Negative Advertising and Political Competition*

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Why is negative advertising such a prominent feature of competition in the US political market? We hypothesize that two-candidate races provide stronger incentives for going negative relative to non-duopoly contests: when the number of competitors is greater than two, airing negative ads creates positive externalities for opponents that are not the object of the attack. To investigate the empirical relevance of the fewness of competitors in explaining the volume of negative advertising, we exploit variation in the number of entrants running for US non-presidential primaries from 2000 through 2008. Duopolies are over twice as likely to air a negative ad when compared to non-duopolies, and the tendency for negative advertising decreases in the number of competitors. The estimates are robust to various specification checks and the inclusion of potential confounding factors at the race, candidate, and advertisement levels.

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1. Introduction

Political competition frequently uses negative portrayals of one's opponent as a strategic weapon, where candidates have spend substantial amounts on negative advertising. For example, Senator John Kerry and President George Bush together spent $522 million in the 2004 presidential campaign, with over $365 million (or 69.9 percent) of this amount spent on negative advertising.[1] In the November 2010 electoral contests for state and federal office, 80 percent of advertisements were negative (NPR, 2010). The prevalence of negative advertising and the potential harm it may pose to the health of a democracy is a serious concern to policymakers and leads to regulations that aim to inhibit negativity.[2] For example, the Stand by Your Ad provision of the Bipartisan Campaign Reform Act in 2002 requires each candidate to provide a statement identifying himself and his approval of the communication. By forcing candidates to personally associate themselves with their campaign messages, the belief is that candidates are less inclined to air attack ads.

While studies in the economics and political science literature focus on determining the consequences of campaigning on election outcomes (for a review of the literature see Lau, Sigelman and Rovner (2007)) what is missing from the debate about negative advertising in politics is a clear understanding of *why* negative advertising is such a central feature of political competition. That is, virtually no empirical attention has been devoted to the supply side incentives that produce negativity. If negative advertising is common in political competition, why is it less common in the marketing of consumer goods? What is it about the nature of political competition, especially in the United States, that lends itself towards going negative?

In this paper we hypothesize that an important part of the explanation lies in a unique feature of the structure of political markets. The two-party system effectively gives rise to duopoly competition between political candidates in a general election, whereas pure duopolies are rarely observed in the consumer product market.[3] We conjecture that there is an economic rationale for why duopolies are more likely to go negative: when the number of competitors is greater than two, engaging in negative ads creates positive externalities to those opponents that are not the object of the attack. In contrast, positive ads benefit only the advertiser. Therefore, the presence of a spillover effect makes it less beneficial to use negative advertising when faced with more than one opponent. This hypothesis is consistent with the following observation: for the most obvious cases where a consumer product market looks like a duopoly, some very well-known negative advertising campaigns exist (e.g., Apple versus Microsoft).[4] It is also consistent with predictions from a growing theoretical literature on sabotage in contests.[5] In an organizational contest, this spillover effect can manifest itself when employees are competing for a promotion. Employees can work not only to improve their own performance, but also to sabotage their opponents' performances because promotion is often based on relative rather than absolute performance and the winner takes all.

The aim of our paper is to empirically examine this spillover hypothesis, which, to the best of our knowledge, has not been previously explored in the industrial organization, labor, or political economy empirical literatures. Data on electoral races are well-suited to empirically study competitors' incentives to sabotage their opponents' performance. Aside from being a winter-take-all contest, political contests provide a measure of negative activities in the form of negative advertising, while it is hard to collect individual-level data on sabotage from organizations.[6] An ideal empirical strategy is to only use data on political races that share the same institutional features, but vary in their number of competitors. This strategy however gives rise to a natural problem: if political markets in the United States are mainly characterized by head-to-head competition between the two major party candidates, how can we determine the effect of the number of competitors on the propensity for going negative when there is minimal variation in the number of candidates?

The empirical novelty of our paper is to exploit variation in the number of competitors in a contest by using data on non-presidential primary contests within the United States, i.e., the contests among Democrats or Republicans that decide who will become the party nominee in a particular House, Senate, or gubernatorial race.[7] The local nature of these primary contests provides us with a cross section of independent races that vary in the number of entrants. Using this variation, we seek to measure the effect of the number of competitors on the likelihood that a political ad is negative.

We use data from the Wisconsin Advertising Project (WiscAds), which contain information on all political advertisements aired in the top 100 media markets in the United States for 2002 and 2004 elections, and the same information for all US media markets in 2008.[8] In addition, we collect candidate level demographic

characteristics to create a comprehensive database of primary races, candidate attributes, and advertising patterns. As the constructed data contain a comprehensive record of the amount of political advertising and its content, we are able to measure the probability of going negative at the advertisement level as a function of market and candidate characteristics. Our main finding is that duopolies have more than double the likelihood of airing a negative ad when compared to non-duopolies. The magnitude suggests that going from two to five competitors can almost entirely eliminate the incentives to go negative. Our results remain robust to a variety of measures of negativity, measures of the number of candidates, and empirical strategies that include a variety of controls at the advertisement, candidate, and election levels.

Our empirical findings, which tie together the number of competitors and the tone of the campaign, also shed new light on the consequences that the policies aimed at shaping the competitiveness of primary elections (and therefore entry) may have on the tone of the campaign, and in turn on voters' behavior.

The plan of the paper is the following. Section 2 contains a discussion of the data construction process, where we create a novel dataset on primary contests, which includes information on candidate characteristics, and advertising patterns; this section also familiarizes the reader with the WiscAds data. In Section 3 we carry out the empirical analysis and illustrate the key empirical relationships in the data. We also include a discussion of the robustness of the raw effects in the data to omitted variable bias by controlling for relevant race, ad, and candidate level covariates. Finally, we provide additional evidence that could rule out alternative explanations to the spillover effect. We conclude in Section 4.

2. Data Description

In order to explore the empirical relevance of the spillover effect, we assemble a new dataset that contains information on all entrants of the primary races in the United States spanning from 2000 to 2008 (with the exclusion of 2006, when ad data were not collected).[9]

Unlike in general elections where election results are widely available, the lack of consistent and thorough record-keeping for Senate, House, and gubernatorial primary races makes it challenging to obtain primary records. Thus, we choose to hard code primary information from *America Votes* (2005; 2009).[10] From this data source, we collect information about each race held in that election cycle, the date of the election, the candidates running for office in that race, the candidate's incumbency status, and each candidate's final vote share. Throughout our analysis, we refer to an election as each specific race (e.g., Democratic Primary for Wisconsin Governor). We eliminate the unopposed elections (i.e., elections with only one candidate running) and all elections where no candidates ran. In a strongly Democratic district, for example, it is not uncommon for there to be no Republican candidates running in a primary.

By matching candidates' names with advertisers' names in the 2002, 2004 and 2008 election cycles, we combine our election-candidate dataset with the dataset assembled by the TNSMI/Campaign Media Analysis Group (CMAG), and made available to us by WiscAds, to obtain detailed information about the tone of the campaigns and the advertising strategy of each candidate. CMAG does not provide information about the identity of the advertiser in the 2000 electoral cycle; here we link the average tone of the campaign with the number of competitors in the race by election and conduct the empirical analysis at the election or single ad level.

The WiscAds data include information on *each* airing of a political advertisement in all media markets in the US in 2008, and in the top 100 media markets in 2002 and 2004. The top 100 media markets cover about 85% of the US population (see Figure A.1). Advertising data from races in 2000 span only the top 75 media markets.[11] This merge leaves us with 343 primary elections with two or more candidates on the ballot and active campaign advertising in 2002, 2004, and 2008. The number of races is 416 if we also consider the 2000 election cycle.

Finally, for each individual in our sample, we collect information about his age when running for the primary, gender, ethnicity, educational background, and if he has political experience prior to running in the primary race of interest. This enables us to determine if the spillover effect is partially driven by different types of candidates entering races of different size.

Another relevant aspect of the dataset we assemble is that we can exploit variation at the race, candidate, and advertisement levels. Therefore, these data allow us to examine i) the overall tone of the campaign at the

election level ii) a candidate's advertising strategy (i.e., the ratio of negative versus positive, conditional on the total level of advertising) and iii) the probability that each ad is negative. In case ii) we give equal weight to all candidates, whereas in case iii) we place more weight on the candidates who advertised more and obtain similar findings. Thus, these three setups reassure us that the amount of advertising does not influence our results.

We now describe each part of the dataset and the sources we used to construct it. In addition, Appendix A provides details on the sample composition, information regarding the specific source of each variable used in this study (Table A.1), and the calculation of each variable (Table A.2).

2.1 Candidate Data

2.1.1 Viable Candidates

There is natural concern that our measure of the number of competitors who appear on the primary ballot (Ballot N) may be overstated, since there could be a number of fringe candidates on the ballot who pose no real competitive threat to the viable candidates (meaning that the viable candidates effectively ignore potential spillover to the fringe candidate in making advertising choices). We thus construct a number of alternative measures of the number of candidates by ignoring candidates who earned less than 5 percent, 10 percent, and 15 percent of the popular vote in the election.[12] We shall refer to these measures of Effective N as $N_{\pi \geqslant 5\%}$, $N_{\pi \geqslant 10\%}$, $N_{\pi \geqslant 15\%}$, respectively.

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Table 1 shows the change of the distribution of the number of candidates across the aforementioned definitions of N.[13] Each Effective N measure puts more mass of the distribution on races with two, three, or four candidates, since elections with five or more candidates are getting re-classified into one of these groups. The more compressed distribution accords with general knowledge that primary races with five or more credible candidates vying for votes are quite rare. A fixed percentage rule may have some limitations if we are comparing duopolies to non-duopolies. For instance, consider the case of a candidate who receives 20 percent of the vote running against three candidates. While he may be a front-runner in this oligopoly contest, he is unlikely to ever be a plausible winner in a duopoly race with the same final vote share. Based on this consideration, we construct an alternative measure that is relative to the winner's final vote share. The fourth measure, $N_{\text{gap} \leqslant 10}$, includes candidates who came within 10 percentage points of the winner's final vote share. When using this measure, we are effectively imposing a sample selection criterion, as only close races will be included. More generally, the number of races decreases as the Effective N measure becomes more restrictive.

In our sample, about 90% of the electoral contests have at least two viable candidates in the race. Races for gubernatorial and Senate seats tend to be associated with lower entry, and the majority of races are from US House races (see Table A.3).

2.1.2 Demographics

Little information is known about the types of candidates who enter US House, US Senate, or gubernatorial primary races, and this data collection process gives us an opportunity to explore who enters primary races. For the specific purposes of this paper, concern may arise that individuals with certain demographic characteristics and political experience are more likely to enter races with fewer candidates and may be more prone to go negative. We collect information about each candidate's age, education (college completion and law school completion), race, gender, private sector occupation, and political experience (holding another public office at the local, state, or federal level). In cases where the candidate has been a member of the US Congress at some point, we obtain these characteristics from the official Biographical Directory of the US Congress (1789-present). In the many cases where the candidate has never served in a US Congressional office, we search through alternative web-based data sources, such as online versions of state and local newspapers and candidate's biographies on their official campaign pages to obtain the relevant information.[14]

Lawyers are the most common profession in our data for all years, followed by businessmen. Approximately two thirds of candidates are between 45 and 60 years of age. Just over 80% of the candidates in our

data are men, and about 90% of the candidates are white. Thus, the modal advertiser is a white male between 45 and 60 years old, and is an attorney or businessman.

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Table 2 Columns (1) and (2) report the summary statistics of the advertisers' demographics and political experience across duopolies and non-duopolies to ensure that different market structures do not attract intrinsically different types of competitors. The demographics are quite similar across races, despite the number of competitors. Only political experience seems to slightly vary amongst duopolies and non-duopolies, making it crucial for us to control for this in the analysis to follow.[15]

We also collect information on the demographics of candidates running for office who did not use televised advertising to confirm that their demographics do not differ from those who did use televised advertising. The data for the remainder of the analysis pertains only to advertisers. In Columns (3) and (4) of Table 2, we find that the only differences are that advertisers are slightly more inclined to hold a law degree, and advertisers are more likely to have political experience.[16]

2.2 Advertising Data

Throughout the entire 2002, 2004, and 2008 election seasons, 697,610 ads aired during the primary campaigns in favor of gubernatorial, US Senate, and US House candidates. We use the air date of the advertisement and the state's primary date to allocate ads to the primary election season, where we drop all ads that aired after the primary date.

In Table A.4 of Appendix A, we report the total ads aired by viable candidates. We observe 635,296 total ads in campaigns for 2002, 2004 and 2008 races with 2 or more effective candidates, of which 28% are from Senate elections, 27% from House elections, and 45% from gubernatorial elections. Given the fact that House districts generally span small sections of multiple media markets, making it costly to advertise in small portions of several markets, it is not surprising that a small percentage of campaign advertising is for House candidates. Senate and gubernatorial elections, on the other hand, are state-wide, and candidates more typically campaign via televised advertising.[17]

The CMAG data provide a rich set of information for each ad aired throughout the election, as the unit of analysis is an individual television broadcast of a single advertisement. The data contain information on when the advertisement aired (date, time of day, and program) and where the ad aired (television station and media market) in addition to the cost of the ad.Virtually all advertisements are for 30 second television spots. WiscAds coders examine the content of each advertisement and record a number of variables related to the content of the ad, including the name of the favored candidate, her political party, the race being contested, the tone, and issues addressed.[18] Coders determine whether the objective of the ad is to promote a candidate, attack a candidate, or a combination of the two. Attack ads do not mention the favored candidate; contrast ads mention both the favored and opposing candidate; promote ads mention only the favored candidate. The WiscAds data include measures for whether or not the opposing candidate is pictured in the ad but do not identify who is the target of the attack. We construct four measures of negativity, which are not mutually exclusive, as follows:

Contrast includes ads that attack at all.
Mostly Attack includes ads that attack for at least half of the airtime.
Attack at End includes only those ads that end with an attack.
Attack Only includes all ads that only attack the opponent.

Each is a dummy variable equal to one if the ad is designated as negative under the above criteria, and zero otherwise.

For our purposes, the most relevant categories of negative advertising are *Contrast* and *Attack Only*, where *Contrast* is a more inclusive measure than *Attack Only*. We make the assumption that negative advertising is candidate specific, meaning each ad attacks one particular candidate. While it is plausible that a candidate can

run an ad attacking all other competitors in the race, we do not find occurrences of this when spot-checking the ad data content explicitly. In primary contests, there are occasional ads that say a variant of "Candidate X is the only one to support Policy Y," though this would not be coded as a negative ad.

3. The Spillover Effect

We now seek to empirically examine the effect of the number of competitors in a race on the propensity to air negative ads. As shown by Konrad (2000), we expect that increasing the number of competitors beyond two players generates a spillover effect that reduces the return of negative advertising. The spillover effect thus suggests two predictions about the data:

1. Duopoly markets should exhibit a greater tendency for negative advertising than non-duopoly markets.
2. The tendency for negative advertising should decrease monotonically with the number of competitors.

Our analysis will determine whether these effects are present in the data and quantify the magnitude of the effect. Assessing the magnitude will provide a sense of the importance of competition as a means of explaining negativity.

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We start our empirical analysis with the first prediction and plot the proportion of negative ads aired in 2002, 2004 and 2008 under the five different measures of negativity for both duopoly and non-duopoly markets again using $N_{\pi \geqslant 10\%}$ as the measure of competition.[19] Figure 1 is consistent with our hypothesis: across all the negativity measures, duopoly markets exhibit a significantly higher probability of airing a negative ad as opposed to non-duopoly markets. Across all measures, duopolies exhibit over twice as high a likelihood of airing a negative ad as compared to non-duopolies. Figure 2 shows that these trends continue to exist when modifying the measure of Effective N as well as looking at the *Ballot N* measure, when focusing on the *Contrast* and *Attack Only* measures. Still, we find that candidates in duopolies are at least twice as likely to engage in negative advertising as those in non-duopolies across all measures of Effective N, and one and a half times as likely when using the Ballot N measure.[20]

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Table A.5 breaks out the information in Figure 1 further by showing the proportion of ads that are negative under the four different measures conditional on the number of competitors in each election by measure of Effective N. The trend in the tables is again consistent with our prediction that negativity decreases monotonically with the number of candidates. Interestingly, for most of the measures, the bulk of the reduction is realized in just doubling the number of candidates from two to four, where two-person races have between two and four times the rate of negativity as four-person races. If we restrict attention to pure attack advertising, Attack Only, we see that with just five or more players, the rate of negative advertising virtually goes to zero.[21] The steep reduction in the rate of negative advertising associated with adding just three viable players suggests that our hypothesis is a valid explanation for the high rates of negative advertising in political markets in the US.

When we regress a duopoly indicator on negativity, the estimated coefficients capture the unconditional moment found in Figures 1 and 2. The point estimates are reported in Table A.7. For instance, when using $N_{\pi \geqslant 10\%}$ and Contrast as a measure of negativity, the propensity of airing a negative ad is 23 percentage points higher in duopoly than in non-duopoly political markets. In other words, races with only two viable candidates have, on average, an 80% higher chance of exhibiting negative ads (the mean value of negativity is 29% in this sample, see Table A.5).

Next we will consider the robustness of these results to the possible presence of omitted variable bias. The potential endogeneity concern is that factors that lead a race to have fewer candidates might also be related to the factors that cause the tone of an election to be more negative. While we may view entry into a primary race

as exogenous to the decision to go negative upon entering (Brady, Han and Pope, 2007), we can nevertheless show that introducing control variables that are likely to explain negativity and entry at the election level do not alter the estimated magnitude of the effect of competition on negativity.

3.1 Empirical Specification

When presenting the results, we mainly restrict attention to the two most straightforward categories of negativity, *Contrast* and *Attack Only*, and focus on the $N_{\pi \geqslant 10\%}$ measure of competition for ease of exposition. However we show that the results would also hold if we had used the Ballot N measure or the other measures of Effective N defined above. Specifically, we employ a linear probability model for the event that an advertisement in the data is negative using the following equation:

$$\text{Negative}_{i,j,t} = \alpha_0 + \alpha_1 \text{Duopoly}_{j,t} + \boldsymbol{\delta X_{i,j,t}} + \epsilon_{i,j,t}. \quad (1)$$

In our main specifications, $\text{Negative}_{i,j,t}$ equals one if the ad run by candidate i in election j at time t was negative (based on the four definitions in Section 2), and zero otherwise. Our main coefficient of interest is α_1, which captures the duopoly effect as $Duopoly$ is a dummy variable equal to one if there are only two candidates in the election. In some specifications, instead of the $Duopoly$ dummy variable, we employ a set of indicators for $N = 2$, $N = 3$ and $N = 4+$ or $ln(N)$. We further include a vector of covariates in $\boldsymbol{X_{i,j,t}}$, including: *Governor, Republican, Political Experience, Incumbent, election cycle dummies, and Days until Election*. These are each explained below. We are careful to cluster the ad level observations at the election level to control for any unobserved shocks that correlate observations within an election, and we are also careful to use robust standard errors to control for heteroskedasticity.

The first control we consider is the presence of an incumbent in the election, or alternatively whether the ad is aired by the incumbent. If there is an incumbent running for the seat, then there is presumably a lower chance other candidates can win the race, which may decrease the number of entrants. In our sample, the average number of candidates is 3.1 and 4.3, conditional on the incumbent running or not running, respectively. An incumbent's policy and personal stances are in essence common knowledge, allowing her to spend the duration of the campaign attacking opponents. This would increase the volume of negative advertising for races with incumbents. The presence of an incumbent may affect each of her opponents' likelihood of going negative. For example, it could be more likely to observe attacks directed towards the incumbent, whose past exposure makes it easier to collect information on which to generate an attack.

Second, gubernatorial races may be susceptible to lower entry. Most gubernatorial offices are subject to term limits, which reduce the average duration of Governors' careers, and therefore lower the value of the seat.[22] In addition, the difference in the scope of accountability (state versus national) may deter entry. Thus, we control for whether or not the race is gubernatorial.

Third, we may worry that one party historically has more negative primaries than the other, and may also attract more candidates in a certain time period (i.e., if it is the majority party in Congress). For this reason, we control for whether or not the race was Republican.

Fourth, we control for the timing of the ad, where the WiscAds data provide us with the specific date each ad airs. One would expect that as the election approaches, all candidates may be more likely to engage in negative advertising. Since each primary has a different duration, we standardize this measure normalizing it by the length of the campaign. *Days until Election* is continuous on the interval [0,1], and takes a value equal to one at the farthest day away from the election and 0 at the election day.[23]

Fifth, at the candidate level we include an indicator for whether or not the advertiser has political experience, which is defined as having held an elected office in a state's legislature or higher. Recall that in Table 2, the only difference in candidate characteristics across duopolies and non-duopolies is that candidates in duopolies are more likely to have held a political office in the past.[24]

Finally, if the openness of a primary election has an effect on N as well as polarization, this could shape the tone of the campaign.[25] To control for state-level policy differences, such as regulation of primary nominations, we provide an additional specification with state fixed effects to control for any time invariant factors

that dispose some states to different tones and different entry strategies. Further, we include election cycle and media market fixed effects to absorb any variation that may affect the demand for negativity at the market level.

3.1.1 Baseline Results We start with the duopoly indicator results across each measure of Effective N, where we estimate Equation 1 using a linear probability model. The results for the Contrast measure are in Panel A of Table 3. The magnitudes here mirror the findings in Figure 1 with a regression framework, where duopolies have a 25 percent absolute higher probability of airing a negative ad than non-duopolies, or almost double. This suggests that the unconditional means in Table A.7 remain approximately the same when we add control variables that might be related to the likelihood of an advertisement being negative and the number of entrants. The main significant control across specifications is the time before the election the ad aired. As the election approaches, meaning the time to the election decreases, the campaign becomes more negative.[26] Next, we show that our results are not particular to the Contrast measure. In Panel B, we replicate our analysis for the other negativity measures, and the same phenomenon holds: duopolies exhibit between 9 and 15 percentage points more negative ads than non-duopolies.

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In Column (1) of Table 4, we further break down N and replicate the results with indicators for three and four or more candidates using the same set of controls. Duopoly races are the excluded group. The estimates of the spillover effect show that the steep reduction in the rate of negative advertising is associated with adding just one viable player. In Columns (2) to (9) we further show that the duopoly effect is present in all election cycles (2000-2008). In all Table 4 columns we do not control for political experience, since this information is unavailable for 2000, as the WiscAds data do not contain candidate identifiers in this year.

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In Table B.5 we log each N measure, and our point estimates show that the percent of negative advertising is decreasing in the number of effective competitors in all specifications. These estimates imply that doubling the number of candidates results in about a 20 - 45 percent decrease in the fraction of negative advertisements depending on the measure of N we consider, where the effect is largest for the $N_{\pi \geqslant 10\%}$ measure of Effective N, and smallest for the Ballot N measure. Further, doubling the number of candidates results in about a 10 - 18 percent decrease in the fraction of purely negative advertisements.

Before turning to the next section, a few remarks are in order. When we estimate the above specifications using each ad as the unit of observation, we essentially weight the ads aired by candidates with high volumes of advertising more heavily. If candidates who advertise more are also more prone to engage in negative advertising, then our findings are driven by just a few candidates. Therefore, we verify these findings using the election or the candidate as the unit of observation. In the former case we focus on the overall tone of the campaign at the election level. In the latter case we focus on a candidate's ratio of negative to total advertising. [27] The results we obtain remain consistent in both cases and are reported in Tables B.6 and B.7, respectively. This suggests that the amount of advertising does not influence our results. Finally, our basic marginal effects do not change in an economically significant way, and are somewhat strengthened, when we use a logit instead of a linear probability model as illustrated in Table B.4.

For the remainder of the analysis, we focus on the $N_{\pi \geqslant 10\%}$ measure, though all results remain consistent if we use the other measures of N.

3.1.2 Robustness We now consider alternative explanations to the spillover effect and provide evidence that could rule them out. When doing so, we include the same covariates as in Table 3 unless otherwise specified.

1. Does the negative tone change in the absence of an incumbent?

Incumbents in the US often coast to re-election and at least to re-nomination by their parties. Incumbents in races with contested primaries may have some weaknesses a challenger can use to generate an attack when compared to incumbents with no viable opponents. For example, Hirano and Snyder (2014) document that incumbents in scandals are more likely to face a serious primary challenger compared to other incumbents. A challenger in these races may campaign more negatively, while the incumbent may counter-attack, especially if she has sparse positive content to provide. This interaction does not suggest that the spillover effect is absent, but simply that it might vary in magnitude for races with and without an incumbent.

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We test this story by splitting the sample into races including and excluding incumbents. In Columns (1)-(2) of Table 5, we find that the estimated effect is still significantly different from zero and of similar magnitude in the two subsamples: having only two competitors results in an increase of 16 percentage points in the likelihood of going negative in races with incumbents, versus 20 percent in the races without an incumbent. Thus, we can say that while the spillover effect is robust across incumbency, it seems that races without incumbents may have a larger spillover effect. We attribute this to the potential added competitiveness in primary races without incumbents.

2. Do districts with a clear dominant party play a role?

Primaries differ from general elections in that winning them is instrumental, rather than an objective per se. For example, candidates may participate in primaries in order to build name recognition, without expecting to win the nomination. If this is the intent, then a candidate will primarily engage in positive campaigning. Assuming there are fewer candidates who compete in the disadvantaged party's primaries (Ansolabehere et al., 2006), this could affect the tone and number of entrants simultaneously. To address this concern, we focus on the primaries in the advantaged party where winning the primary is essentially as good as winning the general election. In such primaries, it will be more likely that everybody who is in the race has a goal of winning. We collect information on the vote gap between the Democrat and the Republican candidates for the last two general elections in the given district.[28] We next split the sample three ways:

1. At least one of the last two general election contests had a vote margin greater than 10 percentage points and that primary election corresponds to the winning party of both of those elections. We consider this the dominant party, as candidates likely strive to win the election.

2. Both of the last two general election contests had a vote margin greater than 10 percentage points and those primary elections correspond to the losing party. We consider this the non-dominant party, where candidates may not strive to win the election.

3. Both of the last two general election contests were within 10 percentage points. We consider this a close district, as a dominant party does not exist. These primaries are likely to be close.

Table 5 Columns (3)-(5) present the results for these three samples, respectively. The results are consistent with our predictions, where the dominant party primary has a statistically significant spillover effect (Column (3)), and the non-dominant party (Column (4)) is no longer statistically different from zero. However, the effect size is largest in Column (5), where we look only at close districts. The point estimate shows that a duopoly increases the likelihood of airing a negative ad by 23 percentage points (an 80% increase on average).

We next create a measure of the average value of the vote gap over the past two general elections, as well as the interaction between this variable and our duopoly measure. For the lagged vote gap measure, we subtract the vote share of the party who aired the ad from the runner up party in that election (i.e. Republican runner-up for an ad aired by the Republican candidate). Table 6 Column (1) shows that the spillover effect is smaller in races that had a lower level of closeness in previous races (i.e., a higher vote gap), and that the interaction is negative, though not statistically different from zero. This sign is consistent in Column (5) when we include state fixed effects in conjunction with this heterogeneity exercise, though the interaction is now statistically different form zero and larger in magnitude.[29]

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3. Does the negative tone increase in close races?

Anticipation of a close race may deter entry (Hirano and Snyder, 2014), and in close duopoly races the tendency to go negative is higher than in races that are not close (Lovett and Shachar, 2011). We propose three specification checks to investigate the relevance of close races when estimating the spillover effect.

First, we ensure that our results are not driven solely by close races. Specifically, we split our sample into races where the winner and runner-up are and are not within 5 percentage points of one another in Table 5 Columns (6)-(7).[30] The magnitude of the spillover effect is higher in close races, where duopoly races have double the likelihood of airing a negative ad. The spillover effect is still present in races with a wider margin of victory, where duopolies increase negative advertising by 55 percent.

In Table 6, Column (2) provides a measure of the deviation of the vote gap from the median, though we take the median for each measure of N, so we do not compare the vote gaps between the winner and runner-up across N. Since this variable subtracts the race's vote gap from the median vote gap, a higher number indicates that the race is closer and a negative number indicates that the race was less close than the median race for that number of competitors. In Column (2), we see that the effect is larger for closer races, where a 0.1 increase in the closeness of the race as compared to the median increases the duopoly effect by 0.05 percentage points. This effect is roughly consistent in Column (6) when we add state fixed effects to the analysis.

Second, we compare duopoly and non-duopoly races with the same margin of victory. Define $\rho_e\left(1\right)$ as the tone of the campaign in a duopoly race and $\rho_e\left(0\right)$ as the tone of the campaign in a non-duopoly race. Let D_e be a dummy variable equal to one if the race is a duopoly, and zero otherwise. The observed outcome is thus $\pi_e = D_e{\cdot}\rho_e\left(1\right)+(1-D_e){\cdot}\rho_e\left(0\right)$. The estimand of interest is the Average Treatment Effect, $E[\rho_e\left(1\right)-\pi_e\left(0\right)]$. We ensure that our control variables from Table 3 are balanced post-estimation, where each of these control variables is not statistically different across the duopoly and non-duopoly groups at the 5 percent level. Table B.8 reports nearest-neighbor propensity score matching estimates when we allow for up to 10 neighbors, and use a matching caliper of 0.001. Our results are robust to different calipers as well as different forms of matching, such as a kernel. The results are largely unchanged, though smaller in magnitude, where duopoly contests exhibit about 10 percent more negativity than non-duopolies.

Third, we construct one additional measure of closeness based on final vote shares. The first one is the own-party Herfindahl-Hirschman Index (HHI), which measures the concentration of the vote share across candidates. As HHI gets large, the popular vote is becoming more concentrated on a small number of candidates. Thus, a more concentrated HHI captures the presence of a dominant candidate in the election.[31] When we control for the own-party HHI in our main specifications in Table B.9, we find that the estimate of α_1 remains significant in all specifications except when we use the $N_{\text{gap}\leqslant 10}$ measure. This finding seems to suggest that the closeness of the race does not jeopardize our main results.

In sum, we can conclude that i) our results are not entirely driven by the level of competition in the race; and ii) the spillover effect is amplified when the race is close.

4. Does the opposing party primary election play a role?

Next, we use a unique feature of the political primary process - the existence of the opposing party's primary for the same political seat. If the opposing party is fielding an especially strong candidate, then a candidate's own party will be less likely to succeed in the general election. Intuitively, if a strong candidate runs in the Democratic primary, this can reduce negativity in the Republican primary, as forward-looking candidates may internalize their general election prospects.[32] To measure this, we construct the opposing party HHI, similar to the way we constructed the own party HHI. When we control for the opposing party HHI in our main specification in Table B.10, we find that our results remain substantively similar.

5. Do state or market-level factors influence the results?

It may be that the results are confounded by state-level unobservable factors that drive candidates to enter and go negative. To show that this is not the case, we provide a specification in Columns (3), (5) and (6) of Table 6 where we add state-level fixed effects. Alternatively, it may also be the case that some markets are more susceptible to negative advertising, and candidates target their negativity towards these markets. Thus, we provide one more specification in Column (4) of Table 6 to show that this is not driving the spillover

effect. In both circumstances, the main spillover effect persists.

6. How does the timing influence the election tone?

In Table 7 we show that the estimates of the spillover effect remain the same across measures of the timing of the ad in Columns (1) and (2). In Columns (3)-(6) we further explore the dynamics of negativity over the campaign. Specifically, Column (1) controls for the number of days until the election the ad aired instead of our preferred normalized measure. Column (2) takes the natural log of the number of days measure. The spillover effect is comparable to our baseline specification (Table 3 Column (3)). In Columns (3)-(6) of Table 7 we restrict the sample to include subsets of the election season. First, it might be the case that all negativity happens in the last two weeks or last one week of the election. If this is the case, the entire effect could be coming from this part of the election season. Columns (3) and (4) show an effect that is virtually identical in magnitude to the average effect. In Columns (5) and (6), we split the sample by the first and second half of the election season, respectively. The effect size is again comparable to the average effect. This suggests that perhaps the variation in negativity over the course of the election is less influential than one might expect ex ante.

COMP: Place Table 7 about here

3.1.3 Discussion Our results have established an empirical link between the number of competitors in a race and the extent of negativity. We motivate this hypothesis as coming from a spillover effect that arises with multiple candidates as compared to duopoly races. However, it could be the case that the empirical pattern we find might be caused by a different mechanism. One possibility is that in multiple candidate races there may be added pressure to refrain from negativity since defecting on the party's general desire to keep the primary clean can create more local enemies in one's party. In duopoly contests, angering one other local candidate of the same party may not be as harmful as burning bridges with many candidates within one's party and state.[33] If the spillover effect is due to this mechanism, then to the extent that one breakdown in the cooperative agreement (i.e., a negative ad) curtails future cooperation, once the first negative ad airs and the tacit agreement to keep the race clean is broken, there should be no systematic differences between oligopoly and duopoly races.

To explore this, we keep elections with 2 or 3 candidates using our preferred measure of Effective N, $N_{\pi \geqslant 10\%}$. We determine when the first attack occurred.[34] For duopolies, the first negative advertisement airs, on average, 33 days after the first advertisement airs. For oligopolies, the first negative advertisement airs, on average, 47 days into the campaign. Next, we descriptively look at the other candidates in the race. For duopolies, this will be the only other candidate in the race, and for oligopolies (3 candidate races), this will be the other two candidates in the race. We denote a response to the negativity as any ad that goes negative from a competitor after that initial negative ad is aired in the contest. On average, duopolies are more likely to have a response to the first negative ad than non-duopolies, where the opponent in a duopoly responds 51% of the time and either opponent responds to a negative attack in 21% of oligopolies. This suggests that the spillover effect exists even after the first negative advertisement is aired and the collusive agreement is broken.

Across oligopoly contests, the average time to the first response is approximately 13.6 days with a median of 7 days. Five percent of these three candidate races respond within one day of the first attack. In half of the oligopoly races with responses (roughly 10% of all oligopoly races), both candidates go negative. When compared with oligopoly races with only one responder, oligopolies with two responders (indicative of a complete breakdown of the party agreement) are similar in political experience, incumbency, candidate demographics, and party. The only dimension in which they differ is that races with two responders are more likely to be gubernatorial races. This may allude to the fact that there is more party collusion on negativity for US Congressional and Senate races, where favors are more often granted to those who lose the nomination (future offices, less prestigious offices, etc.). This may be less common in state-wide offices.

This evidence suggests that even if there is more tacit pressure in oligopoly contests to refrain from negativity, after this agreement is broken, there is still a lower systematic tendency to respond with negativity in multi-candidate races. This highlights the prevalence of the spillover effect. These results highlight the

sources of the increased negativity we find in duopoly races - duopolies air the first negative ad sooner and respond more aggressively than non-duopoly races.

Finally, our study of negative advertising in political contests can be related to a broader literature on comparative advertising, which has been subject to various regulations that differ across countries (see Barigozzi and Peitz (2004) for a review of the legal and economic background). The general view is that comparative advertising provides an avenue for firms to differentiate their products which thereby enhances their market power. This force needs to be balanced against the potentially beneficial effects of information disclosure that comparative advertising provides. There is a small but growing body of research on theoretical models that study the incentives for using comparative advertising. However, these papers have exclusively focused on duopoly markets, which is an understandable restriction given the strategic complexity that multiple competitors poses for comparative advertising as our analysis has highlighted. Nevertheless, there are some robust theoretical conclusions that could be examined with our data. For example, Anderson and Renault (2009) show that in a duopoly where consumers are imperfectly informed about quality, a firm with lower perceived quality (i.e., the challenger) will have incentives to disclose information about the high quality firm (i.e., the incumbent) through comparative advertising. Anderson, Ciliberto and Liaukonyte (2013) examine such predictions empirically, and our data, if restricted to duopoly races, could investigate this further. This is a potential avenue for future research.

4. Concluding Remarks

This paper provides an explanation for the high volume of negative advertising that is generally found in the US political market. When the number of competitors in a market is greater than two, engaging in negative ads creates positive externalities to the opponents who are not the object of the attack. However, political competition in the US is largely characterized by duopolies, creating a greater incentive for negative advertising. This suggests that, perhaps including a viable third party in US contests may decrease the amount of attack advertising. It may also explain the relative negativity in US campaigns when compared to multi-party systems. For example, in 1996 New Zealand abandoned its first-past-the-post electoral system, characterized by a two-party system, and adopted a mixed proportional electoral system, leading to a multi-party system. Ridout and Walter (2013) show that campaigns became more positive after the change of the electoral system.[35]

Using a newly created dataset on primary elections in 2000, 2002, 2004, and 2008 merged with the WiscAds data, we find that duopolies are twice as likely to use negativity in an advertisement when compared to non-duopolies. In addition, adding just three competitors drives the rate of negativity found in the data close to zero. These results show that the data are not just consistent with our theory in a directional sense, but the magnitude of the results suggest that this economic mechanism appears to have first order implications for why general elections are associated with producing more negativity than primary contests. Further, this paper speaks to the growing literature studying sabotage in contests (Chen, 2003; Konrad, 2000), providing empirical evidence that adding more entrants decreases the fraction of negativity in a contest.

The existence of a spillover effect suggests that the structure of the political market can affect the incentives of candidates to engage in negative advertising. Therefore, the results of this article have implications for the regulation of political contests. Any policy that affects entry may have unintended consequences on the advertising strategies of candidates. For example, as states move towards more inclusive nominating procedures, these expanded eligibility rules lead the number of candidates to increase. This, in turn, may decrease the negative tone of the campaign. On the other hand, relaxing spending caps decreases the number of candidates entering the race (Iaryczover and Mattozzi, 2012), which would increase the volume of negative advertising. Understanding the presence of such consequences could help inform policy debates on campaign finance reform, the openness of primaries, and the amount of negativity in politics.

5. Appendix A: Data Appendix

In our data, there were 299 gubernatorial, House, and Senate primary elections that had two or more competitors in 2000, and 341 primary elections in 2002 with two or more competitors. The numbers are similar for the 2004 and 2008 election cycles, with 340 and 384 primary elections with two or more candidates, respectively. In 2000, 191 were two-candidate races and 108 elections have three or more candidates. In 2002, there were 192 two-candidate races, and 149 elections had three or more candidates. in 2004. In 2008, there were 211 two-candidate races, and 173 races had three or more candidates. In 2000 there were 1,468 elections from Senate, House, and gubernatorial primaries; of these, 874 elections are unopposed and 62 elections have no candidates. There are 1,009 elections from 2002 Senate, House, and gubernatorial primaries; of these, 545 were unopposed, and 80 have no candidates. In 2004 Senate, House, and gubernatorial primaries, we start with 966 races, where 558 are unopposed and 68 have no candidates. In 2008 Senate, House, and gubernatorial primaries, we start with 915 races, where 504 are unopposed and 27 have no candidates.

When we merge the candidates' names with the advertisers' names in the Wisconsin Advertising Project data, we are left with 343 primary elections with two or more candidates on the ballot and active campaign advertising over the period 2002-2008. In detail, there are 127 elections with only two candidates, 83 elections with three candidates, 47 elections with four candidates and 86 elections with at least five candidates. Regarding the type of race, our sample contains 64 Senate races, 221 House races and 57 gubernatorial elections. When we enlarge the sample to the 2000 races, the sample consists of 416 races with two or more candidates on the ballot and active campaign advertising. When we conduct this merge, we lose 214 House races, 7 gubernatorial races and 13 Senate races in 2004. Of these dropped races that arose in the match with the advertising data, approximately 20% are due to the fact that they are outside of the top 100 media markets, and about 80% were due to the fact that there is no advertising for the primary election. In 2008, we have data for all 210 media markets, so we only lose races that do not contain any advertising, or 95 races.

We drop one Louisiana governor race in 2004, since it had a runoff after the primary. We also drop Ronnie Musgrove's advertising in a 5 candidate Mississippi election, since he (the incumbent) was prematurely attacking the general election candidate, which does not pertain to primary competition. The 2008 Tennessee Democratic Senate primary race contained a candidate (Gary Davis) with the same name as incumbent Congressmen David Davis and Lincoln Davis. He did not advertise and came close to winning the election, putting favorite Mike Padgett in third place, and thus creating odd incentives.

In the 2002 and 2004 election seasons, over 1.7 million television spots aired in favor of gubernatorial, US Senate, and US House candidates in the top 100 markets. Similarly, in 2008, our data record 1,342,341 advertisements aired throughout the entire 2007-2008 election season. Candidates make an extensive use of televised advertising. For example, in the 2008 US presidential election, candidates spent over $360 million on broadcast time throughout their campaigns. Broadcast media accounted for the highest share of the overall media expenditure, followed by miscellaneous media ($273 million), Internet media ($43 million) and print media ($21 million). See CRP 2008 for more details. In the 2000 election season, 74,122 (471,756) ads aired during primary (general) elections in the top 75 media markets.

In 2000, 74,122 ads were aired in primary campaigns with 2 or more effective candidates. Of those, 21% were aired in gubernatorial races, 31% were aired in House races, and 47% were aired in Senate races.

Figure A.1: Top 100 Media Markets

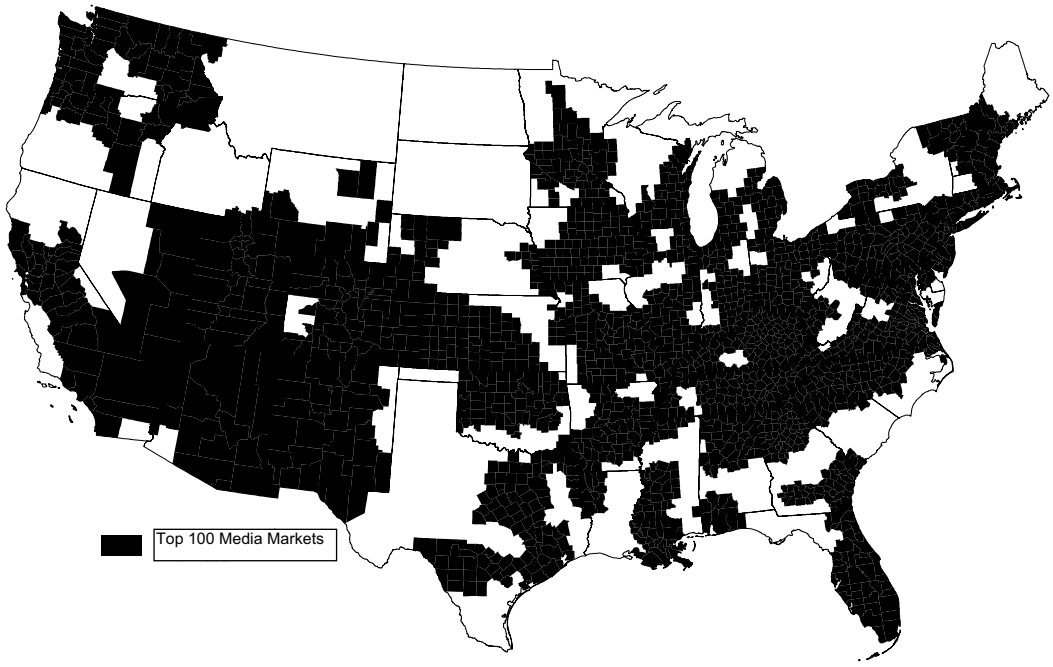


Table A.1: Variables Collected

Variable	Measured	Years	Source
Primary Information	All candidates running in Gubernatorial, House, and Senate primaries Includes vote share of each Candidate, incumbency status, and the dates of each primary	2004, 2008	*America Votes*
Candidate Demographics	Includes gender, race, education, political experience (For candidates ever in Congress) (For candidates never in Congress)	2002, 2004, 2008	Hand Collected Biographical Directory of US Congress Local Newspapers, Official Election Pages, Individual Wikipedia Pages
Political Advertisements	Each ad run by Gubernatorial, House, Senate Primary Candidates	2004, 2008	Wisconsin Ad Project
Lagged General Election Vote Share	Democrat and Republican Vote Shares in the Previous General Election	1998 -2006 Pre 1998	CNN Election Center Clerk of the US House of Representatives
Primary Polling	Any polls taken throughout the election, polled vote percentage for each candidate	2004	Polling Report

Table A.2: Variables Measured

Variable	Measured
Contrast	= 1 if the given ad ever attacked, 0 otherwise
Mostly Attack	= 1 if the given ad attacked for at least half of the time, 0 otherwise
Attack at End	= 1 if the given ad ended in an attack, 0 otherwise
Attack Only	= 1 if the given ad only attacked, 0 otherwise
Percent Negative(i)	% of election-level ads spent attacking using measure i Also calculated at the candidate-level
Ballot N	# of candidates on the ballot (does not include write-ins)
$N_{\pi \geqslant 5\%}$	# of candidates that received at least 5% of vote share
$N_{\pi \geqslant 10\%}$	# of candidates that received at least 10% of vote share
$N_{\pi \geqslant 15\%}$	# of candidates that received at least 15% of vote share
$N_{\text{gap} \leqslant 10}$	# of candidates that came within 10 percentage points of winner
Duopoly (j)	=1 if there are 2 candidates in the race, 0 if more than 2 (j) corresponds to measure of Effective N
Incumbent in Election	Dummy= 1 if incumbent running in election
2008	=1 if primary election happened in 2007-2008 cycle
Vote Gap	Difference in Vote Share of First and Second Place Candidate in the given Primary
Vote Gap Deviation	Difference in Vote Gap and the median Vote Gap for primaries with the same number of competitors
Lagged Vote Gap	Average gap between advertiser's party's vote share and runner-up in two previous general elections for that specific race
Total Ad Volume	Total Ads in Election
Days until Election	CDF continuous on (0,1), where it equals 1 if furthest ad from election day, and 0 if closest to election day
Political Experience	Dummy=1 if candidate ever held political office (State Congress or higher)
Dominant Party	Dummy=1 if previous general election for the given office was won by that party by over 10 percentage points, =0 if opposing party (that lost by more than 10 percentage points) missing if it was a close district
Close District	Dummy=1 if previous general election for the given office was within 10 percentage points
HHI	Herfindahl-Hirschman Index concentration of popular vote across candidates close to 1 $\rightarrow$ vote is concentrated among just one candidate
HHI Opposing Party	Same as HHI Calculated for the opposing party's primary (for Democratic Senate primary, corresponds to Republican Senate primary)

Table A.3: Summary of Office by Effective Number of Candidates

	Ballot N			$N_{\pi \geqslant 10\%}$		
	Governor	House	Senate	Governor	House	Senate
2	17	86	23	26	118	33
	13.49%	68.25%	18.25%	14.69%	66.67%	18.64%
3	17	54	12	19	61	16
	20.48%	65.06%	14.46%	19.79%	63.54%	16.67 %
4	7	30	10	2	24	3
	14.89%	63.83%	21.28%	6.90%	82.76%	10.34%
5 +	16	51	19	0	8	0
	18.60%	59.30%	22.09%	25.00%	45.00%	30.00%
Races	57	221	64	47	211	52

Ballot N includes all candidates whose names were on the ballot (not write-ins).

$N_{\pi \geqslant 10\%}$ includes candidates who received at least 10 % of the final vote share.

Table A.4: Breakdown of Ads by Races

	Number of Ads	Percent of Total Ads
US Senate	178,902	28.10
US House	170,632	26.80
Governor	287,151	45.10
Total	636,685	

Table A.5: Average Negativity Across Effective N Measures

# Candidates	2	3	4	5 or more	Total
$N_{\pi \geqslant 5\%}$					
Contrast	0.40	0.25	0.12	0.11	0.29
Mostly Attack	0.26	0.17	0.08	0.06	0.19
Attack at End	0.21	0.12	0.05	0.03	0.14
Attack Only	0.17	0.11	0.05	0.02	0.12
Observations	270,501	182,181	124,837	25,712	603,231
$N_{\pi \geqslant 10\%}$					
Contrast	0.41	0.18	0.17	0.12	0.29
Mostly Attack	0.26	0.13	0.10	0.08	0.19
Attack at End	0.21	0.08	0.09	0.00	0.15
Attack Only	0.17	0.08	0.08	0.00	0.12
Observations	291,419	232,284	45,465	5,672	574,840
$N_{\pi \geqslant 15\%}$					
Contrast	0.34	0.20	0.16		0.29
Mostly Attack	0.22	0.12	0.09		0.19
Attack at End	0.17	0.09	0.09		0.15
Attack Only	0.14	0.08	0.09		0.12
Observations	398,019	143,978	18,110		560,107
$N_{\text{gap} \leqslant 10}$					
Contrast	0.36	0.22	0.12	0.25	0.32
Mostly Attack	0.26	0.15	0.12	0.24	0.23
Attack at End	0.20	0.13	0.08	0.16	0.18
Attack Only	0.15	0.13	0.08	0.11	0.14
Observations	167,448	28,561	17,997	3,225	217,231

Ballot N includes all candidates whose names were on the ballot (not write-ins).

$N_{\pi \geqslant 5\%}$ includes candidates who received at least 5 % of the final vote share.

$N_{\pi \geqslant 10\%}$ includes candidates who received at least 10 % of the final vote share.

$N_{\pi \geqslant 15\%}$ includes candidates who received at least 15 % of the final vote share.

$N_{\text{gap} \leqslant 10}$ includes candidates who came within 10 % points of winner.

Table A.6: Unconditional Effect of the Number of Candidates on Negativity

	(1) Ballot N	(2) $N_{\pi \geqslant 5\%}$	(3) $N_{\pi \geqslant 10\%}$	(4) $N_{\pi \geqslant 15\%}$	(5) $N_{\text{gap} \leqslant 10}$
Contrast=1 if ad EVER attacked					
3	-0.103***	-0.153***	-0.231***	-0.138***	-0.147***
	(0.00164)	(0.00139)	(0.00121)	(0.00129)	(0.00270)
4	-0.0188***	-0.285***	-0.240***	-0.177***	-0.238***
	(0.00198)	(0.00131)	(0.00198)	(0.00282)	(0.00272)
5+	-0.230***	-0.292***	-0.210***		-0.113***
	(0.00142)	(0.00218)	(0.00179)		(0.00770)
Mostly Attack=1 if ad attacked at least half airtime					
3	-0.0776***	-0.0891***	-0.138***	-0.104***	-0.110***
	(0.00146)	(0.00122)	(0.00107)	(0.00108)	(0.00237)
4	-0.0116***	-0.183***	-0.162***	-0.129***	-0.144***
	(0.00179)	(0.00113)	(0.00164)	(0.00228)	(0.00261)
5+	-0.171***	-0.201***	-0.119***		-0.0142*
	(0.00124)	(0.00170)	(0.00158)		(0.00765)
Attack at End=1 if ad ended in an attack					
3	-0.0436***	-0.0942***	-0.132***	-0.0797***	-0.0694***
	(0.00136)	(0.00110)	(0.000958)	(0.000971)	(0.00225)
4	-0.0185***	-0.162***	-0.124***	-0.0869***	-0.124***
	(0.00163)	(0.00101)	(0.00156)	(0.00216)	(0.00225)
5+	-0.144***	-0.188***	-0.0943***		-0.0485***
	(0.00112)	(0.00127)	(0.00147)		(0.00645)
Attack Only=1 if ad ONLY attacked					
3	-0.0539***	-0.0609***	-0.0939***	-0.0562***	-0.0182***
	(0.00129)	(0.00103)	(0.000901)	(0.000917)	(0.00220)
4	-0.0477***	-0.123***	-0.0919***	-0.0551***	-0.0741***
	(0.00150)	(0.000948)	(0.00147)	(0.00215)	(0.00219)
5+	-0.130***	-0.156***	-0.0520***		-0.0473***
	(0.00108)	(0.00107)	(0.00144)		(0.00548)
Observations	636,685	603,231	574,840	560,107	217,231

Robust standard errors clustered at the election level in parentheses. Linear Probability Model. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Advertising-level analysis. Excluded group is 2 candidates. Includes data from 2000, 2002, 2004, and 2008 for measures of Contrast and Attack Only. 2000 data is excluded for the other two measures as these are not available.

Table A.7: Unconditional Effect of Duopolies on Negativity, Advertising-level Analysis

	(1) Ballot N	(2) $N_{\pi \geqslant 5\%}$	(3) $N_{\pi \geqslant 10\%}$	(4) $N_{\pi \geqslant 15\%}$	(5) $N_{\text{gap} \leqslant 10}$
Contrast=1 if ad EVER attacked					
Duopoly	0.145**	0.213***	0.234***	0.143***	0.178***
	(0.0702)	(0.0444)	(0.0428)	(0.0479)	(0.0590)
Mostly Attack=1 if ad attacked at least half airtime					
Duopoly	0.108*	0.133***	0.143***	0.107***	0.116*
	(0.0612)	(0.0413)	(0.0398)	(0.0359)	(0.0602)
Attack at End=1 if ad ended in an attack					
Duopoly	0.0851*	0.127***	0.132***	0.0805***	0.0878*
	(0.0509)	(0.0306)	(0.0292)	(0.0305)	(0.0480)
Attack Only=1 if ad ONLY attacked					
Duopoly	0.0881*	0.0917***	0.0952***	0.0561**	0.0403
	(0.0459)	(0.0280)	(0.0269)	(0.0270)	(0.0421)
Observations	636,685	603,231	574,840	560,107	217,231

Robust standard errors clustered at the election level in parentheses. Linear Probability Model. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Excluded group is more than 2 candidates. Includes data from 2000, 2002, 2004, and 2008 for measures of Contrast and Attack Only. 2000 data is excluded for the other two measures as these are not available.

Figure A.2: Histogram of Number of Candidates

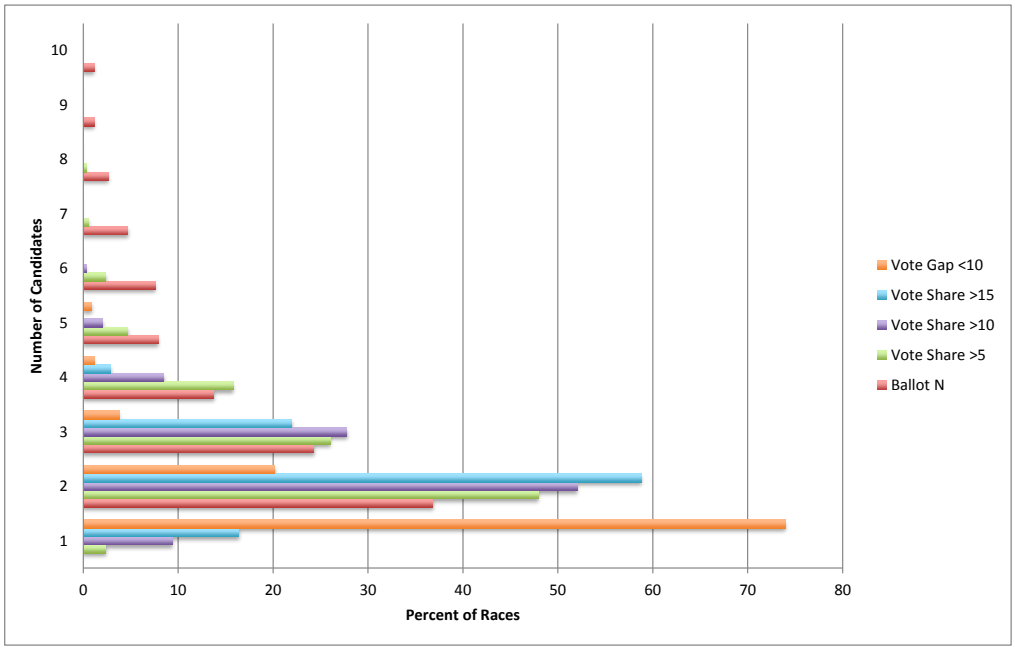
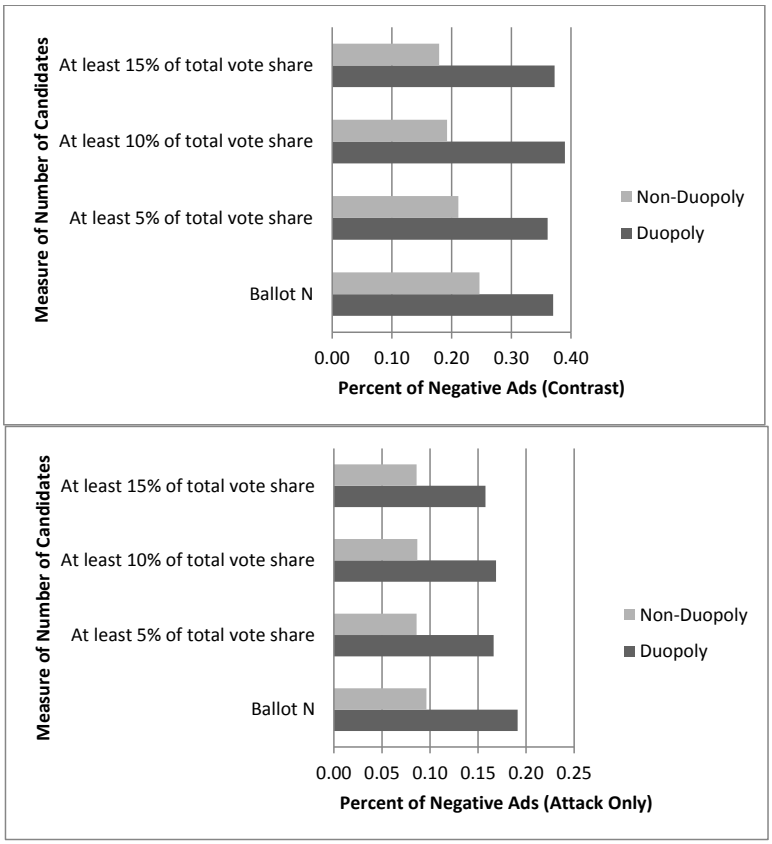


Figure A.3: Frequency of Negative Ads with Two and more than Two Effective Candidates 2000 Only



6. Appendix B

Table B.1: Benchmark Specification 1, without Days Until Election variable

Panel A					
Dependent Variable: Contrast=1 if ad EVER attacked					
	(1)	(2)	(3)	(4)	(5)
	Ballot N	$N_{\pi \geqslant 5\%}$	$N_{\pi \geqslant 10\%}$	$N_{\pi \geqslant 15\%}$	$N_{\text{gap} \leqslant 10}$
Duopoly	0.153**	0.220***	0.238***	0.142***	0.123*
	(0.0759)	(0.0526)	(0.0524)	(0.0536)	(0.0715)
2008	0.150**	0.0394	0.0167	0.0456	0.114
	(0.0593)	(0.0576)	(0.0602)	(0.0662)	(0.0921)
2004	0.0444	-0.0133	0.00522	-0.0498	0.119
	(0.0574)	(0.0513)	(0.0521)	(0.0686)	(0.0830)
Incumbent	0.00628	-0.0700	-0.0586	0.0142	0.123
	(0.0661)	(0.0591)	(0.0582)	(0.0668)	(0.0832)
Governor	0.0597	-0.0157	-0.00486	0.0311	-0.0307
	(0.0488)	(0.0448)	(0.0462)	(0.0543)	(0.0811)
Republican	0.0408	0.0434	0.0441	0.0587	0.119
	(0.0439)	(0.0414)	(0.0433)	(0.0500)	(0.0786)
Political Experience	0.0520	0.0491	0.0315	0.0319	0.0725
	(0.0422)	(0.0372)	(0.0396)	(0.0485)	(0.0709)
Panel B					
Mostly Attack=1 if ad attacked at least half airtime					
Duopoly	0.112**	0.126***	0.142***	0.0797**	0.0804
	(0.0553)	(0.0434)	(0.0415)	(0.0355)	(0.0649)
Attack at End=1 if ad ended in an attack					
Duopoly	0.0799*	0.117***	0.119***	0.0714**	0.0727
	(0.0454)	(0.0320)	(0.0317)	(0.0295)	(0.0541)
Attack Only=1 if ad ONLY attacked					
Duopoly	0.0841**	0.0881***	0.0907***	0.0580**	0.0335
	(0.0403)	(0.0286)	(0.0286)	(0.0270)	(0.0434)
Observations	616,675	583,221	554,840	540,107	205,599

Notes: Robust standard errors clustered at the election level in parentheses. Linear Probability Model. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Advertising-level analysis.

Table B.2: Benchmark Specification 1 including Total Ad Volume

	(1)	(2)	(3)	(4)	(5)
Panel A					
Dependent Variable: Contrast=1 if ad EVER attacked					
	Ballot N	$N_{\pi \geqslant 5\%}$	$N_{\pi \geqslant 10\%}$	$N_{\pi \geqslant 15\%}$	$N_{\text{gap} \leqslant 10}$
Duopoly	0.213***	0.225***	0.246***	0.137***	0.102
	(0.0546)	(0.0448)	(0.0444)	(0.0462)	(0.0649)
2008	0.111**	0.0186	-0.0000815	0.0318	0.0704
	(0.0540)	(0.0550)	(0.0570)	(0.0655)	(0.0798)
2004	-0.0400	-0.0764	-0.0548	-0.102	0.0154
	(0.0501)	(0.0493)	(0.0505)	(0.0671)	(0.0725)
Incumbent	0.00414	-0.0640	-0.0568	0.0166	0.00425
	(0.0502)	(0.0448)	(0.0442)	(0.0493)	(0.0817)
Governor	-0.0177	-0.0945*	-0.0804	-0.0349	-0.216***
	(0.0561)	(0.0535)	(0.0560)	(0.0723)	(0.0793)
Days Until Election	-0.314***	-0.325***	-0.329***	-0.329***	-0.383***
	(0.0468)	(0.0471)	(0.0493)	(0.0509)	(0.0573)
Republican	0.0584	0.0709*	0.0690*	0.0807	0.155**
	(0.0398)	(0.0392)	(0.0413)	(0.0491)	(0.0633)
Political Experience	0.0610	0.0600*	0.0386	0.0389	0.0501
	(0.0400)	(0.0357)	(0.0366)	(0.0465)	(0.0567)
log(Total Ad Volume)	0.0854***	0.0772***	0.0741***	0.0685**	0.145***
	(0.0226)	(0.0230)	(0.0231)	(0.0304)	(0.0266)
Panel B					
Mostly Attack=1 if ad attacked at least half airtime					
Duopoly	0.147***	0.128***	0.146***	0.0748**	0.0591
	(0.0463)	(0.0394)	(0.0377)	(0.0314)	(0.0553)
Attack at End=1 if ad ended in an attack					
Duopoly	0.113***	0.118***	0.122***	0.0660**	0.0589
	(0.0356)	(0.0275)	(0.0279)	(0.0266)	(0.0491)
Attack Only=1 if ad ONLY attacked					
Duopoly	0.115***	0.0894***	0.0934***	0.0545**	0.0215
	(0.0320)	(0.0252)	(0.0255)	(0.0242)	(0.0402)
Observations	593,477	578,350	549,969	535,533	205,599

Notes: Robust standard errors clustered at the election level in parentheses. Linear Probability Model. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Advertising-level analysis.

Table B.3: Benchmark Specification 1 including Candidate Characteristics

Panel A					
Dependent Variable: Contrast=1 if ad EVER attacked					
	(1)	(2)	(3)	(4)	(5)
	Ballot N	$N_{\pi \geqslant 5\%}$	$N_{\pi \geqslant 10\%}$	$N_{\pi \geqslant 15\%}$	$N_{\text{gap} \leqslant 10}$
Duopoly	0.205***	0.247***	0.259***	0.159***	0.132*
	(0.0774)	(0.0548)	(0.0548)	(0.0549)	(0.0788)
2008	0.146**	0.0465	0.0260	0.0576	0.134
	(0.0614)	(0.0587)	(0.0630)	(0.0702)	(0.0998)
2004	0.0452	0.00174	0.0246	-0.0377	0.140
	(0.0570)	(0.0516)	(0.0532)	(0.0721)	(0.0954)
Incumbent	-0.0190	-0.110**	-0.0867	-0.0111	0.103
	(0.0579)	(0.0515)	(0.0529)	(0.0605)	(0.0889)
Governor	0.0686	-0.0203	-0.00546	0.0328	-0.0672
	(0.0498)	(0.0462)	(0.0489)	(0.0577)	(0.0824)
Days Until Election	-0.311***	-0.326***	-0.328***	-0.328***	-0.362***
	(0.0471)	(0.0475)	(0.0499)	(0.0513)	(0.0608)
Republican	0.0173	0.0253	0.0262	0.0492	0.120
	(0.0463)	(0.0427)	(0.0457)	(0.0540)	(0.0780)
Political Experience	0.0471	0.0518	0.0268	0.0261	0.0370
	(0.0436)	(0.0376)	(0.0405)	(0.0504)	(0.0738)
Male	0.00647	0.0578	0.0328	0.0223	-0.0853
	(0.0472)	(0.0493)	(0.0489)	(0.0493)	(0.0618)
College	0.0504	0.0851	0.0407	-0.0157	0.158*
	(0.121)	(0.127)	(0.126)	(0.125)	(0.0874)
Law School	0.0214	-0.00834	-0.0146	0.0113	0.0467
	(0.0365)	(0.0348)	(0.0359)	(0.0371)	(0.0484)
White	0.0371	0.0216	0.0213	0.0461	0.120
	(0.0639)	(0.0616)	(0.0625)	(0.0679)	(0.0972)
Panel B					
Mostly Attack=1 if ad attacked at least half airtime					
Duopoly	0.146**	0.145***	0.156***	0.0907**	0.0934
	(0.0565)	(0.0445)	(0.0433)	(0.0372)	(0.0694)
Attack at End=1 if ad ended in an attack					
Duopoly	0.108**	0.129***	0.128***	0.0847***	0.0835
	(0.0457)	(0.0330)	(0.0328)	(0.0303)	(0.0556)
Attack Only=1 if ad ONLY attacked					
Duopoly	0.112***	0.0969***	0.0967***	0.0678**	0.0431
	(0.0392)	(0.0295)	(0.0295)	(0.0277)	(0.0424)
Observations	567,891	552,764	524,398	511,506	196,809

Robust standard errors clustered at the election level in parentheses. Linear Probability Model. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

College and law school are dummies for completion of the degrees. Advertising-level analysis.

Table B.4: Benchmark Specification 1 using a Logit

Panel A					
Dependent Variable: Contrast=1 if ad EVER attacked					
	(1)	(2)	(3)	(4)	(5)
	Ballot N	$N_{\pi \geqslant 5\%}$	$N_{\pi \geqslant 10\%}$	$N_{\pi \geqslant 15\%}$	$N_{\text{gap} \leqslant 10}$
Duopoly	0.208***	0.236***	0.258***	0.157***	0.147*
	(0.0794)	(0.0541)	(0.0526)	(0.0521)	(0.0758)
2008	0.161**	0.0597	0.0356	0.0651	0.159
	(0.0697)	(0.0626)	(0.0640)	(0.0714)	(0.115)
2004	0.0480	0.00762	0.0314	-0.0328	0.176
	(0.0657)	(0.0580)	(0.0598)	(0.0732)	(0.116)
Incumbent	-0.00533	-0.0713*	-0.0654*	0.00441	0.0764
	(0.0543)	(0.0407)	(0.0394)	(0.0566)	(0.0762)
Governor	0.0808	-0.00921	0.00143	0.0413	-0.0334
	(0.0510)	(0.0465)	(0.0490)	(0.0566)	(0.0874)
Days Until Election	-0.333***	-0.346***	-0.353***	-0.343***	-0.406***
	(0.0480)	(0.0482)	(0.0520)	(0.0521)	(0.0695)
Republican	0.0178	0.0374	0.0371	0.0506	0.130
	(0.0459)	(0.0444)	(0.0467)	(0.0524)	(0.0866)
Political Experience	0.0481	0.0458	0.0247	0.0243	0.0520
	(0.0469)	(0.0404)	(0.0432)	(0.0519)	(0.0836)
Panel B					
Mostly Attack=1 if ad attacked at least half airtime					
Duopoly	0.137**	0.132***	0.152***	0.0889**	0.0887
	(0.0574)	(0.0445)	(0.0425)	(0.0366)	(0.0593)
Attack at End=1 if ad ended in an attack					
Duopoly	0.1000**	0.119***	0.125***	0.0766**	0.0761
	(0.0460)	(0.0336)	(0.0333)	(0.0302)	(0.0489)
Attack Only=1 if ad ONLY attacked					
Duopoly	0.103***	0.0900***	0.0950***	0.0621**	0.0368
	(0.0384)	(0.0291)	(0.0288)	(0.0261)	(0.0418)
Observations	593,477	578,350	549,969	535,533	205,599

Robust standard errors clustered at the election level in parentheses. Logit, marginal effects reported. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Advertising-level analysis.

Table B.5: Benchmark Specification 1, using log(N)

Dependent Variable: Contrast=1 if ad EVER attacked					
	(1)	(2)	(3)	(4)	(5)
	Ballot N	$N_{\pi \geqslant 5\%}$	$N_{\pi \geqslant 10\%}$	$N_{\pi \geqslant 15\%}$	$N_{\text{gap} \leqslant 10}$
log(N)	-0.191***	-0.383***	-0.466***	-0.338***	-0.268**
	(0.0567)	(0.0751)	(0.102)	(0.115)	(0.107)
2008	0.142**	0.0798	0.0502	0.0675	0.134
	(0.0633)	(0.0541)	(0.0590)	(0.0652)	(0.0926)
2004	0.0526	0.0251	0.0148	-0.0307	0.159*
	(0.0508)	(0.0488)	(0.0533)	(0.0681)	(0.0915)
Incumbent	-0.00862	-0.0708	-0.0490	0.00707	0.0782
	(0.0539)	(0.0523)	(0.0519)	(0.0599)	(0.0737)
Governor	0.0410	-0.0231	0.000817	0.0429	-0.0347
	(0.0430)	(0.0432)	(0.0472)	(0.0539)	(0.0815)
Days Until Election	-0.318***	-0.329***	-0.331***	-0.332***	-0.372***
	(0.0458)	(0.0466)	(0.0488)	(0.0502)	(0.0574)
Republican	0.0160	0.0318	0.0408	0.0478	0.116
	(0.0409)	(0.0395)	(0.0441)	(0.0500)	(0.0765)
Political Experience	0.0203	0.0255	0.0197	0.0248	0.0537
	(0.0428)	(0.0381)	(0.0415)	(0.0492)	(0.0726)
Panel B					
Mostly Attack=1 if ad attacked at least half airtime					
log(N)	-0.132***	-0.235***	-0.277***	-0.184**	-0.171
	(0.0433)	(0.0657)	(0.0822)	(0.0812)	(0.105)
Attack at End=1 if ad ended in an attack					
log(N)	-0.103***	-0.202***	-0.229***	-0.165**	-0.150*
	(0.0337)	(0.0497)	(0.0656)	(0.0669)	(0.0819)
Attack Only=1 if ad ONLY attacked					
log(N)	-0.0948***	-0.159***	-0.177***	-0.133**	-0.0859
	(0.0291)	(0.0427)	(0.0572)	(0.0606)	(0.0643)
Observations	593,477	578,350	549,969	535,533	205,599

Notes: Robust standard errors clustered at the election level in parentheses. Linear Probability Model. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Advertising-level analysis. In this specification, we estimate the following equation: $\text{Negative}_{i,j,t} = \alpha_0 + \alpha_1 log(N_{j,t}) + \boldsymbol{\delta X_{i,j,t}} + \epsilon_{i,j,t}$.

Table B.6: Robustness to Benchmark Specification 1 at the Candidate Level

Panel A					
Dependent Variable: Contrast=% of candidate's ads EVER attacked					
	(1)	(2)	(3)	(4)	(5)
	Ballot N	$N_{\pi \geqslant 5\%}$	$N_{\pi \geqslant 10\%}$	$N_{\pi \geqslant 15\%}$	$N_{\text{gap} \leqslant 10}$
Duopoly	0.153**	0.220***	0.238***	0.142***	0.123*
	(0.0759)	(0.0529)	(0.0527)	(0.0538)	(0.0728)
2008	0.148**	0.0390	0.0163	0.0453	0.115
	(0.0598)	(0.0579)	(0.0605)	(0.0666)	(0.0938)
2004	0.0441	-0.0133	0.00514	-0.0499	0.118
	(0.0577)	(0.0516)	(0.0524)	(0.0690)	(0.0846)
Incumbent	0.00618	-0.0703	-0.0587	0.0148	0.125
	(0.0664)	(0.0592)	(0.0582)	(0.0671)	(0.0852)
Governor	0.0602	-0.0155	-0.00464	0.0312	-0.0312
	(0.0491)	(0.0450)	(0.0465)	(0.0546)	(0.0826)
Republican	0.0413	0.0437	0.0445	0.0588	0.118
	(0.0442)	(0.0416)	(0.0435)	(0.0503)	(0.0802)
Political Experience	0.0530	0.0493	0.0317	0.0323	0.0726
	(0.0426)	(0.0375)	(0.0399)	(0.0489)	(0.0722)
Panel B					
Mostly Attack= % of Candidate's ads attacked at least half airtime					
Duopoly	0.110**	0.126***	0.142***	0.0791**	0.0800
	(0.0555)	(0.0436)	(0.0417)	(0.0357)	(0.0660)
Attack at End=% of Candidate's ads ended in an attack					
Duopoly	0.0776*	0.116***	0.119***	0.0709**	0.0724
	(0.0455)	(0.0322)	(0.0319)	(0.0297)	(0.0551)
Attack Only=% of Candidate's ads ONLY attacked					
Duopoly	0.0822**	0.0880***	0.0906***	0.0577**	0.0333
	(0.0404)	(0.0288)	(0.0288)	(0.0271)	(0.0442)
Observations	638	629	598	567	210

Robust standard errors clustered at the election level in parentheses. OLS, weighted by candidate ad volume. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.7: Robustness to Benchmark Specification 1 at the Election level (with 2000)

Panel A					
Dependent Variable: Contrast=% of ads EVER attacked					
	(1)	(2)	(3)	(4)	(5)
	Ballot N	$N_{\pi \geqslant 5\%}$	$N_{\pi \geqslant 10\%}$	$N_{\pi \geqslant 15\%}$	$N_{\text{gap} \leqslant 10}$
Duopoly	0.132**	0.195***	0.221***	0.146***	0.125*
	(0.0617)	(0.0443)	(0.0424)	(0.0428)	(0.0677)
2008	0.0615	0.0371	0.00581	0.0117	0.0998
	(0.0572)	(0.0543)	(0.0528)	(0.0566)	(0.113)
2004	-0.0288	-0.0139	-0.00581	-0.0734	0.0795
	(0.0567)	(0.0531)	(0.0526)	(0.0600)	(0.122)
2002	-0.0924	-0.0202	-0.0231	-0.0386	-0.0703
	(0.0644)	(0.0667)	(0.0662)	(0.0706)	(0.114)
Incumbent in Election	0.0859	0.0406	0.0288	0.0925	0.209**
	(0.0668)	(0.0695)	(0.0697)	(0.0859)	(0.0994)
Governor	0.0848**	0.0142	0.0189	0.0563	0.0360
	(0.0423)	(0.0386)	(0.0398)	(0.0456)	(0.0719)
Republican	0.0378	0.0402	0.0441	0.0523	0.112
	(0.0414)	(0.0381)	(0.0395)	(0.0445)	(0.0746)
Panel B					
Attack Only=% of ads ONLY attacked					
Duopoly	0.0714**	0.0789***	0.0819***	0.0531**	0.0422
	(0.0339)	(0.0255)	(0.0249)	(0.0224)	(0.0464)
Observations	416	405	379	353	106

Robust standard errors clustered at the election level in parentheses.OLS, weighted by election ad volume. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.8: Propensity Score Matching Specification (includes 2000)

Dependent Variable=% Negative$_i$ Ads in Election that Attacked					
	(1)	(2)	(3)	(4)	(5)
	Ballot N	$N_{\pi \geqslant 5\%}$	$N_{\pi \geqslant 10\%}$	$N_{\pi \geqslant 15\%}$	$N_{\text{gap} \leqslant 10}$
Contrast	0.00579	0.0428	0.0901***	0.0713**	0.127**
	(0.0311)	(0.0300)	(0.0311)	(0.0339)	(0.0620)
Mostly Attack	0.0137	0.0227	0.0596**	0.0369	0.0573
	(0.0266)	(0.0257)	(0.0268)	(0.0295)	(0.0496)
Attack at End	0.00748	0.0204	0.0595**	0.0436*	0.0496
	(0.0242)	(0.0232)	(0.0241)	(0.0263)	(0.0451)
Attack Only	0.0224	0.0258	0.0396**	0.0324	0.0204
	(0.0192)	(0.0185)	(0.0192)	(0.0207)	(0.0314)
Observations	416	405	379	353	106

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Elections matched based on the margin between the first and second place candidate in the election. Includes data from 2000, 2002, 2004, and 2008 elections. However, the 2000 data does not have measures for Negative 2 and Negative 3.

Table B.9: Benchmark Specification 1 including HHI

Dependent Variable: Contrast=1 if ad EVER attacked					
	(1)	(2)	(3)	(4)	(5)
	Ballot N	$N_{\pi \geqslant 5\%}$	$N_{\pi \geqslant 10\%}$	$N_{\pi \geqslant 15\%}$	$N_{\text{gap} \leqslant 10}$
Duopoly	0.205**	0.251***	0.269***	0.0884*	-0.0828
	(0.0827)	(0.0599)	(0.0642)	(0.0502)	(0.0692)
2008	0.129*	0.00477	-0.00238	0.217***	0.443***
	(0.0764)	(0.0765)	(0.0814)	(0.0668)	(0.0924)
2004	0.0429	-0.00538	0.0238	-0.00303	0.153**
	(0.0571)	(0.0500)	(0.0498)	(0.0620)	(0.0632)
Incumbent	0.00149	-0.0722	-0.0679	-0.0282	-0.0327
	(0.0559)	(0.0517)	(0.0509)	(0.0587)	(0.0726)
Governor	0.0768	-0.0120	0.00145	0.0345	-0.0284
	(0.0474)	(0.0447)	(0.0461)	(0.0504)	(0.0718)
Days Until Election	-0.316***	-0.327***	-0.331***	-0.333***	-0.379***
	(0.0463)	(0.0467)	(0.0487)	(0.0501)	(0.0550)
Republican	0.0176	0.0376	0.0366	0.0322	0.106
	(0.0427)	(0.0413)	(0.0431)	(0.0476)	(0.0691)
Political Experience	0.0470	0.0496	0.0260	0.0241	0.0902
	(0.0448)	(0.0380)	(0.0397)	(0.0474)	(0.0580)
HHI, measured ex-post	-0.0629	-0.150	-0.112	0.487***	1.237***
	(0.149)	(0.144)	(0.185)	(0.174)	(0.315)
Observations	593,477	578,350	549,969	535,533	205,599

Robust standard errors clustered at the election level in parentheses. Linear Probability Model. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Advertising-level analysis.

Table B.10: Benchmark Specification 1 including HHI of the Opposing Party

Dependent Variable: Contrast=1 if ad EVER attacked					
	(1)	(2)	(3)	(4)	(5)
	Ballot N	$N_{\pi \geqslant 5\%}$	$N_{\pi \geqslant 10\%}$	$N_{\pi \geqslant 15\%}$	$N_{\text{gap} \leqslant 10}$
Duopoly	0.158**	0.200***	0.224***	0.156***	0.121**
	(0.0619)	(0.0421)	(0.0422)	(0.0456)	(0.0605)
2008	0.213***	0.129***	0.106**	0.155***	0.185**
	(0.0582)	(0.0481)	(0.0494)	(0.0555)	(0.0898)
2004	0.0677	0.0329	0.0498	0.00608	0.171*
	(0.0537)	(0.0456)	(0.0478)	(0.0568)	(0.0882)
Incumbent	-0.00151	-0.0802	-0.0764	-0.0263	0.0721
	(0.0580)	(0.0519)	(0.0525)	(0.0593)	(0.0770)
Governor	0.0866*	0.00791	0.0117	0.0472	-0.00563
	(0.0462)	(0.0425)	(0.0441)	(0.0498)	(0.0767)
Days Until Election	-0.317***	-0.329***	-0.332***	-0.334***	-0.377***
	(0.0462)	(0.0467)	(0.0489)	(0.0502)	(0.0567)
Republican	0.00574	0.0182	0.0154	0.0235	0.110
	(0.0399)	(0.0380)	(0.0405)	(0.0438)	(0.0721)
Political Experience	0.0338	0.0346	0.0192	0.0137	0.0197
	(0.0409)	(0.0357)	(0.0379)	(0.0430)	(0.0694)
HHI Opposing Party	0.173***	0.192***	0.192***	0.265***	0.188**
	(0.0658)	(0.0674)	(0.0681)	(0.0826)	(0.0732)
Observations	593,477	578,350	549,969	535,533	205,599

Robust standard errors clustered at the election level in parentheses. Linear Probability Model. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Advertising-level analysis.

Table B.11: Benchmark Specification 1, Before and After Stand By Your Ad

	(1) Contrast	(2) Mostly Attack	(3) Attack at End	(4) Attack Only
Duopoly	0.188***	0.107***	0.0842***	0.0580**
	(0.0477)	(0.0397)	(0.0317)	(0.0280)
Pre-SBA	0.0389	0.0657	0.0501	0.0468
	(0.121)	(0.0765)	(0.0764)	(0.0751)
2008	0.0691	0.0499	0.0533	0.00867
	(0.0594)	(0.0471)	(0.0383)	(0.0348)
2004	0.0350	0.106***	0.0298	0.000498
	(0.0529)	(0.0398)	(0.0329)	(0.0306)
Incumbent	-0.0419	0.0533	0.0617	0.0564
	(0.0505)	(0.0407)	(0.0397)	(0.0400)
Governor	0.0257	0.0199	0.0503*	0.0388
	(0.0439)	(0.0379)	(0.0287)	(0.0260)
Days until Election	-0.378***	-0.248***	-0.196***	-0.160***
	(0.0403)	(0.0349)	(0.0339)	(0.0280)
Republican	0.0825*	0.0694*	0.0536*	0.0462*
	(0.0427)	(0.0359)	(0.0289)	(0.0261)
Political Experience	0.0223	0.0261	0.00107	-0.00351
	(0.0373)	(0.0346)	(0.0278)	(0.0241)
Observations	615,029	615,029	615,029	615,029

Notes: Robust standard errors clustered at the election level in parentheses. Linear Probability Model. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Advertising-level analysis. Duopoly measure created using $N_{\pi \geqslant 10\%}$. Pre-SBA is an indicator equal to one if the ad aired prior to the Stand By Your Ad Regulation on March 27, 2002. There were 41 elections with advertisements prior to this legislation and a total of 76,113 ads aired before the legislation took effect.

Notes

[1]Calculation based on WiscAds 2004 presidential data (Goldstein and Rivlin, 2007*c*).

[2]This view towards negative campaigning is consistent with the conclusions of a strand of studies that find negativity alienates the political middle and harms participation (Crotty and Jacobson, 1980; Cappella and Jamieson, 1997; Ansolabehere and Iyengar, 1995). However, others find that negative advertising increases (Freedman and Goldstein, 1999) or has no effect on turnout (Finkel and Geer, 1998). Krupnikov (2011); Fridkin and Kenney (2011); Lovett and Shachar (2011); Galasso and Nannicini (2013) explain that voters react to negativity differently.

[3]While a number of industries might feature two dominant firms, there is typically a group of firms with smaller market share that influence the behavior of the dominant firms.

[4]One can also compare local markets (few competitors) to national markets (many competitors). Walmart is often attacked in local markets but is not directly attacked in the national forum. Peterson and Djupe (2005) assert that more candidates result in more negative newspaper coverage.

[5]Konrad (2000) considers sabotage in rent-seeking contests among lobbies and theoretically shows that the dispersion effect in sabotage makes it more relevant when the number of lobbies is small; Chen (2003) demonstrates that in a tournament model sabotage is decreasing in the number of contestants.

[6]Sabotage in organizations is often associated with punishable activities, leading researchers to exploit either controlled laboratory data (Harbring and Irlenbusch, 2011; Carpenter, Matthews and Schirm, 2010) or data from a sports tournament (Balafoutas, Lindner and Sutter, 2012).

[7]We omit Presidential races from this analysis for three reasons. First, across the Presidential election cycles from 2000-2008, only five elections had more than two candidates at some point. All but one of these contests concluded by March, leaving little variation in advertising campaigns. Second, Presidential primary races garner more national attention and contain more party advertising than local contests. Third, with a small number of contests, office-level fixed effects would absorb too many degrees of freedom to allow for the identification of Presidential offices.

[8]In some specifications, we use data from 2000 elections, covering the top 75 markets.

[9]The "Stand by Your Ad" act (SBA) was enacted during the 2002 primary season. If we include all 2002 advertisements and a dummy for Pre-SBA, the spillover effect remains robust (Table B.8).

[10]Jim Snyder graciously provided a comprehensive list of all races in 2000 and 2002. He uses these data in Hirano and Snyder (2014); Snyder and Ting (2011); Hirano and Snyder (2012).

[11]See Goldstein and Rivlin (2007*a*,*b*) for a detailed description of the WiscAds data.

[12]Ideally, polling data would determine the number of effective candidates. We recover information for 31 races that have primary match-up polls in 2004 using Polling Report. We observe no remarkable differences in the distribution of N compared to the one using final vote shares.

[13]We also have this information in Figure A.2.

[14]Specific candidate information is in Appendix A. We are missing political experience for 67 (and all demographics for 25) candidates, where 9 came within 10 percentage points of the winner.

[15] We follow Jacobson (1980) in accounting for political experience as a proxy for quality.

[16]The number of viable candidates is similar for elections with and without televised advertising: 2.66 and 2.25 respectively in 2004 and 3.52 and 2.64 respectively in 2008.

[17]Snyder and Stromberg (2010) discuss media boundaries and Congressional advertising.

[18]We keep only ads sponsored by candidates (94% of all ads).

[19]Using Polling Report data, duopolies are still twice as likely to go negative than non-duopolies.

[20]Each mean negativity value across duopolies and non-duopolies in Figures 1 and 2 is statistically different at the 1% level. The histogram for the 2000 data is in Figure A.3.

[21]Similarly, Table A.6 reports the unconditional effect of the number of candidates on negativity when we regress indicators of three, four, and at least five candidates on negativity.

[22]Diermeier, Keane and Merlo (2005) estimate that term limits reduce the value of House and Senate seats by 32% and 21%, respectively.

[23]In Table B.1 we show that our results are robust to omitting this measure. In Table B.2, we control for the logged total volume of advertising in an election.

[24]We include all demographic variables in Table B.3 and results do not change.

[25]McGhee et al. (2014) document that the link between the openness of a primary system and the ideology of state legislators elected is quite weak. Hirano et al. (2010) find little evidence that primary competition is related to partisan polarization in Senate roll call voting.

[26]The effect size is smallest in Column (5) where we use the $N_{\text{gap}\leqslant 10}$ since there are only 66 duopolies, 22 non-duopolies, and all races are close (within 3.7 percentage points). The decrease in variation in the data could explain the smaller effect size as well as the increased standard error.

[27]In this specification, we also weight by the total advertising volume of each candidate.

[28]For House races redistricted, we take averages of the districts comprised of the 2002 district. In some cases we are forced to drop these races.

[29]The lagged vote gap is approximately normally distributed, ranging from -0.5 to 0.5. The magnitude of the duopoly effect ranges from 7% to 41%. This suggests that the effect is reinforced in races with lower lagged vote gaps and when the party lost by a large margin in the past.

[30]In the former case, we are left with 56 elections. Results are robust to using the wild cluster bootstrap (Cameron, Gelbach and Miller, 2008) to get better approximate asymptotically valid standard errors.

[31]When the opposing party has no entrants, we set HHI to missing, and when the opposing party's candidate runs unopposed, HHI=1, as in a monopoly.

[32]While Malhotra and Snowberg (2010) find that each state's presidential primary contest did not change a party's probability of winning the general election, candidates in our data may be forward-looking.

[33]This mechanism is important only if a candidate makes enemies with all other candidates.

[34]We cannot determine to which attacker a candidate was responding in the WiscAds data.

[35]In the 2005 Danish election containing 10 advertising parties, Hansen and Pedersen (2008) report that 8 percent of advertisements featured in 114 newspapers were exclusively negative.

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7. Figures and Tables

Figure 1: Frequency of Negative Ads with Two and more than Two Effective Candidates using $N_{\pi>10\%}$

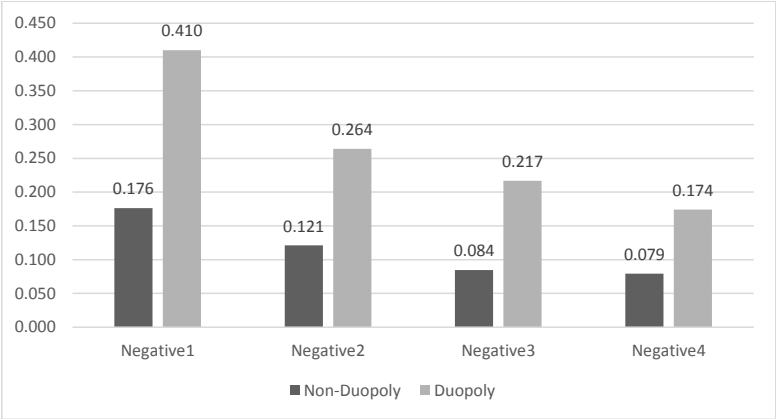

Figure 2: Frequency of Negative Ads with Two and more than Two Effective Candidates

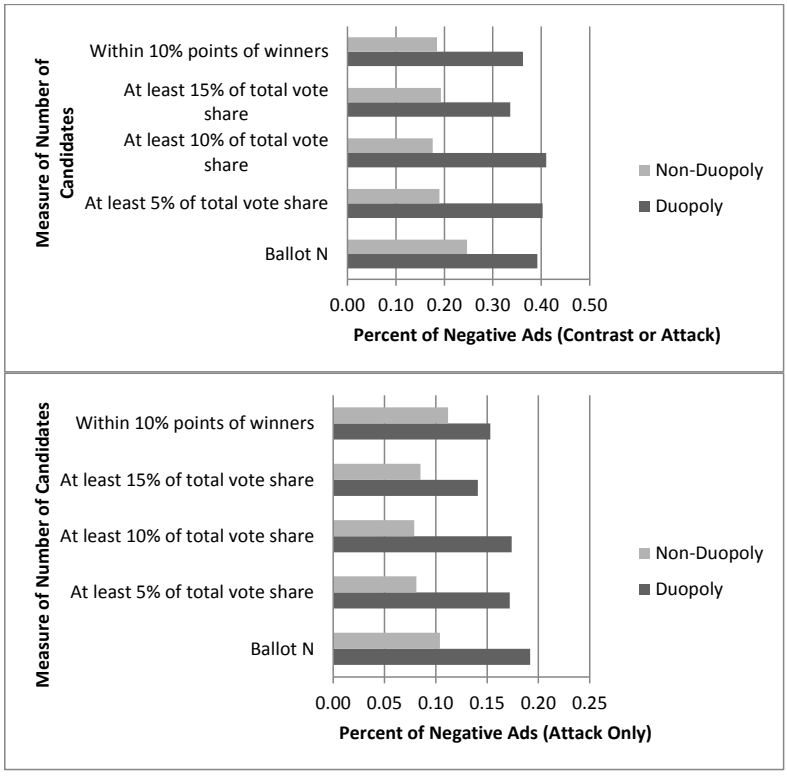

Table 1: The Cumulative Distribution Function of Ballot N and Effective N

Measure N	Ballot N	$N_{\pi \geqslant 5\%}$	$N_{\pi \geqslant 10\%}$	$N_{\pi \geqslant 15\%}$	$N_{gap \leqslant 10\%}$
1	0	2.34	9.36	16.37	73.98
2	36.84	50.29	61.40	75.15	94.15
3	61.11	76.32	89.18	97.08	97.95
4	74.85	92.11	97.66	100	99.12
5	82.75	96.78	99.71	100	100
6	90.35	99.12	100	100	100
7	95.03	99.71	100	100	100
8	97.66	100	100	100	100
9	98.83	100	100	100	100
10	100	100	100	100	100

Notes: There are 342 elections with two or more candidates on the ballot and active campaign advertising in gubernatorial, House, and Senate elections for 2002, 2004, and 2008 combined. Ballot N includes all candidates whose names were on the ballot (not write-ins). $N_{\pi \geqslant 5\%}$ includes candidates who received at least 5 % of the final vote share. $N_{\pi \geqslant 10\%}$ includes candidates who received at least 10 % of the final vote share. $N_{\pi \geqslant 15\%}$ includes candidates who received at least 15 % of the final vote share. $N_{gap \leqslant 10\%}$ includes candidates who came within 10 % points of winner.

Table 2: Candidate Characteristics do Not Differ Across the Duopoly Measure

	Advertisers		Candidates	
	Non-Duopoly	Duopoly	Non-Advertiser	Advertiser
Male	0.8137	0.8281	0.8400	0.8268
	(0.3900)	(0.3780)	(0.3670)	(0.3789)
White	0.9004	0.9128	0.8492*	0.8959*
	(0.3001)	(0.2832)	(0.3586)	(0.3058)
College Degree	0.9608	0.9633	0.9626	0.9614
	(0.1944)	(0.1885)	(0.1901)	(0.1928)
Law School	0.3824	0.3730	0.3029***	0.3836***
	(0.4868)	(0.4846)	(0.4602)	(0.4867)
Political Experience	0.3994***	0.5434***	0.3415***	0.4814***
	(0.4905)	(0.4991)	(0.4748)	(0.5000)
Observations	306	244	407	671

Notes: Sources of demographic variables available at `www.montana.edu/urban/research.html`. Mean of each variable with standard deviation in parentheses. In Columns (1) and (2) Duopoly is defined using the $N_{\pi \geqslant 10\%}$ measure where candidates who came with at least 10% of the final vote share are "viable competitors". In Columns (3) and (4) we consider all candidates on the ballot. *, **, *** Significantly different at the 10%, 5%, and 1% level, respectively. Remainder are not significantly different at the 10% level.

Table 3: Benchmark Specification 1, Advertising-level Analysis

Dependent Variable: Contrast=1 if ad ever attacked					
	(1)	(2)	(3)	(4)	(5)
	Ballot N	$N_{\pi \geqslant 5\%}$	$N_{\pi \geqslant 10\%}$	$N_{\pi \geqslant 15\%}$	$N_{gap \leqslant 10\%}$
Duopoly	0.195***	0.228***	0.250***	0.156***	0.135*
	(0.0733)	(0.0526)	(0.0519)	(0.0524)	(0.0762)
2008	0.150**	0.0563	0.0341	0.0649	0.121
	(0.0582)	(0.0569)	(0.0592)	(0.0655)	(0.0946)
2004	0.0461	0.00427	0.0259	-0.0319	0.139
	(0.0553)	(0.0497)	(0.0500)	(0.0680)	(0.0914)
Incumbent	-0.00258	-0.0784	-0.0698	0.00549	0.0898
	(0.0574)	(0.0519)	(0.0510)	(0.0598)	(0.0743)
Governor	0.0767	-0.00785	0.00295	0.0413	-0.0305
	(0.0471)	(0.0439)	(0.0455)	(0.0537)	(0.0827)
Days Until Election	-0.316***	-0.328***	-0.331***	-0.331***	-0.370***
	(0.0461)	(0.0466)	(0.0487)	(0.0503)	(0.0577)
Republican	0.0173	0.0344	0.0343	0.0503	0.122
	(0.0425)	(0.0406)	(0.0425)	(0.0498)	(0.0799)
Political Experience	0.0446	0.0450	0.0253	0.0250	0.0534
	(0.0427)	(0.0376)	(0.0397)	(0.0489)	(0.0759)
Panel B					
Mostly Attack=1 if ad attacked at least half airtime					
Duopoly	0.135**	0.131***	0.148***	0.0856**	0.0881
	(0.0549)	(0.0435)	(0.0416)	(0.0354)	(0.0673)
Attack at End=1 if ad ended in an attack					
Duopoly	0.102**	0.120***	0.125***	0.0771***	0.0795
	(0.0444)	(0.0322)	(0.0319)	(0.0293)	(0.0569)
Attack Only=1 if ad only attacked					
Duopoly	0.106***	0.0913***	0.0953***	0.0631**	0.0387
	(0.0387)	(0.0287)	(0.0286)	(0.0267)	(0.0454)
Observations	593,477	578,350	549,969	535,533	205,599

Notes: Robust standard errors clustered at the election level in parentheses. Linear Probability Model. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Robustness (using $N_{\pi \geqslant 10\%}$) Across Measure and Years

	Dependent Variable: Contrast=1 if ad ever attacked								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3	-0.228***	-0.191**	-0.269***	-0.186**	-0.308***				
	(0.0441)	(0.0929)	(0.100)	(0.0716)	(0.0665)				
4+	-0.229***	-0.141	-0.297***	-0.294***	-0.251**				
	(0.0512)	(0.114)	(0.0799)	(0.0751)	(0.105)				
Duopoly						0.174*	0.275***	0.191***	0.286***
						(0.0912)	(0.0940)	(0.0710)	(0.0671)
2002	-0.0398								
	(0.0639)								
2004	-0.00774								
	(0.0524)								
2008	0.00161								
	(0.0525)								
Incumbent in Election	0.0348	0.0274	-0.0596	0.181	-0.0905	0.0313	-0.0573	0.185	-0.0954
	(0.0695)	(0.218)	(0.104)	(0.114)	(0.0812)	(0.218)	(0.105)	(0.117)	(0.0809)
Governor	0.0284	0.147	0.0942	0.0398	-0.127	0.140	0.0980	0.0453	-0.127
	(0.0384)	(0.106)	(0.0772)	(0.0658)	(0.0833)	(0.103)	(0.0748)	(0.0674)	(0.0834)
Days Until Election	-0.339***	-0.310***	-0.168	-0.408***	-0.425***	-0.310***	-0.168	-0.408***	-0.425***
	(0.0457)	(0.0845)	(0.102)	(0.0657)	(0.0675)	(0.0845)	(0.102)	(0.0657)	(0.0675)
Republican	0.0341	0.0000628	-0.0703	0.0897	0.0468	-0.00709	-0.0699	0.0814	0.0536
	(0.0381)	(0.0726)	(0.0723)	(0.0612)	(0.0680)	(0.0733)	(0.0724)	(0.0594)	(0.0671)
Years	ALL	2000	2002	2004	2008	2000	2002	2004	2008
Observations	635,296	65,327	167,979	226,899	175,091	65,327	167,979	226,899	175,091

Notes: Robust standard errors clustered at the election level in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Excluded group is two candidates for Columns (1)-(5).

Table 5: Robustness (using $N_{\pi \geqslant 10\%}$)

Dependent Variable: Contrast=1 if ad ever attacked							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Duopoly	0.158*	0.201***	0.190***	0.184	0.231***	0.281***	0.162***
	(0.0874)	(0.0569)	(0.0561)	(0.116)	(0.0540)	(0.0646)	(0.0550)
2008	0.112	0.0468	0.0981	-0.193*	0.184***	0.0314	0.0268
	(0.0977)	(0.0621)	(0.0630)	(0.111)	(0.0628)	(0.0724)	(0.0646)
2004	0.309***	-0.0135	0.149**	-0.249***	0.0667	-0.00497	-0.0174
	(0.0966)	(0.0526)	(0.0639)	(0.0772)	(0.0494)	(0.0677)	(0.0565)
Governor	-0.185	0.0253	-0.0400	-0.0460	0.0587	-0.000727	0.0461
	(0.112)	(0.0496)	(0.0474)	(0.0746)	(0.0510)	(0.0471)	(0.0556)
Days Until Election	-0.328***	-0.329***	-0.410***	-0.182	-0.361***	-0.397***	-0.300***
	(0.0787)	(0.0589)	(0.0519)	(0.132)	(0.0676)	(0.0664)	(0.0622)
Republican	0.0390	0.0236	0.117**	-0.0460	0.0752	0.169***	-0.00817
	(0.0989)	(0.0451)	(0.0487)	(0.0869)	(0.0482)	(0.0495)	(0.0497)
Political Experience	0.0130	0.00297	0.0937*	-0.105***	-0.0375	0.0390	-0.00180
	(0.0759)	(0.0424)	(0.0503)	(0.0389)	(0.0544)	(0.0453)	(0.0467)
Incumbent			0.0239	0.299***	0.0272	0.151*	-0.0111
			(0.0799)	(0.103)	(0.0728)	(0.0819)	(0.0604)
Keeps Incumbent Races	X	-	-	-	-	-	-
Drops Incumbent Races	-	X	-	-	-	-	-
Keeps Dominant Party	-	-	X	-	-	-	-
Drops Dominant Party	-	-	-	X	-	-	-
Keeps Close Districts	-	-	-	-	X	-	-
Keeps Close Races	-	-	-	-	-	X	-
Drops Close Races	-	-	-	-	-	-	X
Observations	107,328	442,641	208,554	144,233	197,182	153,859	396,110

Notes: Robust standard errors clustered at the election level in parentheses. All models include state-level fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Incumbent races have an incumbent in the given party's primary election. The dominant party won the last two general elections, winning one by more than 10 percentage points. The non-dominant party lost the last two general elections, losing one by more than ten percentage points. Close districts did not have a dominant party, as the last two general elections came within ten percentage points. Close races are within 5 percentage points. In Column (4), no incumbents run in districits without dominant parties by construction.

Table 6: Robustness (using $N_{\pi \geqslant 10\%}$)

Dependent Variable: Contrast=1 if ad ever attacked						
	(1)	(2)	(3)	(4)	(5)	(6)
Duopoly	0.237***	0.255***	0.187***	0.183***	0.179***	0.196***
	(0.0480)	(0.0474)	(0.0323)	(0.0326)	(0.0302)	(0.0309)
Lagged Vote Gap	-0.0808				0.0771	
	(0.130)				(0.0927)	
Lagged Vote Gap × Duopoly	-0.338				-0.402**	
	(0.255)				(0.188)	
Vote Gap Deviation		-0.107				-0.205
		(0.206)				(0.162)
Vote Gap Deviation × Duopoly		0.535**				0.481**
		(0.258)				(0.228)
2008	0.0403	0.0285	0.116***	0.114**	0.115***	0.111***
	(0.0561)	(0.0565)	(0.0438)	(0.0454)	(0.0428)	(0.0403)
2004	0.0409	0.00526	0.0875**	0.0788**	0.0942**	0.0846**
	(0.0478)	(0.0467)	(0.0402)	(0.0356)	(0.0406)	(0.0380)
Governor	0.0155	0.00267	0.0119	0.0269	0.0180	0.0305
	(0.0449)	(0.0472)	(0.0342)	(0.0321)	(0.0344)	(0.0370)
Days Until Election	-0.332***	-0.331***	-0.334***	-0.325***	-0.336***	-0.334***
	(0.0493)	(0.0491)	(0.0502)	(0.0487)	(0.0506)	(0.0501)
Republican	0.0134	0.0528	0.0445	0.0588*	0.0357	0.0521*
	(0.0459)	(0.0400)	(0.0288)	(0.0301)	(0.0297)	(0.0284)
Political Experience	0.0227	0.0178	0.0219	0.0375	0.0179	0.0134
	(0.0394)	(0.0377)	(0.0245)	(0.0252)	(0.0247)	(0.0240)
Incumbent	-0.0508	-0.0662	-0.135***	-0.110**	-0.124***	-0.116**
	(0.0482)	(0.0467)	(0.0462)	(0.0462)	(0.0456)	(0.0460)
Observations	545334	549969	549969	533498	545334	549969
State Fixed Effects	-	-	X	-	X	X
Market Fixed Effects	-	-	-	X	-	-
Observations	545,334	549,969	549,969	533,498	545,334	549,969

Notes: Robust standard errors clustered at the election level in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Duopoly measure uses $N_{\pi \geqslant 10\%}$. Lagged Vote Gap equals the average of the difference between the party of the advertiser and the other party (i.e. if the ad was aired by the Democrat, it would be the Democrat- second place candidate) in the last two general elections for the given office. Vote Gap Deviation equals the median vote gap between the winner and runner up for the number of candidates in the election minus the vote gap between the winner and runner up for the given election. This variable is negative if the median vote gap is smaller than the vote gap for the election, meaning higher values of this variable associate with closer races.

Table 7: Robustness (using $N_{\pi \geqslant 10\%}$) Time Until Election

Dependent Variable: Contrast=1 if ad ever attacked						
	(1)	(2)	(3)	(4)	(5)	(6)
Duopoly	0.245***	0.246***	0.244***	0.246***	0.243***	0.240***
	(0.0521)	(0.0533)	(0.0531)	(0.0507)	(0.0562)	(0.0598)
2008	0.0392	0.0459	0.0813	0.0701	0.0614	-0.0263
	(0.0588)	(0.0618)	(0.0584)	(0.0603)	(0.0669)	(0.0715)
2004	0.0474	0.0618	0.0127	0.0349	0.0756	-0.0627
	(0.0558)	(0.0560)	(0.0604)	(0.0616)	(0.0575)	(0.0654)
Incumbent	-0.0535	-0.0530	-0.172**	-0.177**	-0.0917	-0.0576
	(0.0572)	(0.0597)	(0.0725)	(0.0704)	(0.0664)	(0.0520)
Governor	0.0226	0.0351	-0.0545	-0.100**	0.00466	-0.0165
	(0.0510)	(0.0483)	(0.0541)	(0.0504)	(0.0570)	(0.0475)
Republican	0.0290	0.0314	0.0121	0.0507	0.0408	0.0494
	(0.0427)	(0.0436)	(0.0503)	(0.0510)	(0.0540)	(0.0444)
Political Experience	0.0326	0.0313	0.00545	0.0287	0.0617	-0.0108
	(0.0411)	(0.0416)	(0.0401)	(0.0412)	(0.0475)	(0.0422)
Days	-0.000219					
	(0.000161)					
Log(Days)		-0.0282***				
		(0.0105)				
Includes						
Last 2 Weeks	-	-	X	-	-	-
Last Week	-	-	-	X	-	-
First Half	-	-	-	-	X	-
Second Half	-	-	-	-	-	X
Observations	549,969	547,516	225,540	131,517	274,991	279,998

Notes: Robust standard errors clustered at the election level in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Days is the number of days between the date the ad aired and the election. Log(Days) is the natural log of days and is missing for ads aired on election day. Duopoly uses the $N_{\pi \geqslant 10\%}$ measure. Specifications include 2002, 2004, and 2008 elections.