.

effects have similar magnitudes and significance levels to those in column (2). Candidates switch more toward negativity when news media coverage is higher, but do not exhibit this interaction for positive switches. More importantly, if the news media coverage is an omitted variable that is causing both rival and focal candidate negativity to increase, then in column (3) the inclusion of the media coverage variable should block the opponent negativity path, leading to significantly diminished magnitude and significance. The results, however, indicate that introducing the news media coverage variable only slightly decreases the magnitude of the effect of the candidate interaction. The variable *Focal stay*rival switch positive* continues to be insignificant and small in size (0.219, se 0.398). The variable *Focal stay*rival switch negative* continues to be large, positive, and significant at a p-value <0.05 (0.755, se 0.353). The point estimate decreases only marginally, suggesting little blocking is occurring. These results indicate that the candidate interaction is an influence that cannot be explained by the direct effect of news media on negativity alone.

Having established that media has a direct effect, but not one that explains away the candidate interaction, we now consider whether media coverage could play an indirect role in shaping the candidate interaction. In column (4) of Table 4, we examine this additional, indirect role of news media coverage. In this model we include both the direct and indirect

effects of media coverage. The indirect effect takes the form of interactions between *Focal stay*, a rival switch variable, and either media coverage being high or low. The terms with *media low* represent when media is not paying close attention, whereas the terms with *media high* represents when the media coverage is intense. If an indirect effect exists for negativity, we would expect a significant effect only for the term capturing when the rival switches to negative *and* media is high. We find that when news media coverage is low, the effect of a rival’s switch toward negative has a small and insignificant effect (0.290, se 0.531). In contrast, when news media coverage is high, the effect of a rival’s switch toward negative has a large and significant effect (1.300, se 0.491). We note that for shifts toward positivity, the coefficients continue to be insignificant. We also find that the direct effect of media on shifts toward negativity exhibits a small decrease in magnitude, but is still statistically significant with a coefficient of 0.410 (se 0.192). These results suggest that the news media play both a direct and indirect role in shaping candidate negativity. This indirect role is critical for candidate interactions—only when media coverage is intense do we find evidence that candidate interactions are an important factor in shaping tone choices. Further, this indirect role of news media coverage is roughly three times larger than the direct effect, suggesting that it is the more critical influence in how news media shape the negativity of races.

5.4 Falsification tests and summary

In addition to the reported regressions that explore the role of media, we also conduct a series of falsification tests. In these tests, we ensure that we are not merely picking up a general pattern that the news media coverage coincidentally follows. These tests are specified by replacing the media coverage variable as the moderator with each of the previously included contest or market level variables as the moderator (i.e. the same variables included as controls in the previous regressions). These variables include the percent white in the district (pWhite), the percent with a bachelors degree (pBach), the mean household income

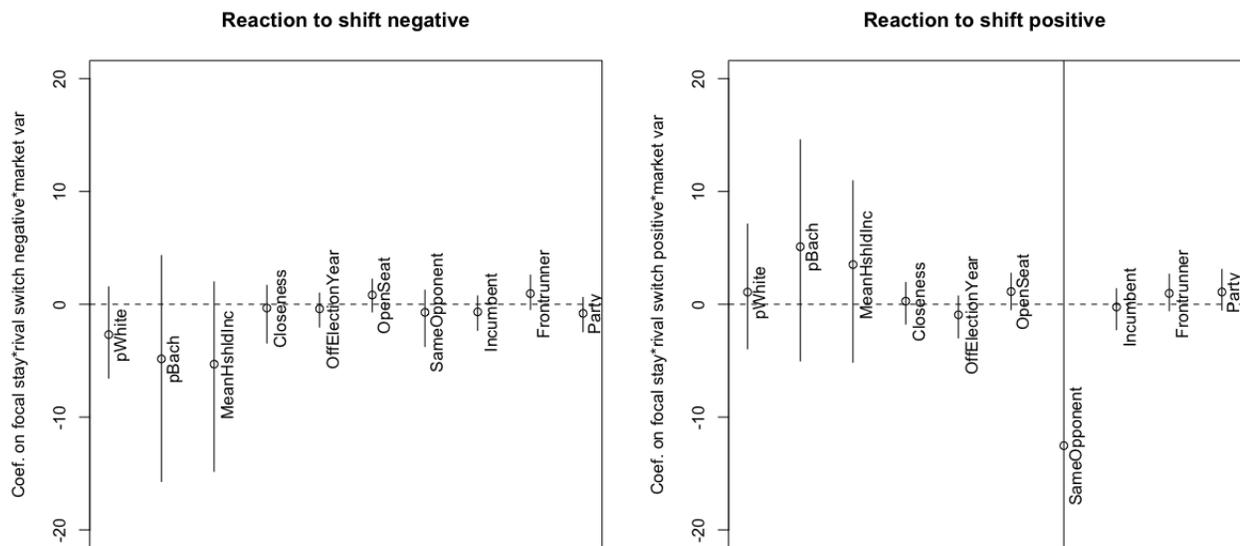


Figure 6: Falsification tests show 95% confidence intervals for the coefficients on the relevant three-way interactions.

(MeanHshldInc), a measure of the ex ante closeness (Closeness), whether the election is not during a presidential election year (OffElectionYear), whether the district has no incumbent (OpenSeat), whether the two candidates have faced each other previously (SameOpponent), whether the candidate is an incumbent (Incumbent), whether the candidate was the frontrunner (Frontrunner) and whether the candidate is a Republican (Party). Since these other variables are all ones that are hypothesized to play some role in advertising decisions, these are all viable alternative moderators for the falsification test. The coefficients for the relevant three-way interactions are presented in Figure 6. We find that of the ten contest and market level variables, none produce a statistically significant interaction in the three-way interactions $focal_stay*rival\ switch*market\ variable$ for shifts toward positivity or negativity. We view these falsification tests as strong support for our main finding.

These results present new insights about the nature of competitive interaction and the role that news media play in that interaction. First, we find that candidates react to one another's shifts toward negativity, but not positivity. This interaction indicates that candidate negativity exhibits strategic complements. We find that news media plays a central role in creating this candidate interaction. We demonstrate, consistent with section 4, that

news media have a direct effect on candidate negativity, but that this direct effect cannot explain away the measured reaction to a rival's move towards negativity. Thus, the candidate interaction extends beyond the simple role of news media coverage elucidated in section 4. However, we find a second, indirect role of the news media that is more important than the direct role. Candidate negativity is only a strategic complement when the news media is intensely focused on the race. Thus, the news media amplification of the rival's messages is a critical condition for expecting candidates to respond to each other's shifts toward negativity.

These findings expand our understanding of the negativity news cycle. In sections 3 and 4, we demonstrated that media and candidates reinforce each others' actions to create the first feedback loop in the negativity news cycle. This section shows that a second feedback loop exists when the news media intensely covers the race. In the presence of intense media coverage, when one candidate goes negative, the other is more likely to follow. These candidate actions and reactions reinforce each other and lead the news media coverage to intensify. Thus, we have shown that all three players play a mutually reinforcing role in perpetuating the negativity news cycle.

6 Exploring the Limits of the Negativity News Cycle

In sections 3 and 5, we provided evidence for two feedback loops that cause the media and each candidate to mutually reinforce their aggressive actions (intense coverage for media and negativity for candidates). These feedback loops drive the negativity news cycle. With these results, one might wonder why we don't see all negativity. We now explore three forces that constrain this reinforcement mechanism.

The first is straightforward: political elections in the U.S. have a known endpoint, election day. This finite nature of the race limits how long a negativity news cycle can last. Further, as we saw in the descriptives, races tend to begin with low media coverage and campaigns typically start positive. This implies that the negativity news cycle has a limited window of

relevance.

Second, we argue that the valuable negative content about ones opponent is inherently scarce. Some forces push around this availability, such as whether the opponent is an incumbent (Kahn and Kenney 1999), but generally the kind of negative content that resonates with voters, and that the media picks up as relevant, is limited. Further, we argue that campaigns (and the media) attempt to uncover “dirt” about their opponent during the campaign, and that the candidates are uncertain what kind, if any, dirt they will find (e.g., Huffman and Rejebian 2012).

The third limiting force relates to the strategic forward-looking behavior of candidates. Candidates may choose to strategically delay the use of the negative content that they have on hand. Why would a candidate strategically delay? Exactly because of the negativity news cycle. If a candidate uses negative content that draws media attention, but believes the opponent has more negative content than she does, initiating such a negativity news cycle can be disastrous. By going negative, the candidate makes going negative more attractive to her opponent. Thus, at times a candidate will have an incentive to delay the use of negative content to limit exposure to her rival’s counterattacks.

In this section, we explore the implications of these forces as they balance against the feedback loops we explored empirically in the previous sections. Because we can neither observe the discovery process nor a campaign’s stock of negative content, we explore this tension theoretically at first. We propose a simple model that incorporates these drivers and limits of the negativity news cycle and provides us with three empirical patterns that might be observable in our data. We then describe the intuition that produces each data pattern and examine these patterns empirically.

6.1 Theoretical Setting for the Negativity News Cycle

To explore the balance between the feedback processes and the limiting mechanisms and to better understand the nature of this complex interplay of forces, we develop a simple model

that incorporates each. The details of this model are contained in Web Appendix A, but we provide an overview here of its most salient features.

First, the model assumes or predicts the findings from sections 3-5. The model assumes that media attends more to negative than positive ads and amplifies negative content when attending to it, that media coverage increases when the race goes negative, and that the benefits and likelihood of going negative increase when media is intensely covering the campaign. The model also predicts that the likelihood of going negative following a rival's move toward negative increases when media coverage is present, but no such increase is predicted for a positive shift.

Second, the model incorporates the three mitigating forces described above. We model the races as finite, lasting three periods. Negative content is limited and includes two types: strong negative content that draws the attention of the media and is the most impactful on voters, and weak content that is less impactful than going positive except when the media is paying attention, in which case all negative content is more impactful than positive. Both types of negative content are stochastically uncovered with known probability over the course of the race. The candidates behave strategically and with foresight. They decide whether to use their negative content now or wait in order to avoid media attention. Such delay can foreclose an opponent from having the benefit of such amplification. Because of this forward-looking behavior, the model involves a critical tension between strategically delaying the use of negative content until later in the race versus using it immediately and generating a potentially longer negativity cycle that gives the opponent a chance to broadcast her weaker negative content.

This simple model setting delivers a number of theoretical insights relevant to understanding the negativity news cycle. We focus on the way the limiting forces balance the feedback loops underlying the negativity news cycle. The model provides equilibrium solutions that characterize candidate behaviors over a range of potential model parameters. In what follows we develop the intuition for three insights that the model provides which can then be taken

to data. We note that the empirical facts in this section could arise for reasons other than our model.

6.2 Assortative matching on ad tone

The first data pattern the model predicts is that candidate tones will exhibit assortative matching. Because media attention amplifies negative content more than positive, when media attends to the race candidates’ incentives to go negative increase. When one candidate uses strong negative content that draws media attention, the other candidate will use whatever (possibly weaker) negative content she has available. Hence, candidates will tend to air negative advertisements in close temporal proximity to one another. Candidates are also likely to air positive advertisements at the same time because of the opposing force that if the news media is not paying attention they do not want to air the weak negative content. Thus, candidates will be more likely to air ads with a common tone than different ones.

To characterize these candidate strategies, we denote the pairs of strategies, (a, b) , where each of a and b can take on different ad tone strategies, e.g., positive, negative, or mixed. We first examine the frequency that candidates take each of the possible strategy pairs.¹³ Using the categorization of negative-mixed-positive, we find that in 51% of the observations the candidates use the same tone (e.g. the two candidates are purely negative in their messages). This percentage increases to 73% when we combine the “mixed” and “negative” categories together.¹⁴ From these simple descriptives it is clear that most of the days when candidates advertise, they use common strategies. This finding is consistent with the negativity news cycle, since such cycles pressure both candidates to go negative in their advertising when news media coverage is intense, and greatly diminish incentives to go negative otherwise.

¹³We drop cases occurring before both candidates have aired any advertisements.

¹⁴Aggregating the data in this way makes sense because both, as noted earlier, the composition of ads within days that are mixed is tilted towards negative, and while “mixed” days include some positive ads, such instances are likely to be perceived as part of a “negative span.”

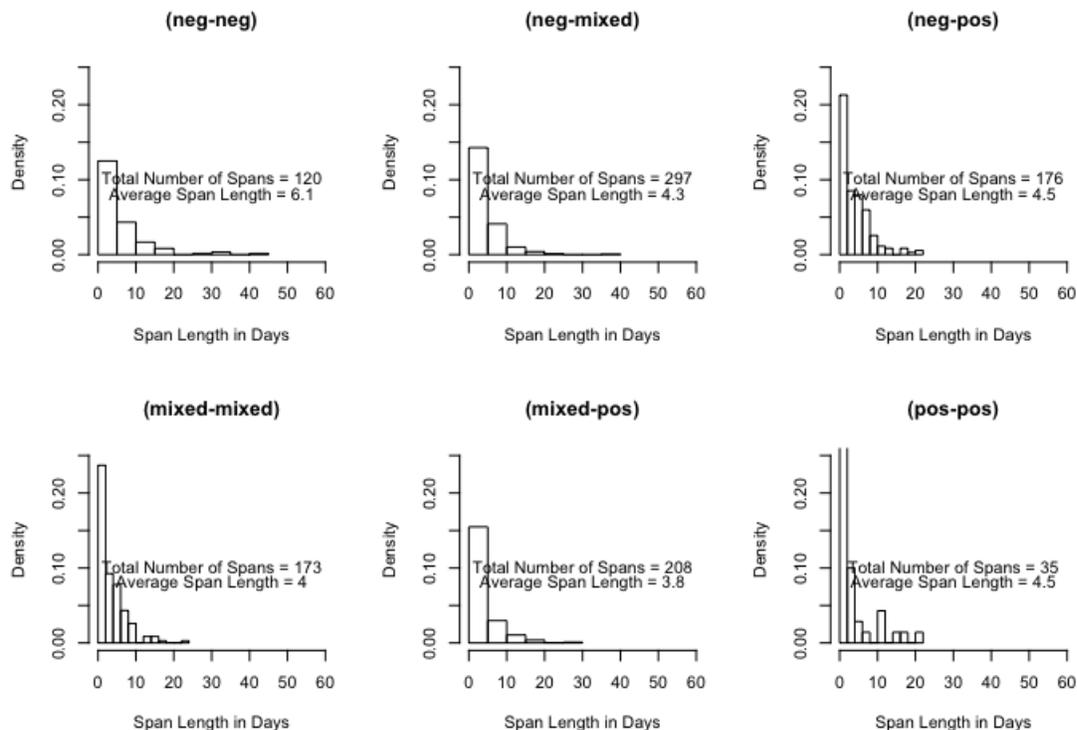


Figure 7: Histogram of span lengths for action pairs

6.3 Persistence of negativity news cycles

Similar forces that produce assortative matching also increase the persistence of the negativity news cycle. First, media attention induces both campaigns to go negative and to respond to each other’s negativity. These responses, in turn, fuel the news media to continue to attend to the race, lengthening the negative-negative strategy pair. Further, when the news media is not paying attention to the race, the campaigns store up negative content to use in case the news media attention intensifies. Once media attention is on the race, the candidates will have more content to persist even longer since they will use this stored up negative content. Importantly our model also demonstrates that strategic delay will not dominate these lengthening forces in equilibrium. As a result, the negative-negative strategy pair will likely be more persistent than the other strategy pairs.

Recall that empirically the initial ad tone in most races is positive, as the default starting tone of a campaign. On the first day campaigns advertise, 75% of campaigns air only positive

advertisements. This is consistent with the idea of negativity news cycles, since the news media coverage is lower early in the campaign season. As a result, there are more observations in which the two candidates adopt a positive tone than occasions in which both adopt a negative tone (132 versus 120), but most of these (97) arise only because of this initial tone. Because this initial tone is actually consistent with our negativity news cycle, we eliminate these since they confuse the meaning of pos-pos tone cases.¹⁵

Figure 7 presents histograms of the length of spans for each strategy pair (a, b) . These histograms also report the total and average length of the spans. The negative span length is 6.1 days on average and cases stretch past 40 days. In contrast, the average span lengths for all other strategic pairs are significantly shorter at around 4 days. The pairwise comparison of the neg-neg to the rest are all significantly different (longer). The t-tests for the neg-neg comparisons have t-stats 3.49, 2.90, 4.38, 4.41, and 2.09 for neg-mix, pos-neg, mix-mix, mix-pos, and pos-pos. This suggests these other states are not as sticky as the neg-neg state. This “stickiness” can also be seen in the state switching matrix which puts the probability of continuing in the state as 0.94 for neg-neg, 0.93 for pos-pos, but the average of the other states is 0.84 (ranging between 0.79 and 0.90).

This finding indicates that once the campaign is fully underway, neg-neg has higher persistence than all other strategic pairs. Such persistence is consistent with the idea that a negativity news cycle creates on-going incentives for candidates to go negative and to react to one another, especially since the negativity of these reactions can spur the news media to attend more closely to the race, leading to continued incentives to go negative and react to each other’s negativity.

¹⁵If we include these initial pos-pos cases, then pos-pos has a longer average span length, as predicted by the negativity news cycle, since the news media generally does not cover early campaign activities intensely. This might also suggest that either the stocking up effect or the strategic delay incentives might be relatively strong in our empirical setting.

6.4 A more positive end game

This persistence and prevalence of negative advertisements are related to another pattern—the over time pattern of negativity and positivity. In Figure 1, we saw that negativity generally increases over the course of the campaign as news media coverage increases. Despite the general consistency of this finding with prior research (Goldstein and Freedman 2002), we also noted that the days with any negative ads flatten out around the last week of the race. We now explore the ending of that pattern more carefully with the perspective of explaining this pattern as potentially arising from equilibrium behaviors related to the balance between the limiting and driving forces for the negativity news cycle.

The intuitive argument for the end game is as follows. Once the news media is attending closely to a race, the campaigns want to use their negative content to take advantage of the intensified coverage. Further, opponent attacks are amplified when the media is turned on (leading to a higher likelihood to respond by the candidate), this exacerbates the need to concentrate negative content. Because opportunities to go negative are limited, campaigns will be pressured to use (up) their best negative content during the negativity news cycle instead of strategically holding the content to spread it out or to use at the end of the race. A similar motivation arises if candidates are afraid to delay use of their negative content because they think they will uncover more dirt, but not be able to use it. Based on the analysis above, we know that the strategic pair neg-neg is more persistent than other strategic pairs. This suggests that candidates are choosing to bunch their negative content in time. If the amount of strong negative content is sufficiently limited, this bunching of negativity could lead some candidates to run out of (strong) negative content just before the end of the race (see the Web Appendix A for a formal demonstration of the conditions for this to arise).

We now examine this idea empirically. The first panel of Figure 8 provides a more nuanced view on the time pattern of negativity by breaking out days where candidates air all negative advertisements and ones where they air a mix of negative and positive ads. The figure reports, for every day, the percent of candidates who aired only positive ads (dashed

line), those who aired only negative (black line), and those who used a mix of positive and negative (red/gray line). Even with this split, it is clear the broad time trend is the same—a decreasing pattern for positive advertising and an increasing pattern for negative and mixed for most of the campaign.

However, as alluded to above, the trend changes sharply toward the end. In the last ten days of the campaigns, we actually observe a decline in negativity. The difference between the negativity at the peak, 10 days before the end of the race, and negativity on the last day is significant (mean=0.078, p-value=.02). In contrast, the proportion of candidates who adopt either “only positive” or “mixed” ad strategies both increase slightly during this period. This finding is consistent with the negativity news cycle sometimes leading candidates to strategically choosing to “use up” their best negative content leaving them with nothing sufficiently strong to use a negative tone through the end of the race. We note that, of course, most races are still using some negative advertising in the last period, so this is about a small proportion of campaigns changing tone at the end. If some races run out of (strong) negative ad content because of the negativity cycles and these races shift toward positive advertising as a result, that could produce the observed pattern.

To examine the robustness of this novel finding, we check whether it is due to a selection bias. It is possible that the decline in negativity in the final days of the campaign is due not to a shift in the behavior of the candidates, as we suggest, but rather by candidates with low budgets entering races late. Suppose that candidates with low budgets can only afford to advertise later in the campaign and that these candidates also favor positive messages (for example, we have already shown that campaigns tend to start positive). If so, the evidence presented above, at the aggregate level, would not be due to variation in candidates’ actions across time, but rather to variation across candidates’ and the timing of their entry.

To explore this possibility, we split our sample into two parts. In the first part, we include only races that began more than a month (30 days) before the election and in the second we include the rest. The second panel of Figure 8 presents the pattern for the longer races

(i.e. those that started more than a month before the election). The pattern is quite similar to the one reported above with an increase in the proportion of negative advertising during the campaign up until the last two weeks and then a sharp decrease until Election Day. In other words, if anything, the phenomenon is even stronger when one focuses on the longer races. As before, the difference between the peak at 16 days before the end of the race and the last day is statistically significant (mean=0.121, p-value=.004). It turns out that the same pattern exists for the shorter races as well (note the time scale is different). As one might expect though, the turning point for the shorter races occurs even closer to Election Day—negativity drops sharply in the last six days of the campaign (last panel of Figure 8). However, in this case, the decline is not statistically significant from the peak at 6 days before the end of the race (mean=.062, p-value=0.22), possibly reflecting the smaller sample size.

Another way to see these trends is by fitting a polynomial to the campaign-level negativity data. We examine increasing orders of polynomials in time and present the best fitting polynomial, which is cubic in all three cases (i.e., all races, those that started late, and those that started early). The results of this analysis are presented in Figure 9, which depicts the predicted values for the negativity trend throughout the campaign along with the average values and 95% confidence interval. With this approximation, the decreasing negativity in the latter part of the race is clear in all three cases (details of the fitted polynomials are discussed in Web Appendix B), providing further support for the phenomenon of decreasing negativity late in the race.

We provide new evidence about the time pattern of negativity. While Goldstein and Freedman (2002) suggested that negativity peaks close to Election day, our findings confirm this general pattern, but also demonstrate that it peaks approximately two weeks earlier. Further, our negativity news cycle provides a rationale for why this could happen—news media coverage leads candidates to intensely and persistently use negative advertising, so intensely and persistently that some campaigns run out of strong negative content to use just before the end of the race. While other stories might also predict the same phenomena,

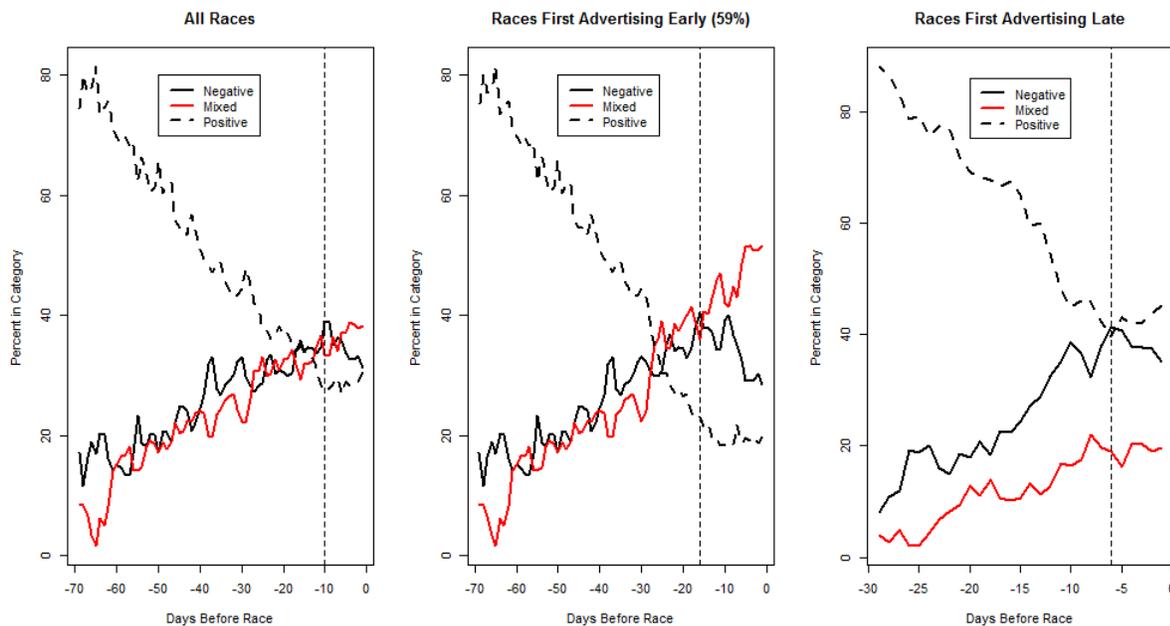


Figure 8: Aggregate Advertising Strategies Conditional on Advertising

the new data pattern that we find is also consistent with the negativity news cycle.

7 Conclusion

This study examines the role of the media in political advertising tone decisions. Using data from campaigns for the U.S. House of Representatives in 2000, 2002 and 2004 we conduct a series of empirical analyses that demonstrate the existence of a phenomena we call the negativity news cycle. This cycle is characterized by the aggressive actions of the news media (covering a race intensely) and candidates (going negative) mutually reinforcing each other to produce persistent negativity. The news media plays two central roles in this process. The first, direct role relates to a feedback loop between media and candidate negativity. We provide evidence that the news media coverage intensifies after a campaign goes negative and that this attention focuses more on negative than positive ads. This amplification leads candidates to go negative in response to increased media coverage. Further, candidates respond to one another's shifts toward negativity, but not positivity, but only when the

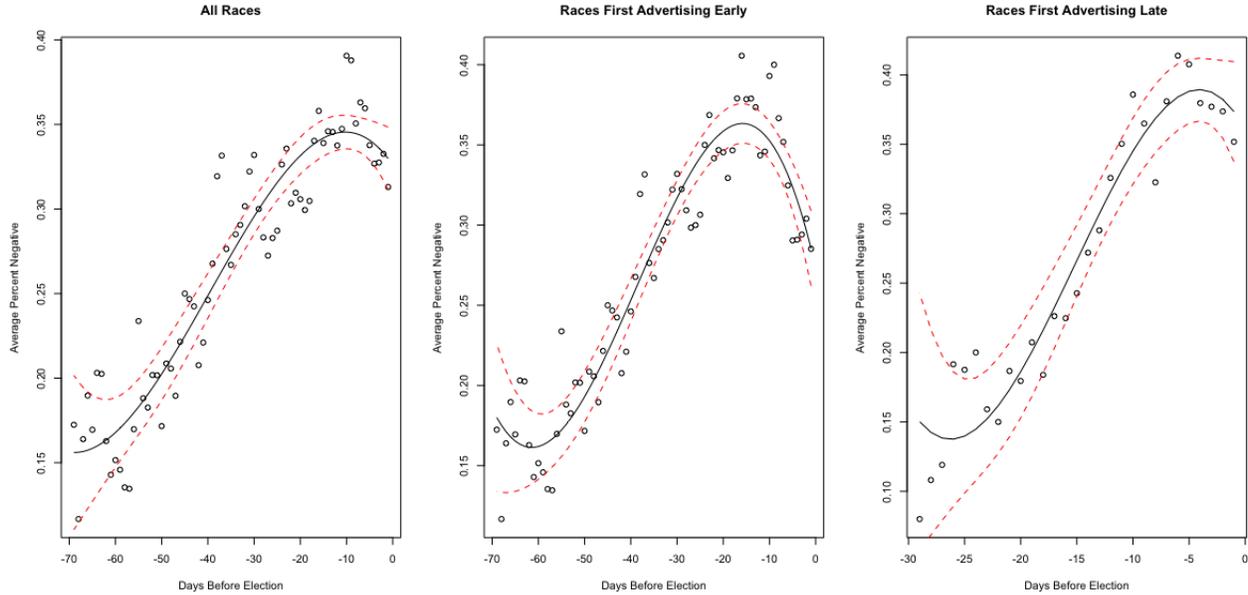


Figure 9: Aggregate Proportion Negative Against Fitted Proportion Negative

media coverage is intense. Thus, the news media also plays an indirect role that enables a feedback loop between a candidate’s and her rival’s negativity. We argue that these feedback processes are limited by three forces—finite races, limited negative content, and incentives to strategically delay the use of negative content. We examine the balance between mutual reinforcement and these mitigating forces and identify three data patterns that might exist in equilibrium. We show that candidates tend to assortative match on tone, that the negativity is more persistent than any other strategic position, and that for some races, negativity decreases in the end game. This total set of evidence portrays a world in which the news media can play an important role in the negativity that campaigns choose to use.

While the interaction between the quantities of advertising and news media (or paid media and earned media) has recently received attention, this study redirects the focus toward media’s influence on the content of advertisements. These issues are not specific to the political setting. Comparative advertising in commercial settings is gaining renewed interest in academia (e.g., Anderson et al. 2016), and its use is not uncommon in practice. For example, in the consumer technology sector, Apple and Microsoft have had several well-publicized rounds of attacking one another in media campaigns (Kolowich 2015). Similarly,

in consumer packaged goods, Campbell's and Progresso soup have employed negative ads as well (Edwards 2009). Moreover, both of these campaigns received additional media attention simply because they were negative. Moving beyond negative ads, content in general is likely important in understanding what gets magnified. For example, one of the most memorable ads of all time ("1984" by Apple) owes its success to the reaction of the news media. The content of the ad (which was aired only twice) grabbed the attention of the news media and the rest is history. Future research might enrich our understanding of integrated marketing communications by adding a "content dimension." Such effort can benefit from the growing availability of content analysis in the digital era.

REFERENCES

- Anderson, S.P., R. Renault. 2006. Advertising Content. *American Economic Review*, 96 93–113.
- Anderson, S. P., F. Ciliberto, J. Liaukonyte, and R. Renault. 2016. Push-Me Pull-You: Comparative Advertising in the OTC Analgesics Industry. *RAND*, 47 (4), 1029–1056.
- Arnold, R. Douglas. 2006. *Congress, the Press, and Political Accountability*. Princeton University Press.
- Che, H., G. Iyer, R. Shanmugam. 2007. Negative advertising and voter choice. Working paper, University of Southern California.
- Confessore, Nicholas, and Karen Yourish (2016) "The 2016 Race: \$2 Billion Worth of Free Media for Donald Trump," *New York Times*, March 15, downloaded from <https://www.nytimes.com/2016/03/16/upshot/measuring-donald-trumps-mammoth-advantage-in-free-media.html> on May 17 2019 8:04 AM.
- Edwards, Jim. 2009. Campbell's Wins Round in Soup War v. Progresso: MSG Ads Nixed by NAD. <http://www.cbsnews.com/news/campbells-wins-round-in-soup-war-v-progresso-msg-ads-nixed-by-nad/> downloaded on 3/11/2016.
- Eshbaugh-Soha, Matthew (2010). "The Tone of Local Presidential News Coverage," *Political Communications*, 27:121-140.
- Fowler, Erika F., Michael M. Franz, and Travis N. Ridout (2016). *Political Advertising in the United States*. Westview Press.

Geer, J.G. 2006. In Defense of Negativity: Attack Ads in Presidential Campaigns. University of Chicago Press

Geer, J.G. 2012. The News Media and the Rise of Negativity in Presidential Campaigns. *PS: Political Science & Politics*. 45(3) 422-427.

Goldstein, K., P. Freedman. 2002. Lessons learned: Campaign advertising in the 2000 elections. *Political Communication* 19(1) 5-28.

Gordon, Brett, Mitchell Lovett, Bowen Luo, and James Reeder (2019), "Disentangling the Effects of Ad Tone on Voter Turnout and Candidate Choice in Presidential Elections", Working Paper.

Hao, L., W. Li. 2013. Misinformation. *International Economic Review* 54(1) 253-277.

Harrington, J.E., G.D. Hess. 1996. A spatial theory of positive and negative campaigning. *Games and Economic Behavior* 17(2) 209-229.

Haynes, A.A., S.L. Rhine. 1998. Attack Politics in Presidential Nomination Campaigns: An Examination of the Frequency and Determinants of Intermediated Negative Messages Against Opponents. *Political Research Quarterly* 51(3) 691-721.

Huffman, A., M. Rejebian. 2012. *We're with Nobody: Two Insiders Reveal the Dark Side of American Politics*. Harper-Collins, New York.

Kahn, K. F., P. J. Kenney. 1999. *The Spectacle of U.S. Senate Campaigns*. Princeton University Press. Princeton, New Jersey.

Kuksov, D., R. Shachar, K. Wang. 2013. Advertising and consumers' communications. *Marketing Science* 32 (2) 294-309.

Kolowich, Lindsay. 2015. Mac or Pc? A Brief History of Apple & Microsoft's Ad War. <http://blog.hubspot.com/marketing/mac-pc-advertising-history> downloaded on 3/11/2016.

Lau, R., G. Pomper. 2004. *Negative Campaigning: An Analysis of U.S. Senate Elections*. Rowman & Littlefield Publishers, Inc.

Liaukonyte, Jura, Thales Teixeira, and Kenneth C. Wilbur (2015), "Television Advertising and Online Shopping," *Marketing Science*, 34(3), 311-330.

Lovett, M. J., R. Peres, and L. Xu. 2019. "Can Your Advertising Really Buy Earned Impressions? The Effect of Brand Advertising on Word of Mouth," *Quantitative Marketing and Economics*.

Lovett, M.J., R. Shachar. 2011. The seeds of negativity: knowledge and money. *Marketing Science* 30(3) 430-446.

Lovett, M.J. and R. Staelin. 2016. The Role of Paid, Earned, and Owned Media in Building Entertainment Brands: Reminding, Informing, and Enhancing Enjoyment,” *Marketing Science* , 35(1), 224-241.

Mayzlin, D., J. Shin. 2011. Uninformative advertising as an invitation to search. *Marketing Science* 30(4) 666-685.

Moody, J.W. 2012. Nature vs. Nurture in Negative Campaigning: Examining the Role of Candidate Traits and the Campaign Environment in Negative Advertising. APSA 2012 Annual Meeting Paper.

Polborn, M.K., D.T. Yi. 2006. Informative positive and negative campaigning. *International Quarterly Journal of Political Science* 1(4) 351-371.

Romano, Lois and Jim Vandehei (2004), "Kerry blasts attack on his war record," *Washington Post*, August 20, downloaded from <https://www.post-gazette.com/news/politics-nation/2004/08/20/Kerry-blasts-attack-on-his-war-record/stories/200408200153> on May 17, 2019 at 9:41 AM.

Sabato, Larry (2005), *Divided States of America: The Slash and Burn Politics of the 2004 Presidential Election*, Longman Publishing Group.

Skaperdas, S., B. Grofman. 1995. Modeling negative campaigning. *American Political Science Review* 89(1) 49-61.

Stephen, Andrew T. and Jeff Galak (2012). "The Effects of Traditional and Social Earned Media on Sales: A Study of a Microlending Marketplace,” *Journal of Marketing Research*, 49(5), 624-639.

Theilmann, J., A. Wilhite. 1998. Campaign tactics and the decision to attack. *The Journal of Politics* 60(4) 1050-1062.

Wang, Yanwen, Michael Lewis, and David A. Schweidel (2018), "A Border Strategy Analysis of Ad Source and Message Tone in Senatorial Campaigns,” *Marketing Science*, 37(3), 333-355.

West, Darrell M. (2018). *Air Wars: Television Advertising and Social Media in Election Campaigns 1952-2016*. Sage: CQ Press.

Web Appendix

A A Formal Argument for Equilibrium Behaviors with a Negativity News Cycle

In this section, we develop a theoretical model of strategic tone choice to provide a mathematically rigorous argument for the equilibrium behaviors that might arise under the negativity news cycle. The model that we develop is intended to complement the intuitive arguments made in the paper.

The model is presented in three stages. In subsection A.1, we describe the setting of the model, including the action space and decision rules of the candidates, the news media and the voter. In subsection A.2, we turn to the solution of the model. While the setting is quite general, the role of the news media (as described below) makes it more relevant for congressional elections than presidential (since presidential campaigns typically receive nonstop attention from the media). In subsection A.4, we extend the model to account for incumbency-based asymmetries. In sections A.5 and A.6, we present technical details of the symmetric and asymmetric models, respectively. Throughout the exposition, we will refer to the voter as a male, to the focal candidate, j , as a female, and to her rival, j' , as a male.

A.1 Setting

A.1.1 Candidates

Two candidates, denoted by j and j' , compete to win the vote of a representative individual. To capture the temporal dynamics of an election, we assume that the election campaign lasts three periods, denoted by t , after which the election takes place. We assume that candidate traits are the basis for voter decisions. As in Lovett and Shachar (2011), each candidate has good traits denoted by a (e.g., effective manager) and bad traits denoted by b (e.g., performs badly under pressure). At the start of period 1, each candidate knows her own good traits but none of her rival's bad traits. To learn of her rival's bad traits, a candidate must engage in opposition research, which we refer to colloquially as "digging for dirt." We assume that both candidates are engaged in this opposition

research in every period (see, for example, Huffman and Rejebian 2012). The outcome of this effort is random with the following three possibilities: s/he finds (1) nothing, (2) a minor bad trait or (3) a major bad trait. The probabilities of each of these outcomes are $(1 - q^L - q^H)$, q^L , and q^H respectively where $q^L > 0$, $q^H > 0$, and $q^L + q^H < 1$ by assumption.

We model political advertising via a message sent to the voter by each candidate in every period. Formally, let $m_{j,t}$ denote the message of candidate j in period t . Each message can contain one trait, be it a good trait regarding the focal candidate or a bad one regarding her rival. Formally, $m_{j,t} \in \{\text{good trait of } j, \text{ minor bad trait of } j', \text{ major bad trait of } j'\}$.¹⁶ To reflect candidate familiarity with her own strengths, we assume that she knows at least three of her own good traits. It is therefore feasible to run only positive ads for the duration of the campaign, should she choose to do so.

The decision over which message to send is a central focus of the model and is discussed below as part of the model’s solution; i.e. the “go-negative” versus “go-positive” decisions are equilibrium outcomes of the model.

A.1.2 News Media

Most *congressional* campaigns do not attract constant close attention from the news media. However, following the findings in section 3, we assume that when dirt surfaces, the campaign becomes more attractive from the news perspective and the news media is more likely to pay attention. To reflect this bias toward negativity by the news media, we assume that a campaign is covered by the media only if at least one message of the candidates contains a major bad trait of her opponent. Furthermore, when the news media finds interest in a congressional campaign (i.e., in the candidates and their traits), it is likely to last for a short time beyond when the information first surfaces. To capture this behavior of the press, we let c_t be an indicator variable that is equal to one if the news media is covering the campaign and zero otherwise and assume that $c_t = 1$ iff $m_{j,\tau} = \{\text{major bad trait of } j'\}$ for any j and for $\tau \in \{t - 1, t\}$. Although we model this as a stark on-off coverage, it could be viewed as intense vs. less intense coverage. To reflect the news media

¹⁶In practice, a negative ad can also demean one of the rival’s good traits, for example, when Kerry was attacked for not really being a war hero in the 2004 Swift Boat ad. In the context of this model it would be considered as a message on b .

bias toward negativity, we assume that it covers (and echoes) only the messages with bad trait information and does not pay attention to messages containing good traits. This can be considered a normalization based on our finding in section 3 that the news media covers negative ads more intensely than positive. As we point out below when discussing voter decisions, the news media’s primary influence in our model is to enhance the effect of negative advertising.

A.1.3 The voter

The representative voter believes that each good trait will improve the performance of the candidate, if elected, whereas each bad trait will decrease it. Thus, in practice, his decision rule is quite simple: weighing the good and bad traits of each candidate and voting for the one whose “balance sheet” dominates, taking into account the relative importance of minor versus major bad traits. Accordingly, the individual votes for j iff

$$\sum_t [\delta_t (v_{j,t}^H + v_{j,t}^L) + v_{j,t}^G] > \sum_t [\delta_t (v_{j',t}^H + v_{j',t}^L) + v_{j',t}^G] \quad (1)$$

where

$$\begin{aligned} v_{j,t}^H &= v^H \text{ if } m_{j,t} = \{\text{major bad trait of } j'\}, \text{ and zero otherwise} \\ v_{j,t}^L &= v^L \text{ if } m_{j,t} = \{\text{minor bad trait of } j'\}, \text{ and zero otherwise} \\ v_{j,t}^G &= v^G \text{ if } m_{j,t} = \{\text{good trait of } j\}, \text{ and zero otherwise} \\ \delta_t &= \delta c_t + (1 - c_t) \end{aligned}$$

Equation (1) reflects our assumption that the perception of candidates traits is influenced by news media coverage.¹⁷ Consistent with section 3, we assume that $\delta > 1$ to capture the degree to which news media coverage enhances the perception of these traits. Accordingly, the individual’s perceptions of the impact of a good trait, a minor bad trait and a major bad trait on the voter’s utility are v^G , v^L and v^H , respectively, without news media coverage and v^G , δv^L and δv^H with

¹⁷Of course, another way to write equation (1) would be by subtracting from each candidate her bad traits rather than adding them to her rival. The two approaches are identical in our setting. Similarly, one might allow individuals to abstain from voting. Although we state our model in terms of candidate preferences, we are agnostic about whether the increase in the representative voter is due to mobilizing voters who prefer the candidate or shifting preferences regarding that candidate.

such coverage. To put it differently, without news media coverage voters learn about traits only from ads, but with it, their perception is also influenced by the media. Since we normalize reporting on good traits as no enhancement, the news media only reports on the bad traits, and only enhances these traits.

Finally, we assume that $v^H > v^G > v^L$ and that $\delta v^H > \delta v^L > v^G$. The first inequality is straightforward, simply reflecting the “major” and “minor” aspects of the bad traits. The second inequality allows the news media coverage to have a meaningful impact, since, if the news media coverage was not allowed to change the ordering of these perceptions, it would not have a material role in the model.

So far we have described the action space of the candidates, the news media and the voters, and the decision rules of the last two. In the next subsection, we solve the model and derive the tone decisions of the candidates. These choices determine both the time trend of negativity during the campaign, as well as the response functions of the candidates.

A.2 Equilibrium behaviors

We now turn to the patterns of negativity in equilibrium: the time trend in negativity, the proportion of time that the candidates use the same (versus different) tone, the length of each tone span, and finally the interaction between the candidates. In the main text, we explore each of these behaviors.

For each of these analyses, we need to calculate the probability that the message of, say, candidate j is negative at time t for $t = 1, 2, 3$. To simplify the exposition, let $n_{j,t}$ be an indicator variable equal to 1 if the message of candidate j is about j 's bad trait (i.e., $m_{j,t} = \{\text{minor bad trait of } j'\}$ or $\{\text{major bad trait of } j'\}$) and 0 otherwise.

Note that there are two potential roles for dynamics in this model. First, past choices and outcomes influence current choices through (i) the stock of information and (ii) the attention of the news media, creating a role for state dependence. Second, candidates may have forward-looking incentives to strategically delay revealing a major bad trait regarding their rival to forestall current news media coverage and thereby deter that rival from revealing a minor bad trait. While state dependence always plays a role, it turns out that this strategic incentive is only relevant for a single

sequence of possible events and a subset of the parameter space.¹⁸

To be clear, in the model candidates are always forward-looking. However, for most parameter values the choice that maximizes the current period payoff is also subgame perfect in all possible paths of play (i.e., also maximizes payoffs in the full, forward-looking problem). In other words, only for a subset of the parameter space and a single sequence of events will candidates choose a lower current payoff to secure the option of facing a better outcome in the subsequent period. In what follows, we discuss each case separately, referring to the first as the case with “no strategic delay” and the second as the case “with strategic delay”.

A.2.1 The pattern and timing of negativity

Focusing first on the case without strategic delay incentives, the probability of negativity for the first period is:

$$\text{prob}(n_{j,1} = 1) = q^H + q^L q^H \quad (2)$$

The intuition behind this is as follows. First, it is easy to show that if the candidate finds a major bad trait in period 1 she has no incentive to delay using it. This event is captured by the first element in equation (2). Second, if she discovers a minor bad trait, she uses it only if the news media covers the campaign (otherwise using one of her good traits is more effective).¹⁹ Note that the news media covers the campaign in the first period only if her rival found a major bad trait (and uses it, which, as already mentioned, is always optimal). This event is captured by the second element in (2), $q^L q^H$. Finally, if she finds no bad trait at all, she will air an ad promoting one of her good traits.

The probability of negativity for the second period is:

$$\text{prob}(n_{j,2} = 1) = q^H + q^L q^H + q^L(1 - q^H) [q^H (2 - q^H)] + (1 - q^L - q^H) q^H (1 - q^H) q^L \quad (3)$$

where the first two terms are exactly the same as in the corresponding probability for the first period,

¹⁸In subsection A.4, we extend the model to account for asymmetry in the propensity of finding dirt, and as a result the scope of strategic delay is greatly expanded.

¹⁹Recall that $v^G > v^L$ and that $\delta v^L > v^G$.

following the same logic. The next two terms capture the dynamic state dependence aspects of the model, thereby linking actions across time. These two terms correspond to two sequences of events: (a) any of the candidates revealed a major bad trait in the previous period which led the news media to cover the campaign in periods 1 and 2, and the candidate draws a minor bad trait in period 2, or (b) the candidate has an unused minor bad trait from period 1 and her rival aired a major bad trait in this period (leading the media to start covering the campaign). The first sequence of events, which we describe as the “continued coverage effect,” is captured by the third term in equation (3), and the second sequence of events, which we describe as the “stock effect,” is represented by the fourth term.²⁰ These two dynamic aspects lead to an increase in the tendency to “go negative” in the second period compared with the first.²¹ In other words, the model implies an increase in negativity between the first and the second period.

The probability that j is negative in the third period is:

$$\begin{aligned} \text{prob}(n_{j,3} = 1) &= q^H + q^L q^H + q^L(1 - q^H) [q^H (2 - q^H)] \\ &\quad + (1 - q^H - q^L) q^H (1 - q^H)^2 q^L (2 - q^L - 2q^H) \quad (4) \end{aligned}$$

The only difference between the probabilities of negativity in periods 2 and 3 is in the last element, the “stock effect,” which is now multiplied by $(1 - q^H) (2 - q^L - 2q^H)$. Since $(1 - q^H) (2 - q^L - 2q^H)$ can be either above or below 1, negativity might increase or decrease in the last period.²² The following statement summarizes this result.

Implication 1: For any value of q^L and q^H , negativity is more likely in the second period than

²⁰Specifically, the “continued coverage effect” is represented by $q^L(1 - q^H) [q^H (2 - q^H)]$. The first two elements capture the case in which in this period candidate j found a minor bad trait while her rival found nothing and the element $[q^H (2 - q^H)]$ is the probability that the media started covering the campaign in the previous period. The “stock effect” is represented by $(1 - q^L - q^H) q^H(1 - q^H)q^L$. The first two elements stand for the case that, in the second period, candidate j did not find anything about her rival, but the rival did. Specifically, he revealed a major bad trait that then led to media coverage. In such a case, candidate j cannot send any negative ads unless she uncovered a bad trait in period 1, but was not able to use it. The probability of this event is $(1 - q^H)q^L$.

²¹Formally, we find that:

$$\text{prob}(n_{j,2} = 1) - \text{prob}(n_{j,1} = 1) = q^L(1 - q^H) [q^H (2 - q^H)] + (1 - q^L - q^H) q^H(1 - q^H)q^L > 0$$

²²For example, this element is equal to $\frac{9}{20}$ when $q^H = 0.5$ and $q^L = 0.1$ and it is equal to $\frac{117}{100}$ when $q^H = 0.1$ and $q^L = 0.5$.

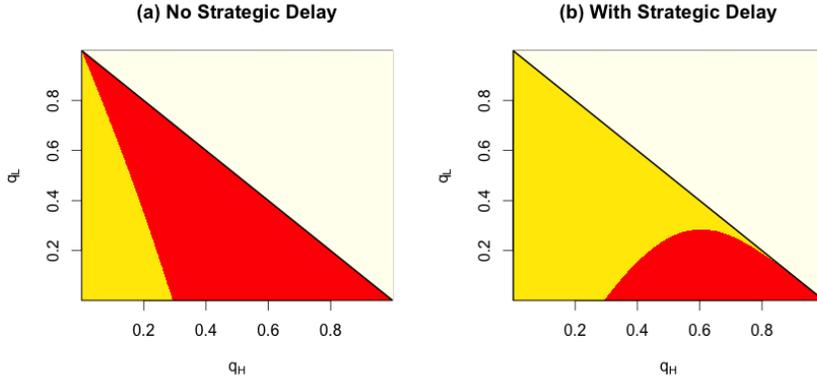


Figure 10: Change in Negativity from 2nd to 3rd Period (No Strategic Delay and With Strategic Delay): Yellow (light) area is where negativity increases, and red (dark) area is where it decreases from the second to the third period.

in the first (i.e. $prob(n_{j,2} = 1) > prob(n_{j,1} = 1)$ $j \in \{1, 2\}$). In contrast, the relationship between negativity in the third and the second periods depends on the specific parameter values. For some, negativity is more likely in the third than in the second (i.e. $prob(n_{j,3} = 1) > prob(n_{j,2} = 1)$ $j \in \{1, 2\}$) and for others it is less likely (i.e. $prob(n_{j,3} = 1) < prob(n_{j,2} = 1)$ $j \in \{1, 2\}$).

The logic behind this result is as follows. In the transition from period 1 to 2 the stock can only increase (since it is zero in the first period) leading to a higher potential for negativity. However, in the transition between periods 2 and 3, the stock can either increase (due to the increase in the length of time over which the candidate can build a stock) or decrease (due to the increase in the opportunities to use the stock) leading to an ambiguous effect on negativity.

Panel (a) in Figure 10 highlights the parameter space that leads to an increase versus a decrease in negativity from the second to the third period for the case where there is no strategic incentive to delay using a major bad trait. The figure illustrates that a downtrend in negativity (red/dark area) is indeed consistent with a meaningful subset of the parameter space.

Furthermore, the left panel also illustrates the role of q^H and q^L in determining whether we get a downtrend or an uptrend in the third period. It shows that an uptrend is more consistent with high q^L rather than high q^H (e.g. q^L values as high as 1 can support the uptrend in negativity, whereas only values less than .3 for q^H can support it). This is due to the fact that a higher q^L

(the chance of finding a minor bad trait) leads candidates to build their stock, while q^H (the chance of finding a major bad trait and thus getting the media interested in the campaign) leads them to drain it.

As noted earlier, for a subset of the parameter space and a single sequence of events, candidates choose a lower current payoff to secure the option of facing a better outcome in the subsequent period. In such cases, candidates have an incentive to delay using a major bad trait (see Web Appendix A.5 for the mathematical details). In particular, this will happen when a candidate who found no dirt on her rival in the first period and a major bad trait in the second faces an opponent who found a minor bad trait in both periods.²³ In such a case, if candidate j uses the major bad trait immediately, the media would cover the campaign in periods 2 and 3 and her rival would use both minor bad traits. If she waits, her rival would use only one minor bad trait, providing an incentive to forestall the media coverage until the next period. At the same time, there are still reasons for her to act immediately (e.g. the prospect that she will reveal another major bad trait in the next period and would be able to use it as well). Accordingly, her decision to delay or not depends on the prospects of finding yet more dirt in period 3 (i.e. on q^L and q^H) and on the value of each outcome (i.e. $\{v^G, v^L, v^H\}$). The subset of the parameter space for which delay is appealing is identified in Web Appendix A.5 and denoted by R .

For this subset of the parameter space, panel (b) of figure 10 presents the areas for which there is an increase versus a decrease in negativity from the second to the third period. Since the forward-looking incentive to delay implies that negativity might move from the second to the third period, the downtrend in negativity (red/dark area) occurs for a smaller subset of the parameter space. That said, even for this subset of the parameter space, we still find that negativity might decrease toward the end of the campaign.

For illustrative purposes, consider a pair of parameter values $q^L = 0.4$ and $q^H = 0.25$. For this pair, strategic delay might be relevant, depending on the values of $\{v^G, v^L, v^H\}$. In other words, for this pair, the candidate strategically delays if $\{v^G, v^L, v^H\}$ belongs to R and does not otherwise. As a result, there is a downtrend in negativity in period 3 outside of R and an uptrend inside R . That is, for this pair, the trend depends on $\{v^G, v^L, v^H\}$. Note that the pair $q^L = 0.4$ and $q^H = 0.25$

²³Note that we assume that the fruits of this effort are common knowledge.

describes a realistic scenario and will be used in the next subsections for illustrative purposes. It is reasonable because it means that the probability of finding a minor bad trait is more likely than the prospect of revealing nothing ($0.4 > 0.35$) and even more likely than the probability of digging up a major bad trait ($0.4 > 0.25$).

In summary, negativity is expected to increase during the campaign, but in some cases it might actually decrease closer to Election Day. This decrease arises because of the finite game and because candidates can use up the opportunities to go negative (i.e., the dirt they have dug up). When opportunities to identify dirt are more limited, the more positive end game is more likely. In section 6.4 we examine this possibility empirically.

A.2.2 Matching on the choice of tone

We now examine another aspect of equilibrium behavior: whether they tend to adopt the same tone or not. In Web Appendix A.5.3 we prove the following result.

Implication 2: In each period t , candidates are more likely to use the same tone than take different tones (i.e. $prob(n_{j,t} = n_{j',t}) > prob(n_{j,t} \neq n_{j',t})$ for all t).

This result is also illustrated in Figure 11, which details the probabilities of both players choosing the same tone under the full range of parameters. In the figure, the area in which the probability of using different tones is the highest is for q^H around 0.5 and for q^L close to zero. The rationale behind this is that for these values the chances are highest that one of the candidates reveals a major bad trait about her rival and the rival cannot respond (unless he also happened to reveal a major bad trait). The probability that the two candidate are using the same tone is higher the lighter the area in the figure. However, while the light areas with high q^H are characterized by a negative tone by both candidates, those with low q^H are characterized by a positive tone. For the parameters we use for illustrative purposes (i.e. $q^L = 0.4$ and $q^H = 0.25$) the probability that the two candidates are using the same tone is quite high, namely 0.79. We examine this implication of the model equilibria in section 6.2.

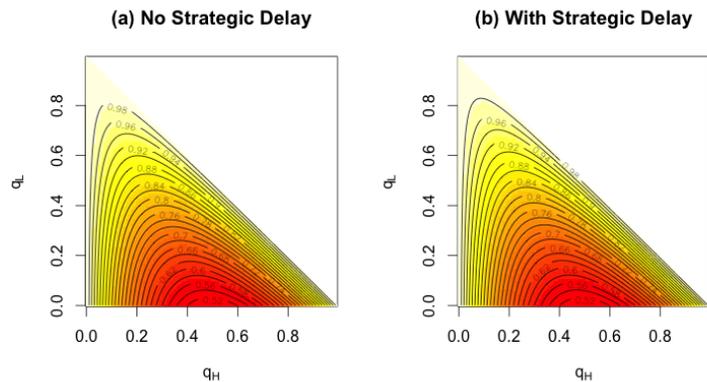


Figure 11: Probability of both players having the same tone

A.3 Persistence in strategy positions and the length of spans

Recall that during the campaign the equilibrium tone is likely to switch, as illustrated in subsection A.2.1. For example, a positive span in the beginning of the campaign might be followed by a negative one. This raises a question regarding the length of each such span. In particular, which span is likely to last longer: positive or negative? Figure 12 addresses this question for the case with a strategic delay incentive (the case without this incentive is quite similar). The figure illustrates that the answer depends on the values of both q^L and q^H . Consider first low values of q^L (which also means low stock levels): for low values of q^H we can expect long spans of positivity; for medium values of q^H we expect long spans in which one of the candidates is using a negative tone while the rival's messages are positive; and finally, for high values of q^H , the longest spans are for negative messages by both candidates. Now consider higher values of q^L : the implications for the same tone spans are quite similar to the above, but the “different tone spans” are much shorter. The rationale is simple: for high levels of q^L the prospect that one candidate goes negative while the rival cannot match is low. For the parameter values we use for illustrative purposes, the length of the positive span is longer than the negative one (1.27 versus 1.03) and both are longer than the “different tone” case (0.54). We examine whether negative-negative span lengths are longer in section 6.3.

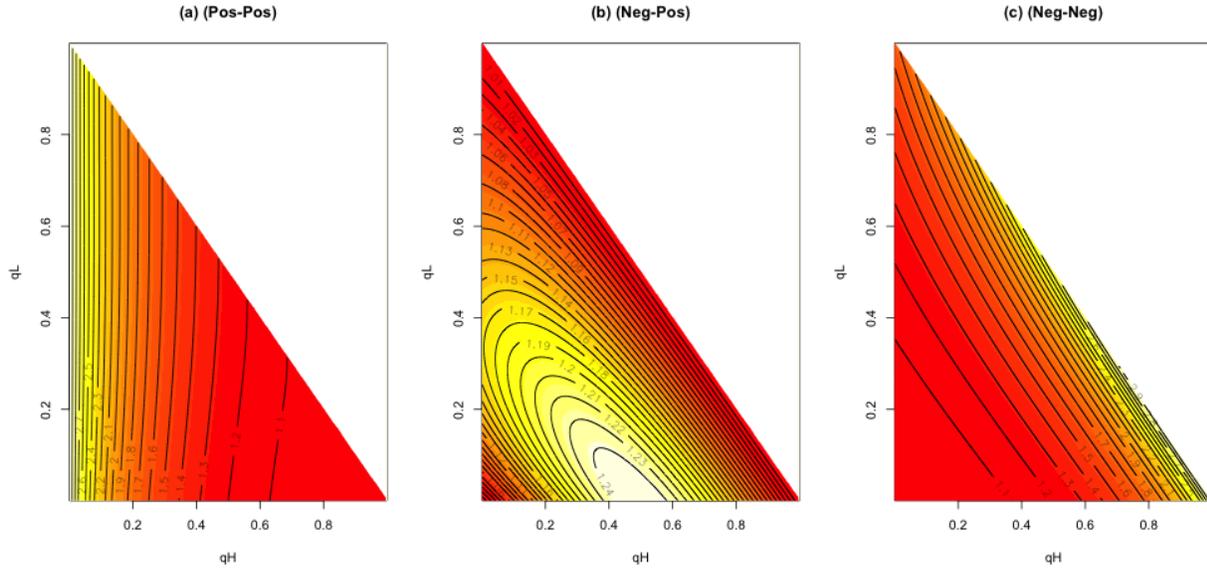


Figure 12: Average length of span of each action pair for case with strategic delay (case without is qualitatively similar).

A.3.1 Candidate Interaction

We now consider the role of strategic interaction, focusing in particular on whether candidates tend to change their tone together, or instead do so independently. Here we are examining whether our simple model can produce the kind of candidate interaction that we measure in the empirical analysis of section 5. Hence, we emphasize the candidates' tendency to move together following a period in which both used the same tone—positive or negative.

Letting $p_t(a | b, c, d) = \text{Prob}(n_{j,t} = a | n_{j',t} = b, n_{j,t-1} = c, n_{j',t-1} = d)$, the following statement summarizes the result (which is shown in Web Appendix A.5.2).

Implication 3:

- (a) Following a period in which both candidates used a positive tone, a candidate is more likely to adopt a negative tone when her rival switches his tone to negative than when he does not (i.e., $p_t(1|1, 0, 0) > p_t(1|0, 0, 0)$ for every t).
- (b) However, following a period in which both candidates were negative, their choices of switching to a positive tone are independent in period 2 (i.e., $p_2(0|0, 1, 1) = p_2(0|1, 1, 1)$),

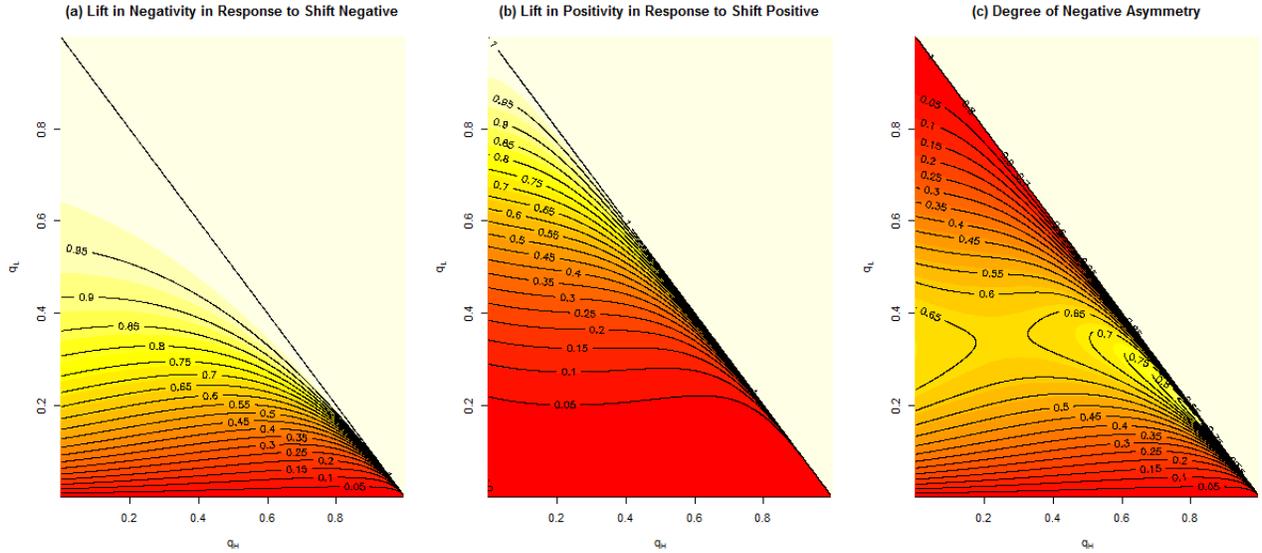


Figure 13: Reaction to competitor tone switches in period 3: Panel (a) is the increase in the probability of going negative in response to the rival’s switching to a negative tone as compared to when the rival stays positive, (b) is the same but for a switch to positive tone, and (c) is the difference between (a) and (b). The figure contains probability increases, not percentage increases.

and

$$(c) \quad \text{for period 3: } \frac{p_3(1|1,0,0)}{p_3(1|0,0,0)} > \frac{p_3(0|0,1,1)}{p_3(0|1,1,1)} > 1.$$

To summarize, the effect of switching tone following both players having a common tone depends on whether the common tone is positive or negative. In particular, switching toward negative seems to be more “contagious.” We refer to this phenomena as an “asymmetric interaction.” The technical details behind these findings appear in Web Appendix A.5.2. However, Figure 13 provides a numerical illustration of this asymmetry for the transition from period 2 to 3. Note that forward-looking considerations are taken into account in both the Web Appendix and Figures.

In Figure 13 panel (a), the axes represent q^L and q^H and the contours indicate the increase in the probability of shifting toward negative in period 3 when the opponent adopts a negative tone. As should be apparent, the likelihood of moving together in the negative direction is always positive and quite high for much of the parameter space. In contrast, Figure 13 panel (b) demonstrates that the likelihood of moving together toward a positive tone is high for a only small subset of the parameter space. Finally, Figure 13 panel (c), which represents the difference between the first

two figures, reveals visually the asymmetry in the interaction between the candidates: at every point in the feasible parameter space, the likelihood of moving together in the negative direction is larger than a corresponding move in the positive direction; for much of the parameter space it is considerably larger.

The intuition behind this “asymmetric interaction” relies on the role of the news media coverage. In our model, switching to a negative tone when both players were previously positive triggers the news media to start covering the campaign. This coverage increases the attractiveness of using an available minor bad trait and thus the likelihood of both players switching to negative. Note that if candidate j found a major bad trait and goes negative, the only scenario in which her rival does not do the same is if he has no negative traits in his stock and failed to uncover one this period as well.

Switching to positive is quite different. In fact, if both players were negative in period 2, there is only one case in which the move by one player depends on the move by the other in period 3. The specifics of this case are: (i) in period 1, at least one of the candidates found a major bad trait, (ii) in period 2, both candidates found a minor bad trait, and (iii) in period 3, candidate j found a minor bad trait. In this case, candidate j 's action depends on whether her rival j' found a major bad trait or not. Specifically, if her rival was not able to find a major bad trait, he will then switch to a positive tone and she will do the same.

To get a sense of the magnitude of this effect, consider the parameters we have been using for illustrative purposes ($q^H = 0.25$ and $q^L = 0.4$). For these values, we find that the probabilities of j turning negative conditional on the action of j' are $Prob(n_{j,3} = 1 | n_{j',3} = 1, n_{j,2} = n_{j',2} = 0) = 0.929$ and $Prob(n_{j,3} = 1 | n_{j',3} = 0, n_{j,2} = n_{j',2} = 0) = 0.049$. In contrast, the probabilities for turning positive are $Prob(n_{j,3} = 0 | n_{j',3} = 0, n_{j,2} = n_{j',2} = 1) = 0.49$ and $Prob(n_{j,3} = 0 | n_{j',3} = 1, n_{j,2} = n_{j',2} = 1) = 0.24$. Thus, while the lift in negativity is over 0.88, the lift in positivity is less than 0.25. Figure 13 panel (c) illustrates that this magnitude is most pronounced for moderate levels of q^L and for moderate and higher levels of q^H .

This “asymmetric interaction” is consistent with the indirect effect of candidate interaction that we find in section ???. Although we have developed the model from the assumptions that underlie the negativity news cycle, this consistency arises from the equilibrium behaviors. As a result, this

provides an additional demonstration of the suitability of this simple model to capture the complex phenomena of negativity news cycles.

A.4 Extension: Incumbency-based asymmetry

So far we have assumed that the two candidates are fundamentally the same. In reality, candidates often differ along important dimensions. A key practical distinction in many races is whether the candidate is an incumbent or a challenger. We turn now to this distinction, highlighting the ways in which it changes incentives and outcomes.

From the perspective of the model, incumbency status is most likely to impact the ability to uncover damaging information. An incumbent has spent more time in the public eye and has an established record. Furthermore, many of her actions fall in the public domain, making it easier to collect information on them. While some challengers are reasonably known, many of them are not and collecting information on them is not a trivial task.

To account for this fundamental difference between the candidates, we adjust the “digging for dirt” function so that the prospect of uncovering an incumbent’s bad trait is higher compared to her rival. Specifically, we let the probability that the challenger uncovers a minor bad trait regarding the incumbent be $q^L + \epsilon$, and we keep the mirror probability (i.e. that the incumbent uncovers a minor bad trait regarding the challenger) at q^L . Accordingly, the parameter ϵ represents the degree of asymmetry between the two candidates. While we introduce asymmetry with respect to q^L , we keep the probability of uncovering a major bad trait, q^H , the same for both candidates. This is intended to capture the possibility that being in the public eye during the previous term increases the prospect of finding minor dirt on a candidate related to various policy decisions, votes, and statements, but not necessarily a scandal. To put it differently, uncovering a major bad trait requires research into records that are not publicly available and thus, the incumbent is not more exposed on this front than the challenger. Since we keep the probability of uncovering a major bad trait, q^H , the same for both candidates, the prospect of not finding any dirt on your rival is also asymmetric. Specifically, the challenger is less likely to find no dirt ($1 - q^H - q^L - \epsilon$) than the incumbent ($1 - q^H - q^L$).

It turns out that implications 1-3 continue to hold when $\epsilon > 0$ except in one obvious case.

With $\epsilon = 0$, candidates were more likely to use the same tone than take different tones. When we introduce asymmetry between the candidates (i.e. $\epsilon > 0$), differentiation is, of course, more likely and thus in some cases candidates are more likely to take different tones.²⁴ Note that while implications 1-3 continue to hold (with implication 2 holding for only a subset of the parameters under asymmetry), the scope for strategic delay is significantly expanded under asymmetry. In particular, the region of the parameter space and sequences of events that yield delay are larger and more numerous, making the proofs more involved. As such, the full results of this expanded analysis are presented in Web Appendix A.6.

A.5 Technical Details of Theoretical Model Results-Symmetric Case

A.5.1 The pattern of negativity with the strategic delaying incentive

In this section, we provide technical details related to the claims made in section 2 related to strategic incentives to delay in the symmetric model. As mentioned in the text, a forward-looking candidate might delay the use of dirt found on her rival in one specific sequence of events and for a subset of the parameter space. Furthermore, the text also describes the specific sequence of events. Briefly, delaying is appealing in the symmetric model when in period 2 one candidate with no stock draws H while her rival draws L in periods 1 and 2.

Here we (a) describe the the subset of the parameter space for which the candidates decides to delay, and (b) the impact of the strategic incentive on the pattern of negativity. In the next subsection we describe the effect of the strategic incentive on the interaction between the candidates.

The subset of the parameter space. The following two equations presents the incentive to play a high bad trait now (B_{now}) and the incentive to wait (B_{wait}).

$$B_{now} = \delta * v_H + \delta * q_H * v_H + \delta * q_L * v_L + q_N * v_G - (\delta * v_L + q_H * \delta * v_H + \delta * v_L (q_N + q_L)) = \delta(v_H - v_L) + q_N * (v_G - \delta * v_L)$$

$$B_{wait} = v_G + \delta * v_H - (v_G + q_H * \delta * v_H + (1 - q_H) * \delta * v_L) = \delta(q_N + q_L) * (v_H - v_L)$$

²⁴For $\epsilon = 0$ we found that the probability of using different tones is the highest and closest to 0.5 for q^H around 0.5 and for q^L close to zero. For $\epsilon > 0$ this probability can become greater than 50 percent and thus differentiation would be more likely than using the same tone.

Comparing these two incentives, we get that the candidate decides to wait if $\delta(v_H - v_L) + q_N * (v_G - \delta * v_L) < \delta(q_N + q_L) * (v_H - v_L)$, which can be simplified to $\delta * v_H * q_H + q_N * v_G < \delta * v_L (q_H + q_N)$.²⁵ Let R be the set of q^L and q^H for which this condition holds. This condition defines the subset of the parameter space – i.e. R – where the incentive to delay is stronger than the incentive to use the H . This incentive implies that the probabilities of going negative in the 2nd and 3rd periods will differ inside versus outside the subspace.

The impact on the pattern of negativity. As a result of the strategic delaying, both the second and third period probabilities of going negative differ from the case without strategic delay. Directionally, the second period is going to be less negative (because there is a case in which the H will be delayed and so the tone of both players is positive). The probability of this occurrence is $(1 - q^L - q^H) q^H q^L q^L$. When adjusting the probability of going negative in the second period (as it appears in the text for the myopic case) we need to subtract it (i.e. $(1 - q^L - q^H) q^H q^L q^L$). This leads to the period two negativity of

$$prob(n_{j,2} = 1) = q^H + q^L q^H + q^L (1 - q^H) [q^H (2 - q^H)] + (1 - q^L - q^H) q^H (1 - q^H) q^L - (1 - q^L - q^H) q^H q^L q^L$$

The third period, however, will be more negative under the strategic incentive than without it. The reason for the increase in negativity is, of course, the candidate who delayed. She will surely use the stocked H in period 3 even if she draws no bad traits in this period. Thus, she might become more negative. Notice that her rival will be negative in the third period in any case. In the case of no-delay, he would be negative since he has at least two L s (from periods 1 and 2). In the case of delay, he clearly has enough negativity in his stock and might even get H in the last period. Thus, period 3 might be more negative and the added probability is $(1 - q^L - q^H)^3 q^H q^L q^L$. As a result, the updated probability of negativity in period 3 is

²⁵Note that this condition can hold for arbitrary values of q_N and q_H .

$$\begin{aligned}
\text{prob}(n_{j,3} = 1) &= q^H + q^L q^H + q^L(1 - q^H) [q^H (2 - q^H)] \\
&+ (1 - q^H - q^L) q^H (1 - q^H)^2 q^L (2 - q^L - 2q^H) + (1 - q^L - q^H)^2 q^H q^L q^L \quad (5)
\end{aligned}$$

These probabilities are used to create figure 10 panel (b). In this figure it is clear that the parameter values for which negativity increases is larger under strategic waiting than without it.

A.5.2 The interaction between the candidates with strategic delaying

Here we present the calculations behind Figure 13 which describes the reaction of candidate j to a switch in tone by her rival. These calculations take into account, among others, the forward-looking incentive to delay. We start by considering the case of switching toward positive. For the transition from period 1 to 2 we get:

$$\begin{aligned}
\text{Prob}(n_{j,2} = 0 | n_{j',2} = 0, n_{j,1} = n_{j',1} = 1) &= (1 - q^H - q^L) \\
\text{Prob}(n_{j,2} = 0 | n_{j',2} = 1, n_{j,1} = n_{j',1} = 1) &= (1 - q^H - q^L)
\end{aligned}$$

Of course, in this case it is obvious that switching by the rival (i.e., candidate j') has no impact on the actions of the focal candidate (i.e., j).

Next we consider the case in which the rival switches to a negative tone in period 2. To simplify notation and make the equations less cumbersome, we use the short-hand $q_H = H$, $q_L = L$, $(1 - q_H - q_L) = N$, and $M = H(2 - H)$. Furthermore, we first present the calculations under no strategic delay and then add the strategic delay incentive. Notice that in order to show that:

$$\text{Prob}(n_{j,2} = 1 | n_{j',2} = 1, n_{j,1} = n_{j',1} = 0) > \text{Prob}(n_{j,2} = 1 | n_{j',2} = 0, n_{j,1} = n_{j',1} = 0)$$

all we need to show is that²⁶:

$$\begin{aligned} & Prob(n_{j,2} = 1, n_{j',2} = 1, n_{j,1} = n_{j',1} = 0) Prob(n_{j,2} = 0, n_{j',2} = 0, n_{j,1} = n_{j',1} = 0) > \\ & Prob(n_{j,2} = 1, n_{j',2} = 0, n_{j,1} = n_{j',1} = 0)^2, \end{aligned}$$

which means that we need to show that:

$$[N^2(2L + H) + NL(2 + 2L) + L^2(2 - H)] H [(N + L)^4] > [N^2 H (N + L)]^2.$$

This is equivalent to showing that:

$$\frac{[N^2(2L + H) + NL(2 + L) + L^2(2 - H)] [(N + L)^4]}{H [N^2(N + L)]^2} > 1$$

or that:

$$\frac{[N^2(2L + H)] [(N + L)^4]}{H [N^2(N + L)]^2} + X > 1,$$

where

$$X \equiv \frac{[NL(2 + L) + L^2(2 - H)] [(N + L)^4]}{H [N^2(N + L)]^2} > 0.$$

This can be rewritten as

$$\frac{(2L + H)(N + L)^2}{HN^2} + X > 1,$$

and since $(N + L)^2 > N^2$ and $(2L + H) > H$ the above is true and we have shown that a candidate is more likely to switch her tone to negative if the rival did the same. All in all, the above indicates that for the transition from the 1st to the 2nd period, the probability of going negative when the opponent goes positive is smaller than the probability of going negative when the opponent goes negative.

²⁶Recall that

$$Prob(n_{j,2} = 1 | n_{j',2} = 1, n_{j,1} = n_{j',1} = 0) = \frac{Prob(n_{j,2} = 1, n_{j',2} = 1, n_{j,1} = n_{j',1} = 0)}{Prob(n_{j,2} = 1, n_{j',2} = 1, n_{j,1} = n_{j',1} = 0) + Prob(n_{j,2} = 0, n_{j',2} = 1, n_{j,1} = n_{j',1} = 0)}$$

$$Prob(n_{j,2} = 1 | n_{j',2} = 0, n_{j,1} = n_{j',1} = 0) = \frac{Prob(n_{j,2} = 1, n_{j',2} = 0, n_{j,1} = n_{j',1} = 0)}{Prob(n_{j,2} = 1, n_{j',2} = 0, n_{j,1} = n_{j',1} = 0) + Prob(n_{j,2} = 0, n_{j',2} = 0, n_{j,1} = n_{j',1} = 0)}$$

This tendency to act the same as the rival for a negative switch is also true for the subset of the parameter space R under which strategic delay occurs. Following the logic above, we need to show that

$$[N^2(2L + H) + NL(2 + L) + L^2(2 - H)] H [(N + L)^4 + L^2HN] > [N^2H(N + L)]^2.$$

This is equivalent to showing that

$$\frac{[N^2(2L + H) + NL(2 + L) + L^2(2 - H)] [(N + L)^4 + L^2HN]}{H [N^2(N + L)]^2} > 1$$

or that

$$\frac{[N^2(2L + H)] [(N + L)^4]}{H [N^2(N + L)]^2} + X' > 1,$$

where

$$X' \equiv \frac{[NL(2 + L) + L^2(2 - H)] [(N + L)^4 + L^2HN] + [N^2(2L + H)] [L^2HN]}{H [N^2(N + L)]^2} > 0.$$

This can be rewritten as

$$\frac{(2L + H)(N + L)^2}{HN^2} + X' > 1,$$

and since $(N + L)^2 > N^2$ and $(2L + H) > H$ the above is true and we have shown that the tendency to act the same as the rival for a negative switch is also true for the subset of the parameter space R under which strategic delay occurs.

Next we present the transitions from period 2 to 3. These transitions are the focus of the analysis in the main body of the paper, including Figure 13.

We start by presenting the conditional probabilities of switching tone to negative for the set of parameters for which delaying is not an attractive option, i.e., not in R .

$$\begin{aligned} & \text{Prob}(n_{3,2} = 1 | n_{3,1} = 1, n_{2,1} = n_{2,2} = 0) = \\ & \frac{N^2(H^2 + 2HL + 2HN + N^2)H(2L + H) + N^2(2NL + L^2)H2K + L^2(4N^2 + 4NL + L^2)H(N + K)}{N^2(H^2 + 2HL + 2HN + N^2)HK + N^2(2NL + L^2)H(N + 2K) + L^2(4N^2 + 4NL + L^2)H(N + K)} \end{aligned}$$

$$\begin{aligned}
& \text{Prob}(n_{3,2} = 1 | n_{3,1} = 0, n_{2,1} = n_{2,2} = 0) = \\
& \frac{N^2(H^2+2HL+2HN+N^2)NH+N^2(2NL+L^2)HN}{N^2(H^2+2HL+2HN+N^2)(N+L(N+L))+N^2(2NL+L^2)(2(L+N)^2+HN)+L^2(4N^2+4NL+L^2)(L+N)^2}
\end{aligned}$$

For the subset of the parameter space for which delaying is possible (i.e., in R), the probabilities become

$$\begin{aligned}
& \text{Prob}(n_{3,2} = 1 | n_{3,1} = 1, n_{2,1} = n_{2,2} = 0) = \\
& \frac{N^2(H^2+2HL+2HN+N^2)H(2L+H)+N^2(2NL+L^2)H(2K)+L^2(4N^2+4NL+L^2)H(N+K)+NHL^2}{N^2(H^2+2HL+2HN+N^2)HK+N^2(2NL+L^2)H(N+2K)+L^2(4N^2+4NL+L^2)H(N+K)+NHL^2}
\end{aligned}$$

$$\begin{aligned}
& \text{Prob}(n_{3,2} = 1 | n_{3,1} = 0, n_{2,1} = n_{2,2} = 0) = \\
& \frac{N^2(H^2+2HL+2HN+N^2)NH+N^2(2NL+L^2)HN}{N^2(H^2+2HL+2HN+N^2)(N+L(N+L))+N^2(2NL+L^2)(2(L+N)^2+HN)+L^2(4N^2+4NL+L^2)(L+N)^2}
\end{aligned}$$

While the probabilities above describe the case of switching to a negative tone the ones below are for the events in which the candidate switch in the positive direction. We start by considering the set of parameters not in R for which delaying is not attractive. We get:

$$\begin{aligned}
& \text{Prob}(n_{3,2} = 1 | n_{3,1} = 1, n_{2,1} = n_{2,2} = 0) = \\
& \frac{(N^2H(4L+H)+(H^2+2HL+2HN)(H^2+2HL))(H+L)N+NLH(3L+H)N+L^2H^2N(N+K)}{(N^2H(4L+H)+(H^2+2HL+2HN)(H^2+2HL))(H+L)+NLH(3L+H)(K+H)+L^2H(2L+H)+L^2H^2(N+K)K}
\end{aligned}$$

$$\begin{aligned}
& \text{Prob}(n_{3,2} = 1 | n_{3,1} = 0, n_{2,1} = n_{2,2} = 0) = \\
& \frac{(N^2H(4L+H)+(H^2+2HL+2HN)(H^2+2HL))N^2+L^2H(N+K)(N+L)^2}{(N^2H(4L+H)+(H^2+2HL+2HN)(H^2+2HL))N+NLH(3L+H)N+L^2H(N+K)((N+L)^2+HN)}
\end{aligned}$$

When we consider the subset R for which delay might be possible, we get:

$$\begin{aligned}
& \text{Prob}(n_{3,2} = 1 | n_{3,1} = 1, n_{2,1} = n_{2,2} = 0) = \\
& \frac{(N^2H(4L+H)+(H^2+2HL+2HN)(H^2+2HL))(H+L)N+NLH(2L+H)N+L^2H^2N(N+K)}{(N^2H(4L+H)+(H^2+2HL+2HN)(H^2+2HL))(H+L)+NLH(2L+H)(K+H)+L^2H(2L+H)+L^2H^2(N+K)K}
\end{aligned}$$

$$Prob(n_{3,2} = 1 | n_{3,1} = 0, n_{2,1} = n_{2,2} = 0) = \frac{(N^2H(4L+H)+(H^2+2HL+2HN)(H^2+2HL))N^2+L^2H(N+K)(N+L)^2}{(N^2H(4L+H)+(H^2+2HL+2HN)(H^2+2HL))N+HN)+NLH(2L+H)N+L^2H(N+K)((N+L)^2+HN)}$$

These probabilities are used to generate figure 13 that is presented in subsection 5.2. This figure illustrates the “asymmetric reaction function” numerically for the transition from period 2 to 3.

A.5.3 Proof that same tone is more likely

We prove for periods 1 and 2 that the candidates are more likely to use the same tone. In period 1, the probability of different tone is $2HN$. Since the maximum value of $2H(1 - H)$ is 0.5, and $N < (1 - H)$ (recall $L > 0$) we know for sure that $2HN < 0.5$.

In periods 2 the probability of different tone is (ignoring strategic delay for now):

$$\Pr(E_0 \cap E_1)2HN + \Pr(E_0 \cap E_2)HN + \Pr(E_0 \cap E_3)0 + \Pr(E_0^C)2N(1 - N)$$

where the events are defined as follows: $E_1 = \{\text{none of the candidates has a stock}\}$, $E_2 = \{\text{one of the candidates has a stock}\}$, $E_3 = \{\text{both candidates have a stock}\}$, and $E_0 = \{\text{media was off in previous p}$

We have already shown that $2HN$ is smaller than 0.5, and of course HN and 0 are also smaller than 0.5. Thus, while $2N(1 - N)$ can be equal to 0.5 (when $N = 0.5$) the resulting weighted average of $2HN$, HN , 0, and $2N(1 - N)$ must be smaller than 0.5.

In period 3 the probability is

$$\Pr(E_0 \cap E_1)2HN + \Pr(E_0 \cap E_2)HN + \Pr(E_0 \cap E_3)0 + \Pr(E_0^C \cap E_1)2N(1 - N) + \Pr(E_0^C \cap E_2)N + \Pr(E_0^C \cap E_3)0$$

We analyzed this quantity numerically and included it in the analysis presented in section ??.

Finally, strategic delay does not change much. In period 2 it is replacing a cases in which both were negative with one in which both are positive, and thus changes nothing, and in period 3 it is replacing something with a case of negative-negative and thus weakly increase the probability of same tone.

A.6 Technical Details of the Asymmetric Incumbency Model

For the pattern of negativity over time as summarized in implication 1, it is straightforward to see that both statements continue to hold under the incumbency asymmetry. Notice that equations 2-4, which correspond to the probability of going negative in periods 1, 2, and 3, respectively, are for the region of the parameter space where strategic delay doesn't occur in equilibrium. Without this strategic delay possibility, the probability of going negative is "independent" of whether the rival uncovers a low bad trait. In other words, the probability of going negative only depends on whether the opponent plays a major bad trait, since such a trait induces media coverage. As a result, the incumbent has the same probabilities as presented in equations 2-4 and the challenger only differs in that the q_L is replaced by $q_{L,I} = q_L + \epsilon$. Hence, for the region of the parameter space where there is no strategic delay, the formulae for the probabilities of negativity for the challenger and incumbent have not changed (only replacing q_L with $q_L + \epsilon$). As a result, the pattern of negativity also does not change given $\epsilon > 0$, and implication 1 still holds under incumbency when there is no strategic delay. Implication 1 has two statements: the first indicates that negativity is always higher in the second period than in the first and the second statement indicates that for some parameter values negativity decreases from the second to the third period. We have already established the second statement for some parameters values, but the first statement we need to show also for all parameter values, hence also when there is strategic delay.

To evaluate the increase in negativity from the first to the second period under strategic delay, we have to consider the various strategic delay cases. When one player has H and the other has $\{L, L\}$ in stock, the affect on negativity has the same qualitative nature whether $\epsilon = 0$ or $\epsilon > 0$. Hence, this case does not affect our previous analysis. Consider next the period 2 delay when the incumbent has H and the challenger has L . This situation reduces negativity in period 2, but only by $q_H q_L q_N^2$. Inspection of equations 2-3 indicate this reduced negativity is not sufficient to switch the overall negativity trend.

Finally, we evaluate the case when the incumbent has H and the challenger has L in the first period. This case is more involved due to the value function calculations and the multiple potential delay cases in the second period. Consider a region of the parameter space G . Let this region induce incentives to delay for some subset of possible delay cases, which we denote by D . D excludes the

case where delay occurs in period 1. Let G' be a region of the parameter space that adds to D only the delay case for period 1. Comparing these two regions, we can see that under G' in period 1 the probability of going negative will be $q_H q_L$ less than under G . Hence, period 1 delay makes the first period less negative and the implication 1 more likely. In period 2, the delay under G' implies media is not turned on as it would be under G . If the incumbent doesn't use the H , this could lead to less negativity in the second period. However, not using the H is only optimal when strategic delay is optimal. This occurs only if the incumbent uncovers nothing and the challenger uncovers either nothing or L . However, in either case, this reduction in the probability of going negative in the second period is always smaller than the increase in going positive in the first period. Hence, implication 1 always holds.

We now turn to Implication 2, which states that candidates are more likely to use the same tone than take different tones. This implication does change for intuitive reasons. Because the challenger has an advantage in uncovering dirt about the opponent, the challenger goes more negative. However, as previously noted when $\epsilon = 0$, the parameter space of q_L and q_H attains equality in the probability of both being the same (exactly when $q_H = .5$ and $q_L = 0$). Since the asymmetry in q_L must increase the asymmetry in actions, this necessarily implies that the set of parameters for which asymmetry in actions is more likely than symmetry must be non-null. To see this, consider after the news media is turned on, the challenger is more likely to draw an L than the incumbent, resulting in greater asymmetry.

Implication 3 requires more involved calculations to demonstrate. First consider the region of parameter space with no strategic delay. In this region, the period 1 probabilities of both going positive (negative) and incumbent/challenger going negative (positive) in period 2 are

$$\begin{aligned}
p(n_{I,1} = 0, n_{C,1} = 0, n_{I,2} = 1) &= NN_I H (1 + L) + NL_I H (1 + L) + LN_I H (1 + L + N) + LL_I H (1 + L + N) \\
&= N (L + N) H (1 + L) + L * (L + N) * H * (1 + L + N) \\
p(n_{I,1} = 0, n_{C,1} = 0, n_{C,2} = 1) &= NN_I H (1 + L_I) + NL_I H (1 + L_I + N_I) + LN_I H (1 + L_I) + LL_I H (1 + L_I + N_I) \\
p(n_{I,1} = 1, n_{C,1} = 1, n_{C,2} = 0) &= H (L + L_I + H) N \\
p(n_{I,1} = 1, n_{C,1} = 1, n_{I,2} = 0) &= H (L + L_I + H) N_I.
\end{aligned}$$

The period 2 joint probabilities of both players going negative (positive) and that they both went positive (negative) in period 1 are

$$\begin{aligned}
p(n_{I,1} = 0, n_{C,1} = 0, n_{I,2} = 1, n_{C,2} = 1) = \\
NN_I H (L + L_I + H) + NL_I H (1 + L) + N_I LH (1 + L_I) + LL_I H (1 + L + N) \\
p(n_{I,1} = 1, n_{C,1} = 1, n_{I,2} = 0, n_{C,2} = 0) = \\
H (L + L_I + H) NN_I.
\end{aligned}$$

The period 1 probabilities of both going positive (negative) and incumbent/challenger going positive (negative) in period 2 are

$$\begin{aligned}
p(n_{I,1} = 0, n_{C,1} = 0, n_{I,2} = 0) &= (NN_I + NL_I) (N + LN_I + LL_I) + (LN_I + LL_I) (NN_I + NL_I + LN_I + LL_I) \\
p(n_{I,1} = 0, n_{C,1} = 0, n_{C,2} = 0) &= (NN_I + LN_I) (N + NL_I + LL_I) + (NL_I + LL_I) (NN_I + NL_I + LN_I + LL_I) \\
p(n_{I,1} = 1, n_{C,1} = 1, n_{C,2} = 1) &= H (L + L_I + H) (H + L) \\
p(n_{I,1} = 1, n_{C,1} = 1, n_{I,2} = 1) &= H (L + L_I + H) (H + L_I).
\end{aligned}$$

The period 2 joint probabilities of one player going positive while the other goes negative and both positive (negative) in period 1 are

$$\begin{aligned}
p(n_{I,1} = 0, n_{C,1} = 0, n_{I,2} = 0, n_{C,2} = 1) &= NN_I NH + NL_I NH \\
p(n_{I,1} = 0, n_{C,1} = 0, n_{C,2} = 0, n_{I,2} = 1) &= NN_I HN_I + N_I LHN_I \\
p(n_{I,1} = 1, n_{C,1} = 1, n_{I,2} = 1, n_{C,2} = 0) &= \\
&H (L + L_I + H) N_I (L + H) \\
p(n_{I,1} = 1, n_{C,1} = 1, n_{C,2} = 1, n_{I,2} = 0) &= \\
&H (L + L_I + H) N (L_I + H).
\end{aligned}$$

The objects of interest are the lift in probability that you go negative when your opponent goes negative after both having gone positive (vs. your opponent staying positive) and symmetrically that you go positive when your opponent goes positive after both having gone negative (vs. your opponent staying negative). These probability lifts are

$$\begin{aligned}
NegLift &= p(n_{j',2} = 1 \mid n_{j,1} = n_{j',1} = 0, n_{j,2} = 1) - p(n_{j',2} = 1 \mid n_{j,1} = n_{j',1} = 0, n_{j,2} = 0) \\
&= \frac{p(n_{j,1}=n_{j',1}=0, n_{j,2}=1, n_{j',2}=1)}{p(n_{j,1}=n_{j',1}=0, n_{j,2}=1)} - \frac{p(n_{j,1}=n_{j',1}=0, n_{j,2}=0, n_{j',2}=1)}{p(n_{j,1}=n_{j',1}=0, n_{j,2}=0)} \\
PosLift &= p(n_{j',2} = 0 \mid n_{j,1} = n_{j',1} = 1, n_{j,2} = 0) - p(n_{j',2} = 0 \mid n_{j,1} = n_{j',1} = 1, n_{j,2} = 1) \\
&= \frac{p(n_{j,1}=n_{j',1}=1, n_{j,2}=0, n_{j',2}=0)}{p(n_{j,1}=n_{j',1}=1, n_{j,2}=0)} - \frac{p(n_{j,1}=n_{j',1}=1, n_{j,2}=1, n_{j',2}=0)}{p(n_{j,1}=n_{j',1}=1, n_{j,2}=1)}.
\end{aligned}$$

Based on numerical analysis of these probabilities and setting the ϵ to a value of 0.05, we conclude that the lift in negativity when responding to the opponent moving toward negative is always greater than zero, whereas the corresponding lift in positivity when the opponent moves positive is zero. The latter is due to the independence of actions when media is turned on. We further find that the challenger has a larger increase in negativity than the incumbent.

The third period probabilities are similar in form, but are more complicated. To calculate the period 3 probabilities, let us first define several probabilities related to getting varying stock and media states with both players being positive or negative. The first set relates to when both players are positive and media is off and are referred to as A (no stock), B (0, L), C (L , 0), and D (L , L):

$$A = NN_I NN_I + NN_I H (1 + N_I + L_I)$$

$$B = NN_I N L_I + N L_I (N N_I + N L_I)$$

$$C = NN_I L N_I + L N_I (N N_I + L N_I)$$

$$D = NN_I L L_I + N L_I (L N_I + L L_I) + L N_I (N L_I + L L_I) + L L_I (N N_I + N L_I + N_I L + L L_I).$$

The probabilities of both players going positive in period 2 and the incumbent/challenger/both going negative in period 3 are

$$\begin{aligned}
&p(n_{I,2} = 0, n_{C,2} = 0, n_{I,3} = 1) = \\
&AH (1 + L) + BH (1 + L) + CH (1 + L + N) + DH (1 + L + N) \\
&p(n_{I,2} = 0, n_{C,2} = 0, n_{C,3} = 1) = \\
&AH (1 + L_I) + CH (1 + L_I) + BH (1 + L_I + N_I) + DH (1 + L_I + N_I) \\
&p(n_{I,2} = 0, n_{C,2} = 0, n_{I,3} = 1, n_{C,3} = 1) = \\
&AH (L + L_I + H) + BH (1 + L) + CH (1 + L_I) + DH (1 + L + N).
\end{aligned}$$

The probabilities of both players going positive in period 2 and one player going positive (and

the other going negative) in period 3 are

$$\begin{aligned}
& p(n_{I,2} = 0, n_{C,2} = 0, n_{I,3} = 0) = \\
& (A + B)(N + LN_I + LL_I) + (C + D)(NN_I + NL_I + LN_I + LL_I) \\
& p(n_{I,2} = 0, n_{C,2} = 0, n_{C,3} = 0) = \\
& (A + C)(N + NL_I + LL_I) + (B + D)(NN_I + NL_I + LN_I + LL_I) \\
& p(n_{I,2} = 0, n_{C,2} = 0, n_{I,3} = 0, n_{C,3} = 1) = \\
& (A + B)(NH) \\
& p(n_{I,2} = 0, n_{C,2} = 0, n_{C,3} = 0, n_{I,3} = 1) = \\
& (A + C)HN_I.
\end{aligned}$$

The second set relates to when both players are negative and are referred to as A' (Media on, no stock), B' (Media on, stock $(0, L)$), C' (Media on, stock $(L, 0)$), D' (Media on, stock (L, L)), and E' (Media off, no stock):

$$\begin{aligned}
A' &= NN_I H (2 - H) + H (1 + N + L) H (L + L_I + H) \\
B' &= NL_I H (2L + L_I + H) \\
C' &= LN_I H (L + 2L_I + H) \\
D' &= LL_I H (L + L_I + H) \\
E' &= H (1 + N + L) LL_I.
\end{aligned}$$

The probabilities of both players going negative in period 2 and the incumbent/challenger/both going positive in period 3 are

$$\begin{aligned}
& p(n_{I,2} = 1, n_{C,2} = 1, n_{I,3} = 0) = \\
& (A' + B')N + E'(N + LN_I + LL_I) \\
& p(n_{I,2} = 1, n_{C,2} = 1, n_{C,3} = 0) = \\
& (A' + C')N_I + E'(N_I + NL_I + LL_I) \\
& p(n_{I,2} = 1, n_{C,2} = 1, n_{I,3} = 0, n_{C,3} = 0) = \\
& A'NN_I + E'(NN_I + NL_I + LN_I + LL_I).
\end{aligned}$$

The probabilities of both players going negative in period 2 and one player going negative (and

the other going positive) in period 3 are

$$\begin{aligned}
& p(n_{I,2} = 1, n_{C,2} = 1, n_{I,3} = 1) = \\
& (A' + B')(H + L) + C' + D' + E'H(1 + L) \\
& p(n_{I,2} = 1, n_{C,2} = 1, n_{C,3} = 1) = \\
& (A' + C')(H + L_I) + B' + D' + E'H(1 + L_I) \\
& p(n_{I,2} = 1, n_{C,2} = 1, n_{I,3} = 1, n_{C,3} = 0) = \\
& A'N_I(H + L) + C'N_I + E'HN_I \\
& p(n_{I,2} = 1, n_{C,2} = 1, n_{C,3} = 1, n_{I,3} = 0) = \\
& A'N(H + L_I) + B'N + E'HN.
\end{aligned}$$

We calculate numerically the negativity and positivity lift for period 3 as we did for period 2 setting the ϵ to a value of 0.05. The plots for the lift in negativity, positivity and the difference between the two are contained in Figure 14 for the incumbent and Figure 15 for the challenger. We can see that the positivity lift is generally positive and that the negativity lift is always positive. As in the main analysis, we can also see that the lift is larger for the negative than positive reaction. Although this differs mildly between the incumbent and challenger, the broad implication that the negative lift is always greater than the positive lift holds for all feasible parameters values of q_H and q_L for the given value of $\epsilon = .05$. This suffices to support our statements in section A.4.

Finally, it is easy to see that strategic delay (a) can only increase the correlation in player shifts to negativity, and (b) is unrelated to the shift to positive after negative. For (a), notice that any time delay results in both players going positive in the “delaying” period(s), followed by a period in which both players go negative. For (b), notice first that strategic delay requires both players to go positive in the delay period and second that strategic delay cannot occur when media is turned on. In contrast, shifting from negative to positive requires both players to go negative in the first or second period, and positive in the second or third period. These two sets of remarks are not compatible, and demonstrate that it is impossible for strategic delay to increase the shift from negative to positive.

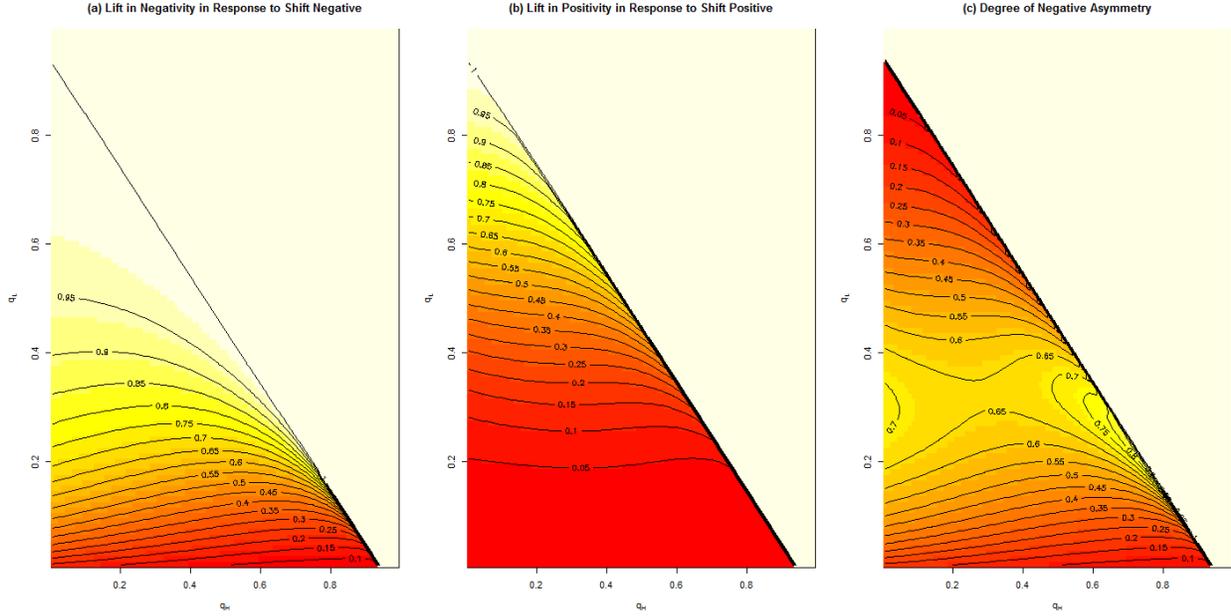


Figure 14: Reaction to competitor tone switches in period 3 - Incumbent: Panel (a) is the increase in the probability of going negative in response to the challenger’s switching to a negative tone as compared to when the challenger stays positive, (b) is the same but for a switch to positive tone, and (c) is the difference between (a) and (b). The figure contains probability increases, not percentage increases.

B Details of Polynomial Time Trend Fitted to Negativity Patterns

We describe here our analyses of the time pattern in negativity. For this analysis, we used a linear regression of negativity on a polynomial of time before Election Day (where 1 is the day of the election and 70 is 70 days before the election). We applied polynomials of increasing order until no improvement in model fit was obtained. We applied the analysis to three sets of data (1) the full data, (2) the data containing races that started less than 30 days before Election Day and (3) those that started more than 30 days before Election Day.

Table 5 presents the results of the ANOVA for each of the datasets on the quadratic, cubic, and quartic polynomials. Based on the F-tests, in all three cases the cubic is clearly the polynomial order that best fits the data. We also present the coefficients and standard errors for the best fitting model in Table 6. In each case the best fitting cubic has an S shape (positive first order, negative second order, and positive third order terms). Notice that the top concave portion is capturing the

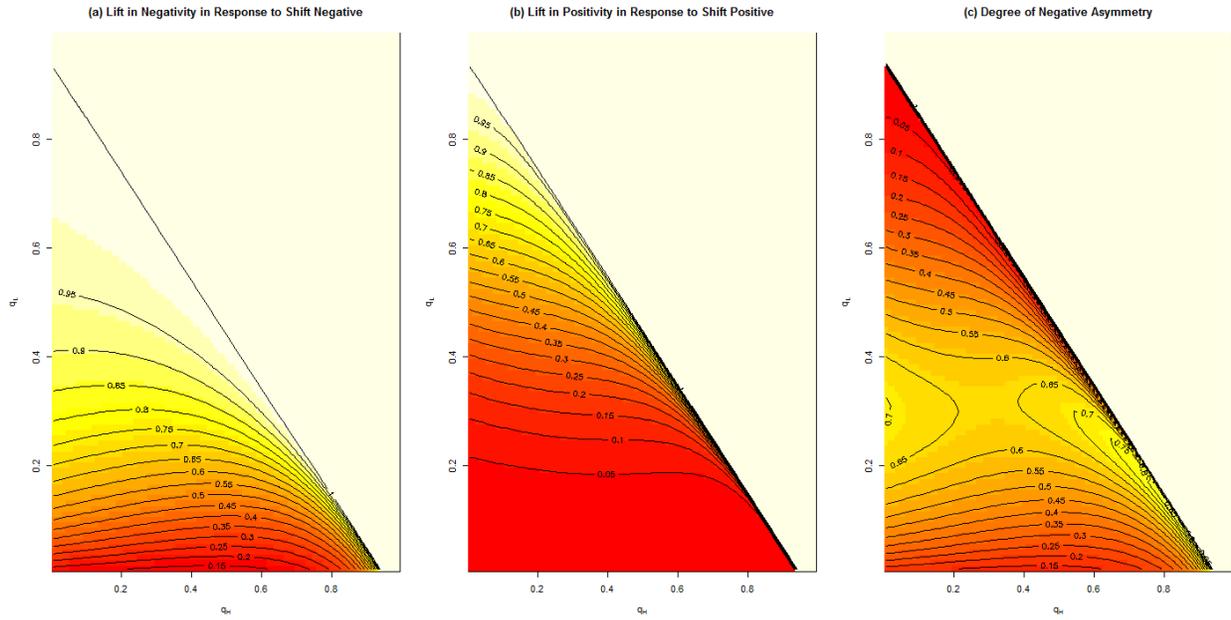


Figure 15: Reaction to competitor tone switches in period 3 - Challenger: Panel (a) is the increase in the probability of going negative in response to the incumbent's switching to a negative tone as compared to when the incumbent stays positive, (b) is the same but for a switch to positive tone, and (c) is the difference between (a) and (b). The figure contains probability increases, not percentage increases.

drop in negativity close to the end of the race as described in section A. The fitted curve along with the average *MediaCoverage* for each period is presented in Figure 9 in the main body of the paper.

| Races | Model | SSE | SSE Difference | F-statistic | p-value |
|--------------------------------|-----------|--------|----------------|-------------|---------|
| All | Quadratic | 3403.7 | | | |
| | Cubic | 3401.8 | 1.86 | 9.02 | 0.00 |
| | Quartic | 3401.8 | 0.05 | 0.23 | 0.63 |
| >30 Days Before Election | Quadratic | 2700.4 | | | |
| | Cubic | 2692.4 | 7.97 | 39.09 | 0.00 |
| | Quartic | 2692.0 | 0.37 | 1.82 | 0.18 |
| ≤ 30 Days Before Election | Quadratic | 683.34 | | | |
| | Cubic | 681.97 | 1.37 | 6.59 | 0.01 |
| | Quartic | 681.86 | 0.11 | 0.51 | 0.48 |

Table 5: F-tests for best fitting polynomial order for negativity as function of time

| Variable | All Periods | | >30 Days | | ≤ 30 Days | |
|-----------------------|-------------|--------|----------|--------|----------------|--------|
| Intercept | 0.32 | (0.01) | 0.26 | (0.02) | 0.34 | (0.03) |
| Time/100 | 0.44 | (0.17) | 1.34 | (0.20) | 1.82 | (0.98) |
| $(\text{Time}/100)^2$ | -2.29 | (0.62) | -5.07 | (0.69) | -22.43 | (7.9) |
| $(\text{Time}/100)^3$ | 1.88 | (0.62) | 4.26 | (0.68) | 46.27 | (18.0) |

Table 6: Coefficients and standard errors for best fitting (cubic) time trend model of negativity