

**Strategic Candidates, Campaign Dynamics, and Campaign Advertising in  
Gubernatorial Races in 2002**

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## **Abstract**

Political campaigns are dynamic struggles between candidates to define the informational context for voters. Although much research describes how campaigns unfold or explores their effects on voters, less attention has been given to developing and testing a dynamic theory of candidate interaction during campaigns. In this study, we develop a rational expectations theory of candidate interaction and test it within the context of the TV advertising aired in 23 gubernatorial elections held in 2002. The analysis examines both the total advertising efforts and the total negative advertising efforts of candidates in these races, differentiating between candidates based on partisanship, incumbency status, and whether they won or lost. We find general support for our rational expectations theory.

## **Introduction**

Political campaigns are dynamic struggles between candidates to define the informational context for voters (e.g., Johnston et al. 1992; Carsey 2000; Johnston, Hagen, and Jamieson 2004). Candidates running for office face a number of considerations when mapping out their strategies. They must consider the constituency that they seek to represent, potential local, national, and international circumstances that might shape their particular race, and their own qualities and qualifications. The information available to candidates prior to the start of the campaign allows them to form an overall plan for the campaign season. However, candidates also monitor and respond to any number of developments over the course of the campaign itself.

Of critical importance in shaping a candidate's campaign strategy is the opponent and her behavior. Whether the opponent has prior political experience, has particular strengths on some issues or among specific segments of the constituency, or is expected to run a negative campaign are just a few examples of what might matter to candidates in formulating their own campaign plans. In fact, candidates may prepare multiple strategies in situations where the eventual opponent is not yet clear (Carsey 2000). While much of this information is available prior to the start of the general election campaign, much more will be learned during the campaign itself. In this study, we examine how candidates interact with each other over the course of a campaign, focusing specifically on their TV advertising effort. First, we develop a rational expectations theory of campaign behavior and test it in the context of the TV advertising efforts of the two major party candidates in 23 gubernatorial elections held in 2002. In so doing, we examine both the overall advertising effort of candidates as well as their level of negative advertising. Next, we further explore the dynamic interaction between competing candidates by differentiating between candidates in terms of their partisanship, incumbency status, and whether they won or lost. We conclude with a discussion of our findings as well as directions for future research on campaign dynamics.

## **Campaigns and Candidate Interaction**

Theoretical expectations regarding how campaigns unfold can be divided into three major categories. First, it could be the case that many opposing candidates simply ignore each other over the course of the campaign. Rather than getting caught up in a daily give-and-take with the opponent, a candidate may prefer to set in place before the campaign begins a strategy that she believes will help her to win, and then stick to that plan regardless of what her opponent does. Such a candidate might believe, for example, that mobilizing voters in a specific region of the state is critical to her success, and will thus concentrate her advertising effort in that region regardless of what her opponent does. Similarly, a candidate (e.g., a seemingly safe incumbent) may prefer to continue to wage a positive campaign even when her opponent starts to attack. Perhaps on normative grounds or, more likely, as part of a strategic calculus, such a candidate might make a conscious decision at the outset of a campaign to “go positive” and remain so to avoid the potentially damaging charge of having engaged in campaign mudslinging. Alternatively, a candidate (e.g., a relatively unknown challenger) may make the early strategic decision to mount an unrelentingly negative campaign regardless of the tone her opponent adopts, perhaps believing that only this style of advertising provides her with a chance to win the election (Skaperdas and Grofman 1995; Theilmann and Wilhite 1998; Lau and Pomper 2001, 2002). We call this perspective the *candidate independence* theory.

The scholarly literature provides some basis for expecting little in the way of interaction between candidates during a campaign. Gelman and King (1993) argue that presidential campaigns do not really affect the outcome of elections,<sup>1</sup> although they do appear to inform voters of salient considerations such as the health of the economy. Carsey (2000) argues that candidates focus attention on those issues on which they have a relative advantage to increase the salience of those issues to voters on Election Day. Similarly, the notion of issue ownership suggests that a candidate will discuss an issue only if the public perceives the candidate’s party as better able than the opponent’s party to handle the issue – thus competing candidates should avoid discussing many of the same issues during a campaign (Petrocik

1996; Petrocik, Benoit, and Hansen 2003; for a related discussion, see Spiliotes and Vavreck 2002). Simon (2002) presents a formal model that predicts that candidates will talk past each other rather than engage in a genuine dialogue.<sup>2</sup> Finally, an extensive literature on priming (e.g., Druckman 2004a, 2004b; Druckman et al. 2004) and learning (e.g., Lenz 2005) is consistent with the idea that candidates in a general election might focus their attention on their own strengths and/or their opponent's weaknesses, but never really engage in an active give-and-take.

A second perspective, which we label *reactive responsiveness*, views candidates as adapting their behavior in response to the observed behavior of their opponent. Here, candidates do engage in give-and-take over the course of a campaign, reacting to what their opponent does. There is substantial anecdotal evidence that reactive responsiveness takes place in modern campaigns for major offices. For example, it has become common for candidates to send staff members or volunteers to shadow their opponent at public events (e.g., Carsey 2000, chap. 6). Campaign staffers monitor the press releases, public events, and campaign commercials of their opponent, and even seek to determine their opponent's polling behavior (e.g., Carsey 2000, chap. 5). The press also fosters reactive responsiveness between candidates. Reporters covering the activities of one candidate routinely contact representatives from the opposing camp seeking comments about, or reactions to, what the candidate whom they are following said or did (see Sides 2005 for a similar discussion).

Lau and Pomper (2001) provide empirical evidence that Senate candidates retaliate against attacks on an almost one-to-one basis, suggesting a reactive strategy.<sup>3</sup> They write: "Our campaign data do not have the dynamic element that would allow us to say anything about strategic advantages in the *timing* of negative attacks on an opponent (and the timing of responses thereto), but we can say that a one-to-one response, *sometime* during the campaign, seems almost inevitable" (Lau and Pomper 2001, p. 81).

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<sup>1</sup> However, as the erroneous predictions from the 2000 presidential election forecasting models highlight, this argument is contingent on both major party candidates waging strategically competent campaigns (e.g., Bartels and Zaller 2001; Fiorina, Abrams, and Pope 2003).

<sup>2</sup> Simon (2002) does report empirical evidence of candidates engaging in dialogue, but his formal model predicts that they will not.

Geer (2006, p. 48) asserts that, in the context of presidential elections, “by going negative, the opposition can force a response from [a] candidate, generating dialogue and discussion of issues that might otherwise not be discussed.” Sides (2006b) also reports some evidence of the Bush and Gore campaigns, as well as the two national party organizations, responding to attacks by the other side during the 2000 presidential election, with similar results for House and Senate races in 2000 and 2002.

We offer a third view of campaign dynamics and candidate interaction. Specifically, we argue that candidates may pursue a *rational expectations* approach to their campaign strategy over the course of a campaign. The phrase “rational expectations” refers to rational actors gathering information to form unbiased expectations about future behavior, and then acting on those expectations.<sup>4</sup> Applied to campaigns, this perspective predicts that Candidate A will adjust her campaign activities based on her expectation, or forecast, of how Candidate B will behave in the future, and vice-versa. That is, the rational expectations view sees candidates as proactively anticipating their opponent’s behavior and adjusting their own behavior accordingly. Consistent with this line of thinking, Ansolabehere and Iyengar (1995a, p. 110) advise candidates to “design advertisements after *anticipating* the opponent’s moves (emphasis added).” In contrast, the reactive responsiveness view presents candidates who respond to the behavior of their opponent only *after* observing that behavior.

A rational expectations theory of campaign behavior assumes that candidates can accurately forecast the behavior of their opponent. To do so, candidates must develop beliefs about the information to which their opponent has access and how their opponent will respond to new developments. The opponent may draw on a variety of sources of information. A gubernatorial candidate herself generally has prior political experience. Also, a modern gubernatorial campaign typically employs seasoned professionals who often have both statewide and national experience, and includes polling operations and focus groups. Thus, any gubernatorial candidate can safely assume that her opponent’s campaign

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<sup>3</sup> However, Kahn and Kenney (1999, p. 28) conclude that “candidates do not consider the strategies of their opponents or the critical nature of campaign coverage when making decisions about negative advertising.”

<sup>4</sup> See McGinnis and Williams (2001) for an overview of rational expectations theory as applied to military arms races.

includes experienced advisors, polling, and the like as well. General election candidates also have the advantage of observing their opponent in the period leading up to the general election campaign, which typically includes a primary contest. Finally, statewide races often have local historical features that both candidates know. These might include which regions of the state are regularly competitive, regular events typically associated with increased or decreased campaign activities, and so forth. Thus, candidates almost certainly have beliefs about their opponent's likely behavior on which they can act.

In a rational expectations framework, candidates will make use of their beliefs about how their opponent will behave in two types of situations. First, there may be aspects of the general election campaign process that affect how a candidate expects her opponent to behave and that are known to both candidates in advance. For example, there may be an annual event in the state that is historically associated with increases in TV advertising by gubernatorial candidates. Similarly, a candidate might expect her opponent to go on the attack after a televised debate in an effort to coordinate advertising strategy with debate strategy. Rational expectations theory would predict that a candidate who expects her opponent to increase her total advertising effort or her negative advertising effort in response to events like these would also increase her own total advertising effort or negative advertising effort at that time. She would not wait to see if her expectations were realized before acting – she would act directly on those expectations.

Second, campaigns often experience unexpected events. Scandals emerge, political or economic conditions in the state change unexpectedly, or a national event impacts the gubernatorial contest. While the event itself might be unexpected – a random shock to the campaign environment – rational expectations theory asserts that a candidate can still predict how her opponent will react to that unexpected event and will shape her own reaction based on her expectation of her opponent's behavior.

To summarize, the rational expectations argument depends on candidates having enough information to predict how their opponent will react to both anticipated and unanticipated events that occur during the campaign. Furthermore, the rational expectations argument asserts that candidates will

act based on their predictions of their opponent's behavior rather than waiting to first observe whether their prediction was accurate.

However, obstacles likely prevent candidates from predicting their opponent's behavior perfectly and/or reacting immediately. First, candidates and their staffs guard strategic information. They do not release their polling data, advertising strategies, or talking points unless they see a strategic advantage in doing so. In fact, candidates often deliberately try to hide their strategies from their opponent, seeking to catch her off guard. Second, although almost all gubernatorial campaigns employ polling operations, they do not necessarily gather the same information. Candidates for the same office routinely ask different questions in their polls as they test different campaign strategies (e.g., Carsey 2000, chap. 5), and all polls have some margin of error.

Third, campaigns themselves are notorious for experiencing internal disagreements about how to form their own strategies or how to respond to events as they unfold. Well-documented was the internal debate in John Kerry's presidential campaign in 2004 regarding whether or how to respond to the TV ads aired by the *Swift Boat Veterans for Truth* (see Sides 2005). In this situation, two "conventional wisdoms" collided, as one group argued that negative attacks require a response, whereas another argued that a response grants the attacks greater legitimacy. The relevant point for rational expectations theory is that candidates and their staffs are occasionally uncertain about what their own behavior should be. If candidates are unsure about their own actions, clearly their opponents are likely to make some mistakes in forecasting that behavior.

Finally, rational actors may face what McGinnis and Williams (2001) call implementation costs in trying to adjust their own behavior so as to incorporate fully their expectations about another actor's future behavior. In the case of political campaigns, many decisions must be made in advance and are difficult or impossible to change quickly (Sides 2006b). Events are planned, trips are scheduled, and TV airtime is purchased days, weeks, or months in advance. Thus, even if candidates want to respond to what they expect their opponent will do, their ability to do so quickly and efficiently may be limited.

Implementation costs, incomplete information, and uncertainty present hurdles to candidates' capacity to forecast accurately the behavior of their opponent and to make the proper adjustments in their own behavior. As a result, the ability of candidates to adapt to their expectations of their opponent's behavior will likely be delayed and/or updated as candidates realize their forecasting errors. In the context of the present study, such obstacles lower the probability of observing rational expectations behavior, suggesting that whatever evidence we do uncover may underestimate the actual importance of rational expectations as a motivating force for candidates.

In practice, elements of all three theories of candidate interaction may come into play as candidates prepare for and execute their campaigns. Below, we offer specific hypotheses consistent with each theory regarding the TV advertising effort of candidates, focusing particular attention on the rational expectations theory of campaigns. Before presenting and testing these hypotheses, we provide a brief review of the role of TV advertising in campaigns.

### **Campaign TV Advertising**

We examine TV advertising in search of uncovering dynamic interaction between gubernatorial candidates for several reasons. TV advertising has become a staple in modern statewide and national political campaigns. Candidates devote huge sums of money to these efforts and have become quite sophisticated in developing and executing their advertising strategies. TV advertising has become a primary means of communicating directly with voters.

More specifically, TV advertising provides for direct and unfiltered communication from candidates to voters. As Sides (2005) and Carsey (2000) note, examining campaigns using newspaper coverage of campaign events and statements can be problematic. Reporters may filter information in a way that colors their coverage of a campaign. For example, reporters tend to focus disproportionately on conflict and the horse-race aspects of a campaign, perhaps artificially creating the appearance of candidate interaction (Patterson 1994). Making comparisons across campaigns based on newspaper coverage also runs the risk of conflating variance in actual campaign activities with variance in how reporters cover races across newspapers (Carsey 2000).

Considerable academic research has been devoted to the study of campaign TV advertising. Scholarly interest in the topic heightened with the appearance of Ansolabehere et al.'s (1994; see also Ansolabehere and Iyengar 1995b) provocative argument that negative campaigns demobilize potential voters. They drew much of their evidence from a series of experiments in which participants were exposed to television news broadcasts that contained a variety of campaign ads, including negative ones. Despite a good deal of counter-evidence (e.g., Finkel and Geer 1998; Freedman and Goldstein 1999; Lau et al. 1999; Wattenberg and Briens 1999; Goldstein and Freedman 2002; Jackson and Carsey forthcoming), Ansolabehere et al. (1999) remain steadfast in their claims. Subsequent to Ansolabehere et al.'s initial work, several other efforts (e.g., Finkel and Geer 1998; Kahn and Kenney 1999) relied on campaign TV commercials deposited at media archives to revisit the relationship between campaign negativity and voter turnout.

More recently, the appearance of an incredibly rich data source – The University of Wisconsin Advertising Project (WiscAds) – has facilitated a wave of research on campaign television advertisements. The Campaign Media Analysis Group (CMAG), a commercial firm that specializes in providing detailed satellite tracking information to campaigns in real time, has provided to Professor Kenneth Goldstein, now at the University of Wisconsin and director of the WiscAds Project, a wealth of data on campaign TV advertising in recent elections in the nation's largest media markets. Under Goldstein's direction, these data have been (and continue to be) systematically coded, archived, and made available to the research community.<sup>5</sup> Each case in the WiscAds data set represents the airing of one ad, and, among other things, includes information about the date of an ad's airing and a coding of its contents.

Many things about the WiscAds data are noteworthy. They provide to researchers for the first time reliable and valid information on the *universe* of ads that were *actually aired* in a large number of media markets, as well as the number of times that each ad was aired. To date, most of the research

relying on WiscAds data has created contextual measures of campaign TV advertising (typically at the media market level), which are then merged with cross-sectional, individual-level survey data. The most common dependent variables have been voter turnout, vote choice, and citizen political attitudes (e.g., Freedman and Goldstein 1999; Goldstein and Freedman 2000, 2002; Freedman, Franz, and Goldstein 2004; Jackson and Carsey forthcoming). Surprisingly, very little empirical work has used these data to assess the behavior of strategic elites in campaigns (for recent exceptions, see Sides 2005, 2006a, 2006b; Kaplan, Park, and Ridout 2006). Structured as a time series, they are ideal for examining the dynamics of TV advertising in campaigns.

### Modeling Campaign Dynamics

To evaluate the three theoretical perspectives regarding strategic interaction during campaigns, we need to estimate an empirical model capable of both capturing campaign dynamics and isolating the (possible) effects of each perspective. A two-equation vector autoregression (VAR) provides an appropriate model.<sup>6</sup> VARs model dynamic interaction over time without placing significant restrictions on the nature of that interaction (Brandt and Williams n.d.; Freeman, Williams, and Lin 1989). In a VAR model, current values of each variable are expressed as functions of their own past values, the past values of the other variables in the analysis, and a residual. Any contemporaneous relationships between the variables included in the model are parameterized in the residuals of each equation, resulting in contemporaneous correlation between the residuals across equations. So, for two candidates, **R**epublican and **D**emocrat, the model would be:

$$(1) \quad R_{it} = c_1 R_{it-1} + c_2 R_{it-2} \dots c_k R_{it-k} + d_1 D_{it-1} + d_2 D_{it-2} \dots d_k D_{it-k} + e_{1it}$$

$$(2) \quad D_{it} = p_1 D_{it-1} + p_2 D_{it-2} \dots p_k D_{it-k} + q_1 R_{it-1} + q_2 R_{it-2} \dots q_k R_{it-k} + e_{2it}$$

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<sup>5</sup> For overviews of these data and of the archival efforts that are making them available to the academic community, see Freedman and Goldstein (1999), Goldstein and Freedman (2000, 2002), Krasno and Seltz (2000), Ridout et al. (2002), Goldstein and Ridout (2004), and <http://polisci.wisc.edu/tvadvertising/>.

<sup>6</sup> See Carsey (2000 Appendix A) for a brief conceptual discussion of modeling campaign dynamics as a VAR. Sides (2005) employs a limited application of this modeling approach to House and Senate races, as well as to the 2000 Presidential election (Sides 2006b), although his interpretation of results differs from traditional approaches to VAR models. Sims (1972, 1980) provides the foundation for VARs, Freeman, Williams, and Lin (1989) provide an introduction and application for political science, and Brandt and Williams (n.d.) present an accessible overview.

Where  $R_{it}$  and  $D_{it}$  are the number of TV ads run by the Republican and the Democratic candidate, respectively, in media market  $i$  at time  $t$ . The right-hand side of each equation includes  $k$  number of lags of both campaigns' previous advertising. Although  $k$  is often determined empirically, it should extend to capture any cycles that might exist in either series. Because we have daily measures of TV advertising, we use 10 lags to reach beyond any possible weekly cycle in campaign advertising effort.

To illustrate the model, we focus here on Equation (1) for the Republican candidate. All *previous* information available to the Republican when deciding her allocation of TV advertising is summarized in her past advertising decisions. The degree to which the lagged values of the Republican's advertising predict her current advertising reflects the importance of this past information. Previous information may include events and developments during the campaign that the Republican used to update her behavior, but would also include information that was available to her before the campaign started and that she used to design her overall strategy.

In Equation (1), the lagged values of TV advertising by the Democrat represent the past history of choices made by the Republican's general election opponent (i.e., the Democrat), up to the most recent decision at time  $t-1$ . This portion of the model captures the degree to which the Republican candidate reacts or responds to the previous TV advertising activities of her Democratic opponent when formulating her own current TV advertising plans.

Thus, if the two candidates ignore each other in making decisions about their own campaign advertising, then each candidate's advertising at time  $t$  will only be a function of her own previous advertising behavior. For neither candidate will the previous advertising decisions of her opponent add significantly to explaining her own current TV advertising. However, if candidates respond in a reactive manner to their opponent, then the set of lagged values for the opponent's advertising specified in Equations (1) and (2) will contribute in a statistically significant manner to explaining a candidate's own campaign advertising behavior at time  $t$ . Specifically, the lagged values of TV advertising effort by the Democrat in Equation (1) will contribute significantly to explaining current advertising effort by the

Republican, and the lagged values of TV advertising effort by the Republican in Equation (2) will significantly influence current advertising effort by the Democrat.

Neither the theory of candidate independence nor the theory of reactive responsiveness predicts a contemporaneous relationship between the advertising efforts of the two candidates. Because VAR models parameterize contemporaneous relationships (when they do exist) in the residuals of the equations, both theories therefore predict that  $e_{1it}$  and  $e_{2it}$  should be uncorrelated. In contrast, the rational expectations theory explicitly predicts a positive contemporaneous correlation between  $e_{1it}$  and  $e_{2it}$ .

Captured in each residual is the portion of observed TV advertising effort at time  $t$  for a candidate that is not accounted for by knowing either that candidate's previous advertising effort or her opponent's previous advertising effort. If candidates respond to their expectations of what their opponent will do in the future, they are in essence responding to their beliefs about this residual for their opponent. For example, the Republican candidate in Equation (1), applying a rational expectations decision-making strategy for determining her own amount of TV advertising at time  $t$ , will predict what she expects the Democrat's TV advertising to be in time  $t$  and incorporate that into her own choice. To predict  $D_{it}$  after controlling for past values of advertising by both candidates is equivalent to predicting  $e_{2it}$ . If an event leads the Republican candidate to believe that the Democrat is going to increase her advertising effort beyond what past behavior would predict, the Republican would be predicting a positive value for  $e_{2it}$ . If the Republican responds to that prediction by increasing her own advertising beyond what past behavior would forecast, that will result in a positive value for  $e_{1it}$  as well, resulting in a positive correlation between  $e_{1it}$  and  $e_{2it}$ .

If both candidates respond in this way, and there are no errors in forecasting and no delays in implementing these responses, then the correlation between  $e_{1it}$  and  $e_{2it}$  captures completely the rational expectations response. In other words, in a pure rational expectations setting, previous decisions of the other candidate will *not* influence current decisions about advertising. However, if delays in implementation occur or if the candidates generate biased forecasts of each other's behavior, which are later updated based on the observed behavior of their opponent, then the previous decisions of the

opponent will affect the current decisions of a candidate. However, the contemporaneous correlation between the residuals will remain. Thus, the key test of the rational expectations theory lies in the contemporaneous correlation between these residuals (McGinnis and Williams, 2001).

We evaluate the predictions of these three theories using Granger causality tests on the blocks of lagged advertising measures for the candidate's opponent in Equations 1 and 2, respectively, and by analyzing the correlation between  $e_{1it}$  and  $e_{2it}$ . Granger causality tests the hypothesis that the block of lagged values of one variable contributes in a statistically significant manner to explaining variance in the current value of a second variable after controlling for lagged values of that second variable. For example, testing whether advertising by the Democrat Granger causes advertising by the Republican means testing the null hypothesis that the parameters  $d_1$  through  $d_k$  in Equation (1) are all simultaneously equal to zero. Similarly, testing whether advertising by the Republican Granger causes advertising by the Democrat means testing the null hypothesis that the parameters  $q_1$  through  $q_k$  in Equation (2) are all simultaneously equal to zero. The candidate independence theory predicts that neither variable will Granger cause the other. The reactive responsiveness theory predicts that each variable will Granger cause the other. However, Granger causality is also consistent with the rational expectations theory if there are implementation costs or errors in candidates' forecasts of their opponent's behavior. Thus, the Granger causality tests alone do not distinguish between the reactive responsiveness and rational expectations theories of candidate interaction. However, only the rational expectations theory predicts a positive and significant correlation between  $e_{1it}$  and  $e_{2it}$ .

After conducting these tests, we further explore the dynamics of candidate advertising by examining the decomposition of forecast error variance in the model. This process involves estimating the amount of variation in forecast errors for each of the variables in the VAR system that is due to changes in each of the variables in the system over a given time period. This is a post-estimation technique commonly used to describe more fully the dynamics of VAR systems. More detail about this process is provided below.

We estimated our models using TV ads aired during the general election campaign in support of the Republican and the Democratic candidates for governor in 66 designated media markets (DMAs) covering 23 races held in 2002.<sup>7</sup> For descriptive purposes, the 23 races, the two major party candidates, their vote shares, and their total spending (when available) are presented in Table 1. The unit of analysis is the DMA day. DMAs were included in the analysis if both major party candidates exhibited sustained advertising efforts over the last 30 days of the general election period.<sup>8</sup> The number of observations in the data set from each DMA (i.e., the number of days included) varies from a low of 36 to a high of 183. The number of observations (days) included from each DMA was determined first by the date of the state's primary election – only advertising aired after the primary is included. Second, several media markets, particularly those in states with early primaries, saw no advertising by either candidate for periods of weeks or months. In these cases, we determined the starting date of the TV advertising campaign in a DMA as the date at which at least one of the two major party candidates begins a TV advertising effort that is sustained to Election Day.<sup>9</sup> If the opposing candidate does not respond initially, that candidate receives a score of zero ads aired for each of those days. The data are taken from the 2002 rendition of the Wisconsin Advertising Project (<http://polisci.wisc.edu/tvadvertising/>), which includes a full census of every gubernatorial campaign TV ad aired in the 100 largest DMAs in the United States in 2002. First, we examine the total amount of advertising aired by each candidate. Next, given the

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<sup>7</sup> Candidates themselves sponsored 93 percent of ads, with their parties sponsoring another five percent. The remaining two percent were sponsored by other groups. In order to simplify the analysis, advertisements aired by, or on behalf of, third-party or other minor candidates are excluded from this analysis.

<sup>8</sup> We operationalize a “sustained effort” as no break in advertising lasting more than one week.

<sup>9</sup> In these cases, we operationalize “sustained efforts” somewhat differently so as to consider the efforts of both candidates. For example, suppose, for a given media market, Candidates A and B both run ads during the first week in June, but then suspend their advertising efforts. Candidate A begins advertising again on August 1<sup>st</sup>, doing so every day through the first week of September. Suppose that Candidate B does not begin to advertise again until September 1<sup>st</sup>, but continues to advertise until Election Day with no break lasting more than one week. Finally, suppose that Candidate A goes off the air for the last three weeks of September, but then resumes advertising again on October 1<sup>st</sup> and continues advertising daily until Election Day. In this circumstance, we consider August 1<sup>st</sup> as the effective starting date of the sustained TV advertising campaign for both candidates. Most of June and all of July saw no activity by either side. Thus, there is nothing for either candidate to consider responding to, and, of course, no variance to explain. Starting August 1<sup>st</sup>, however, at least one candidate is active. At this point, how and whether the other candidate is active reflects a choice about whether to respond rather than no response simply indicating a dormant setting.

attention that negative advertising has received in the scholarly literature, we examine negative advertising specifically.<sup>10</sup>

We use daily measures of advertising because doing so allows for a fine-grained analysis of the timing of advertising. We also believe that contemporary gubernatorial campaigns often make their TV advertising decisions on a day-to-day basis.<sup>11</sup> We measure daily advertising levels in each DMA rather than aggregating up to the state-level because candidates make their choices about *where* to advertise on a media market basis. Focusing on the DMA allows us to examine how candidates respond to each other in front of the same “audience.” For example, if the Democratic candidate in California decides to “go negative” in the Los Angeles media market, we want to explore whether her Republican opponent responds in Los Angeles as opposed to, say, in San Francisco.<sup>12</sup> As is typical, we estimate our VAR models via simple OLS.<sup>13</sup> Because we essentially have pooled cross-sectional time series data, we include a set of dummy variables for the 66 DMAs to capture any fixed effects.<sup>14</sup>

We conduct our analyses in three steps. First, we provide a basic description of the advertising behavior of the candidates included in our study. Second, we provide direct tests of the three theories of campaign dynamics, focusing on our rational expectations theory. Third, we conduct a further exploration of the dynamics of these campaigns in order to shed light on the behavior of incumbents

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<sup>10</sup> Drawing on the WiscAds coding scheme, we treated both *attack* and *contrast* ads as negative in tone (e.g., Goldstein and Freedman 2002; Jackson and Carsey forthcoming).

<sup>11</sup> Aggregating up to weekly measures, as done by Sides (2006b), or monthly measures would obfuscate much of the interesting dynamics in the campaign process, while disaggregating down to the hourly level, for example, does not seem to us to reflect accurately how gubernatorial campaigns make their TV advertising decisions. In addition, using daily measures does not require that candidates are, or are capable of, responding to events in one day’s time. If candidates follow a reactive responsiveness pattern, but take several days to respond, our use of a 10-day lag structure will capture that response. Similarly, if it takes candidates several days to implement a change in behavior based on their forecast of what their opponent will do in response to an unexpected event, as long as it typically takes their opponent the same amount of time to react, the result will still manifest itself in a contemporaneous correlation between residuals across equations. Finally, candidates acting on their rational expectations of their opponent’s behavior at different rates will bias our results against finding evidence of rational expectations motivated behavior.

<sup>12</sup> The response by candidates across media markets might be a potentially interesting line of future inquiry, but it extends beyond the scope of this paper.

<sup>13</sup> Given our expectation of a correlation between the residuals of each equation in our VAR models, it may be attractive to estimate the model as a set of Seemingly Unrelated Regressions (Brandt and Williams, n.d.). Not surprisingly, doing so has no effect on any of our conclusions. All models were estimated using RATS 6.1.

versus challengers and winners versus losers. For example, Sides (2005) claims that incumbents tend to respond more to challengers than do challengers to incumbents, particularly in regards to negative advertising. Looking at winners versus losers might also show us whether winners consistently employ strategies that differ from those followed by losers.

## **Empirical Results**

### *Descriptive Overview of Candidate Advertising*

Figures 1, 2, and 3 present the mean levels of total advertising and total negative advertising aired in the 66 DMAs included in our analysis.<sup>15</sup> Figure 1 presents this information for Democrats and Republicans. Figure 2 distinguishes between incumbents and challengers,<sup>16</sup> and Figure 3 between those candidates who ultimately won the election and those who eventually lost. Several features are apparent in these three figures.

First, the figures reveal a clear cycle in advertising volume, particularly during the last 60 days of the campaign. That cycle reflects a consistent tendency for candidates to reduce their amount of advertising on Saturdays and Sundays. This is not surprising given that roughly half of all gubernatorial ads are aired during local news broadcasts, national news broadcasts, and morning news shows, and these shows are aired and watched more regularly during the week.<sup>17</sup>

Second, substantial similarity exists in the aggregate in the advertising efforts of Democrats and Republicans, incumbents and challengers, and winners and losers. However, some minor differences do

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<sup>14</sup> Love and Zicchino (2006) suggest that potential problems may accompany simply including a set of fixed effects dummies in a panel VAR model. As a check, we re-estimated our models using routines developed and provided by Love (see Love 2001) and found very similar results.

<sup>15</sup> Although the aggregate patterns in these figures provide some basic picture of the advertising taking place in these elections, readers should be careful not to draw inferences about individual candidates or pairs of candidates running against each other based on these average patterns. The mean reported for each day prior to Election Day is based only on those DMA days included in the overall analysis. Thus, the mean for day -182 (182 days prior to Election Day) is based only on seven DMAs from Texas – the only DMAs where ads were being aired at that time – while the means for the final 35 days are based on all 66 DMAs in the analysis. Thus, high reported means early in the figures are based on fewer DMAs. This, combined with the relative distance from Election Day, accounts for the more sporadic advertising levels in the earlier periods of each figure.

<sup>16</sup> Figure 2 excludes candidates running for open seats.

<sup>17</sup> Cycles of this type do not present problems for VAR models. The standard approach is to include enough lagged values in the model to extend beyond the period of the cycle. Thus, we include 10 lags in our models. Thus, our subsequent results regarding rational expectations behavior are not an artifact of this weekly cycle.

emerge. The average total advertising of Democrats more than 50 days out from Election Day is somewhat higher than that of their GOP counterparts, but that gap closes as Election Day approaches. In contrast, challengers tend to exhibit higher levels of advertising early in the campaign process, but a slight incumbent advantage emerges and persists over the last 50 or so days of the campaign. However, challengers do appear to match incumbents over the final weeks of the campaign season in terms of the average amount of negative advertising they air. Finally, Figure 3 suggests that candidates who ultimately won their election aired more ads on average than did those who lost, but that the level of negative advertising by eventual winners and losers was roughly the same for most of the period. However, the winners' advantage in the total number of ads aired may simply reflect their greater relative ability to continue to raise funds to pay for ads.

Third, the volume of ads run in these DMAs is substantial. Average total ads routinely exceed forty per day during the final 30 days of the campaign, with over twenty per day common as far back as 90 days before Election Day. Similarly, it is not uncommon for candidates to air, on average, 15-20 negative ads on any given weekday during the last 45 days of the race, and the average DMA in our analysis saw at least 5 to 10 negative ads aired each weekday beginning in early August. Fourth, there is a steady trend upward over time. That is to be expected, as candidates concentrate their efforts closer to Election Day.<sup>18</sup>

#### *Testing Theories of Campaign Dynamics*

The aggregate patterns in Figures 1 through 3 provide a backdrop for our analysis, but they do not provide a test of our theoretical propositions. To do this, we turn to our VAR analysis. Each two-equation model estimates a total of 172 parameters. Each equation includes: 10 parameter estimates operating on lagged values of the candidate's own prior advertising behavior, 10 parameter estimates operating on lagged values of the opponent's prior advertising behavior, and 66 parameter estimates

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<sup>18</sup> Brandt and Williams (n.d.) argue that including a sufficiently long lag structure is the best way to capture such trends in VAR models. They explicitly argue against differencing or otherwise de-trending the data. We include 10 lags in our models and found no substantial evidence of remaining first order serial correlation in the residuals,

operating on DMA dummy variables. None of these individual parameter estimates is interesting in and of itself. We are primarily interested in the blocks of parameters operating on lagged values of the opponent's prior advertising levels for the Granger causality tests, the contemporaneous correlation between the residuals of the equations in each model, and the overall dynamics captured in each model. Thus, rather than presenting the full OLS models, we move directly to these results.<sup>19</sup>

Table 2 reports the results of a series of Granger causality tests and residual correlations, again comparing Democrats to Republicans, incumbents to challengers, and winners to losers. Before turning to Table 2, we note that each measure of campaign advertising at time  $t$  responds strongly and statistically significantly to its own past values. This is not surprising, but it is worth noting at the outset that candidates' choices about both the number of total ads and the number of negative ads to air on any given day are strongly related to their own previous advertising pattern. We will have more to say about this later.

Table 2 shows that, in every circumstance, the previous advertising behavior of a candidate Granger causes the current advertising of her opponent. The Granger causality tests present clear evidence that gubernatorial candidates respond to the behavior of their opponent when making choices about both the number of ads to air and the number of negative ads to air. Candidates do not simply follow their own course when deciding on their TV advertising. Rather, there is a dynamic interaction that takes place as the campaign unfolds. The Granger causality tests document significant interaction between the TV advertising of opponents in a race, but do not help to clarify the nature of that interaction. These tests are consistent with both a theory of reactive responsiveness and a theory of rational expectations characterized by implementation costs or imperfect forecasting of opposition behavior.

However, the final column in Table 2 provides a direct test of the rational expectations theory. Recall that candidate independence and reactive responsiveness both predict *no* contemporaneous correlation between the residuals of the equations in each of our models, but that the rational expectations

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indicating that our lag structure is sufficiently long and that our results regarding rational expectations are not an artifact of this trend.

theory predicts a positive and significant correlation. Table 2 reveals, in every instance, a positive and statistically significant contemporaneous correlation between the residuals for the two candidates in a race. These correlations range from a high of .42 to a low of .28, with somewhat higher correlations among models focused on total advertising effort compared to those limited to negative advertising effort. Overall, these results provide strong and consistent support for viewing gubernatorial campaigns, at least in part, as an exercise in which each candidate forecasts the behavior of her opponent and adjusts her own behavior based on these forecasts. Candidate interaction during the course of the campaign is not limited merely to reacting to the behavior of the opponent—it also includes anticipating the actions of the opponent and making decisions based on those expectations. In fact, uncovering clear support for the rational expectations theory among the residuals lends weight to interpreting the Granger causality tests as consistent with the implementation costs view of the rational expectations theory rather than strictly in terms of reactive responsiveness. We also note that these positive correlations among residuals would not appear if candidates tried to anticipate the behavior of their opponent but were unable to do so with any reliability. A positive correlation depends on candidates guessing right on the expected actions of their opponent more often than not.

#### *Further Exploration of Campaign Dynamics*

VAR models permit further exploration of the dynamics of the system of equations beyond the tests we have presented thus far. In particular, VAR models lend themselves to parsing the variance in forecast errors over time into innovations associated with each variable in the model. As noted above, this allows us to account for the percentage of the variance in the forecasts predicted by the model that is due to each variable in the model. This procedure is implemented after estimating the VAR model, but requires us to place an additional restriction on the models. As a result, the decomposition of the forecast error variance can be sensitive to the order in which the researcher considers the variables. With this

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<sup>19</sup> Full statistical results are presented in the Appendix.

concern in mind, we explore further the dynamics of campaign advertising in these 23 gubernatorial races.<sup>20</sup>

Table 3 presents the results of the decomposition of the forecast errors for each of the VAR models we estimated. We estimate each model twice so we can evaluate the impact of changing the order in which the variables are considered. To make clear what the entries in Table 3 indicate, consider the first row of entries, which are associated with the total advertising effort of the Democrat. The first column reports that when the Democrat's advertising is entered first into the system, 93 percent of the forecast error variance in her advertising is accounted for by her own past advertising, while only seven percent can be traced to the past behavior of the Republican. In contrast, when the Republican's advertising effort is considered first, 67 percent of the forecast error variance in the Democrat's series is accounted for by its past values in that series, while 33 percent of the variance is associated with past values of Republican advertising. Looking at the next row of entries associated with the Republican, we see a similar pattern. While some rules of thumb exist, there are no firmly established criteria with which to determine what variables should be included first in these post-estimation analyses (Brandt and Williams n.d.). In this particular case, the symmetry of the findings for the Democratic and Republican series provides no hint. However, Table 3 makes clear that a substantial majority of the variance in each variable's forecast errors is attributable to its own past values, while no more than a third, and potentially less than ten percent, of the forecast error variance in each series is accounted for by the opponent's past behavior.

We noted above that the VAR results reveal that each series is strongly determined by its own past values. The decomposition of the forecast error variance gives a sense of just how strongly. The advertising decisions of gubernatorial candidates appear to depend heavily on their own previous choices and the information embodied in those choices. However, the Granger causality tests and these forecast

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<sup>20</sup> Another common post-estimation tool is the construction of impulse response functions (IRFs). IRFs and forecast error variance decomposition make use of the same information, require the same additional restriction, and often reveal the same dynamics. In the interests of space, and because they did not reveal anything unique, we do not present any IRFs here.

error variance decompositions do reveal a meaningful response by candidates to the advertising behavior of their opponent.

The total advertising entries for incumbents versus challengers and for winners versus losers show similar patterns in terms of both magnitude and symmetry to those discussed for Democrats versus Republicans. Table 3 does suggest a tendency for challengers to respond somewhat more to incumbents than do incumbents to challengers regarding total advertising levels. Similarly, eventual losers of the general election appear to respond somewhat more to the total advertising levels of the winners than do winners to those of the losers. The implication is that, when compared to challengers and eventual losers, both incumbents and eventual winners, respectively, tend to establish a pattern of total advertising effort that builds on their own previous behavior, while paying somewhat less attention to the behavior of their opponent.<sup>21</sup>

Turning to the results in Table 3 dealing with levels of negative advertising, we see virtually no differences in how Democrats and Republicans, incumbents and challengers, and winners and losers respond to each other. The one exception appears in the first column of results comparing incumbents to challengers. Consistent with results reported by Sides (2005), the first column of Table 3 suggests that incumbents respond somewhat more strongly to negative advertising by their challenger than do challengers to negative advertising by the incumbent. This suggests that challengers decide to go negative and, having made this choice, decide how many negative ads to run, largely without regard to the negative tone of the incumbent's advertising. In contrast, the incumbent seems to weight somewhat more heavily the tone of her opponent's advertising when making her own decisions about how many negative ads to run. This evidence is consistent with the commonly held belief that incumbents have a tendency to wait until their challenger goes negative before they do so (e.g., Salmore and Salmore 1989).

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<sup>21</sup> One question is to what degree incumbents tend also to be eventual winners in the data set. First, of the 23 races included in the analysis, only nine involved incumbents. Of those, five incumbents won and four lost. Of course, some races contribute more to the sample size because they cover more DMAs and/or more days. Only 41 percent of the observations in the data set for winners are contributed from winning incumbents (2,477 out of 6,031). However, 78 percent of the cases associated with incumbents involve incumbents who won (2,477 out of 3,159).

This contrasts with the results reported in Table 3 comparing the negative advertising efforts of winners to those of losers. Here we see no evidence that eventual winners respond to the level of negative advertising by their opponent in a manner different from that of eventual losers. Earlier, we recounted the story of the 2004 Kerry campaign's internal debate over whether and how to respond to attacks on his record in Vietnam. Two conventional wisdoms collided: 1) never allow an attack to go unanswered, and 2) do not lend credibility to negative attacks by responding to them. The evidence presented here does not enable us to discern which of these two folk wisdoms is more typically pursued by the eventual winners of gubernatorial races.

## **Conclusions**

Campaigns are dynamic events that unfold over time. The daily campaign advertising efforts of candidates reflect, to a large degree, the information embodied in their own past behavior. However, candidates also respond in a statistically significant and substantively important way to what their opponent does. This manifests itself in two ways. First, we provide strong, systematic evidence that candidates follow, at least in part, a rational expectations approach to decision making. Candidates appear to forecast the expected behavior of their opponent and adjust their own behavior based on those forecasts. Candidates do not simply wait until they can observe the behavior of their opponent before taking action. That is, candidates are not sitting still to take the punch today and waiting until tomorrow to counter-punch.<sup>22</sup> Rather, they anticipate those punches and determine when to throw their own accordingly.

Second, we find that candidates also respond to the previous observable behavior of their opponent. Although potentially consistent with a reactive response theory of campaigns, this finding also comports with candidates behaving as the rational expectations theory predicts in circumstances when they are unable to forecast the behavior of their opponent perfectly and/or face implementation costs

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Thus, the analysis of winners versus losers is not dominated by cases involving winning incumbents. However, the analysis of incumbents versus challengers is dominated by incumbents who won.

associated with adjusting their behavior based on their forecasts of their opponent's behavior. Our findings make it clear that candidates attempt to anticipate the behavior of their opponent. This suggests that if candidates had complete information and did not face implementation costs, we would see a stronger correlation between the residuals and a diminished impact for delayed response. Ask any candidate if she would rather base her decisions on knowing what her opponent *will do* rather than on what her opponent *has already done* -- we think the answer is obvious. Taken together, we conclude that rational expectations played a major role in shaping campaign advertising effort in these 23 gubernatorial elections.

Looking more closely at the dynamics of candidate advertising efforts, we found some limited evidence of incumbents being more responsive to negative attacks by challengers than were challengers to negative attacks by incumbents. This finding is consistent with the conventional wisdom that challengers must attack regardless of what the incumbent does, but that incumbents may wait until their challenger goes negative before they do so. We also found some evidence that challengers and losers may be more responsive to the total advertising levels of their opponent than are incumbents and winners. This may reflect a tendency for incumbents and winners to stay the course in regards to their total advertising efforts. It could also be a by-product of incumbents and eventual winners generally having more funds and, thus, fewer resource restrictions regarding their total advertising effort, thereby reducing their incentive to respond closely to what their opponent does.

We have provided systematic support for a rational expectations theory of campaign dynamics and candidate interaction, but obviously this study does not represent the final word on the subject. While several directions exist for future research to pursue, we believe that we have laid out a fruitful approach for further exploration of candidate interaction during campaigns.

Perhaps most obviously, given our focus on gubernatorial campaigns, researchers should examine contests for other offices – e.g., the U.S. House, the U.S. Senate, and the presidency – to determine

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<sup>22</sup> Thus, our evidence suggests that some candidates follow a more sophisticated strategy than that suggested by Roger Ailes, whose first axiom of campaign advertising strategy is “once you get punched, you punch back” (quoted

whether similar patterns emerge (e.g., Sides 2005, 2006b). Such efforts would provide opportunities to assess our rational expectations theory of candidate interaction in additional contexts.

Furthermore, our focus on total ads and the subset of ads that are negative in tone admittedly limits this study's treatment of candidate advertising efforts. We did so to provide a theoretically informative, yet manageable, first look at the question. However, future research should consider whether candidates respond to the substantive content of their opponent's advertising. Do candidates, via their own advertising, react to, and perhaps even anticipate, the specific issues and topics that become the focus of their opponent's campaign advertising? The answer to this question has important implications for the conduct of representative democracy in the United States. As a campaign unfolds, do the candidates engage in a meaningful dialogue, enhancing the supply of information and arguments available to the electorate, or do they simply "talk past" each other? Recent research has begun to provide insight into campaign dialogue (e.g., Simon 2002; Sigelman and Buell 2004; Kaplan, Park, and Ridout 2006), but, relying on summary measures of campaign content, does not dissect the dynamics of the underlying process. Is dialogue primarily a product of candidates reacting to, or anticipating, their opponent's behavior, the concerns of the electorate (perhaps with the median voter as the focal point), or something else altogether?

In addition, our examination of TV advertising effort excludes the myriad of other campaign activities in which candidates engage over the course of the campaign. What dynamics govern whether and when candidates respond to each other in their public speeches, direct mail efforts, or interviews with the press? How do the dynamics that describe these processes interact with the dynamics of TV advertising? Available case studies explore these issues (e.g. Carsey 2000, Johnston et al. 1992, Johnston et al. 2004), but more systematic work across multiple races is in order.

Finally, our study considers only the final sustained advertising efforts of gubernatorial candidates during the general election. We leave unexplored the strategic decision-making and interaction that takes place prior to this final stage. The information gathered by candidates before the

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in Runkel 1989, p. 164).

final general election period is incorporated into our analysis through each candidate's own previous behavior, but we did not examine those learning and decision-making processes directly. Thus, a great deal of candidate interaction, which we believe is also likely to be structured by rational expectations, is obscured from view in the current analysis. In other words, we suspect that by focusing on the final period of these campaigns, we have underestimated the actual level of interaction that takes place between candidates over the course of the entire campaign season.

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<b>Table 1: States and Candidates Included in the Analysis, Including Campaign Expenditures and Election-Day Vote Shares</b>			
<b>State</b>	<b>Candidates</b>	<b>Spending</b>	<b>Vote Share</b>
Alabama	Bob Riley (R)	\$13,847,976	49.2%
	Don Siegelman (D) <sup>a</sup>	\$11,389,116	48.9%
Arizona	Matt Salmon (R)	\$2,097,587	45%
	Janet Napolitano (D)	\$42,297,981	46%
California	Bill Simon (R)	\$33,572,205	42%
	Gray Davis (D) <sup>a</sup>	\$64,215,205	47%
Connecticut	John Rowland(R) <sup>a</sup>	\$6,117,067	56%
	Bill Curry (D)	\$1,752,168	44%
Florida	Jeb Bush (R) <sup>a</sup>	\$7,624,866	56%
	Bill McBride	\$6,519,693	43%
Hawaii	Linda Lingle (R)	\$5,408,527	51%
	Mazie Hirono (D)	\$2,370,496	47%
Illinois	Jim Ryan (R)	\$13,903,032	45%
	Rod Blagojevich (D)	\$22,409,565	53%
Iowa	Doug Gross (R)	\$5,961,434	45%
	Tom Vilsack (D) <sup>a</sup>	\$6,051,598	53%
Kansas	Tim Shallenburger (R)	\$2,371,185	45%
	Kathleen Sebelius (D)	\$4,362,442	53%
Maine	Peter Cianchette (R)	\$796,581	41.5%
	John Baldacci (D)	\$1,584,380	47.1%
Maryland	Robert Ehrlich (R)	\$2,533,835	51.6%
	Kathleen Kennedy Townsend(D)	\$2,596,970	47.7%
Massachusetts	Mitt Romney (R)	\$9,361,003	50%
	Shannon O'Brien (D)	\$6,261,188	45%
Michigan	Dick Posthumus (R)	\$3,411,190	47.4%
	Jennifer Granholm (D)	\$8,888,296	51.4%
New Hampshire	Craig Benson (R)	\$11,164,368	59%
	Mark Fernald (D)	\$741,952	38%
New Mexico	John Sanchez (R)	\$1,993,731	39%
	Bill Richardson (D)	\$7,326,497	56%
New York	George Pataki (R) <sup>a</sup>		48%
	Carl McCall (D)	\$15,162,596	33%
Oklahoma	Steve Largent (R)	\$3,301,783	42.6%
	Brad Henry (D)	\$3,231,710	43.3%
Oregon	Kevin Mannix (R)	\$3,899,121	46.2%
	Ted Kulongoski (D)	\$3,210,505	49%
Pennsylvania	Mike Fisher (R)		44%
	Ed Rendell (D)		53%
Rhode Island	Don Carcieri (R)	\$2,441,691	55%
	Myrth York (D)	\$4,290,594	45%
South Carolina	Mark Sanford (R)		53%
	Jim Hodges (D) <sup>a</sup>		47%
Tennessee	Van Hilleary (R)	\$5,626,459	48%
	Phil Bredesen (D)	\$9,763,343	51%
Texas	Rick Perry (R) <sup>a</sup>	\$27,899,725	58%
	Tony Sanchez (D)	\$76,279,307	40%
Wisconsin	Scott McCallum (R) <sup>a</sup>	\$6,899,771	41%
	Jim Doyle (D)	\$5,526,312	45%

<sup>a</sup>Incumbent

Source: Thad Beyle's State Election Spending Data (<http://www.unc.edu/~beyle/guber.html>)

**Table 2: Granger Causality Tests and Residual Correlations Based on VAR Models of Gubernatorial Candidate TV Advertising**

<b>Total Advertising</b>	<b>Granger Caused by Opponent's Advertising</b>	<b>Residual Correlation</b>
Democrat	F = 27.92 (10/5265)*	.42*
Republican	F = 23.55 (10/5265)*	
Incumbent	F = 13.91 (10/2798)*	.35*
Challenger	F = 18.18 (10/2798)*	
Winner	F = 16.31 (10/5265)*	.41*
Loser	F = 36.24 (10/5265)*	
<b>Total Negative Advertising</b>		
Democrat	F = 26.02 (10/5265)*	.31*
Republican	F = 23.10 (10/5265)*	
Incumbent	F = 15.11 (10/2798)*	.28*
Challenger	F = 15.82 (10/2798)*	
Winner	F = 21.17 (10/5265)*	.30*
Loser	F = 22.44 (10/5265)*	

\*p<.01

Table entries in the first column are joint F-tests (and associated degrees of freedom) on the block of lagged variables associated with the advertising levels of the opponent. Entries in the second column are simple correlation coefficients. All VAR models included ten lagged values of each pair of advertising variables as well as a full set of fixed-effects dummy variables for the 66 DMAs.

Source: 2002 WiscAds data

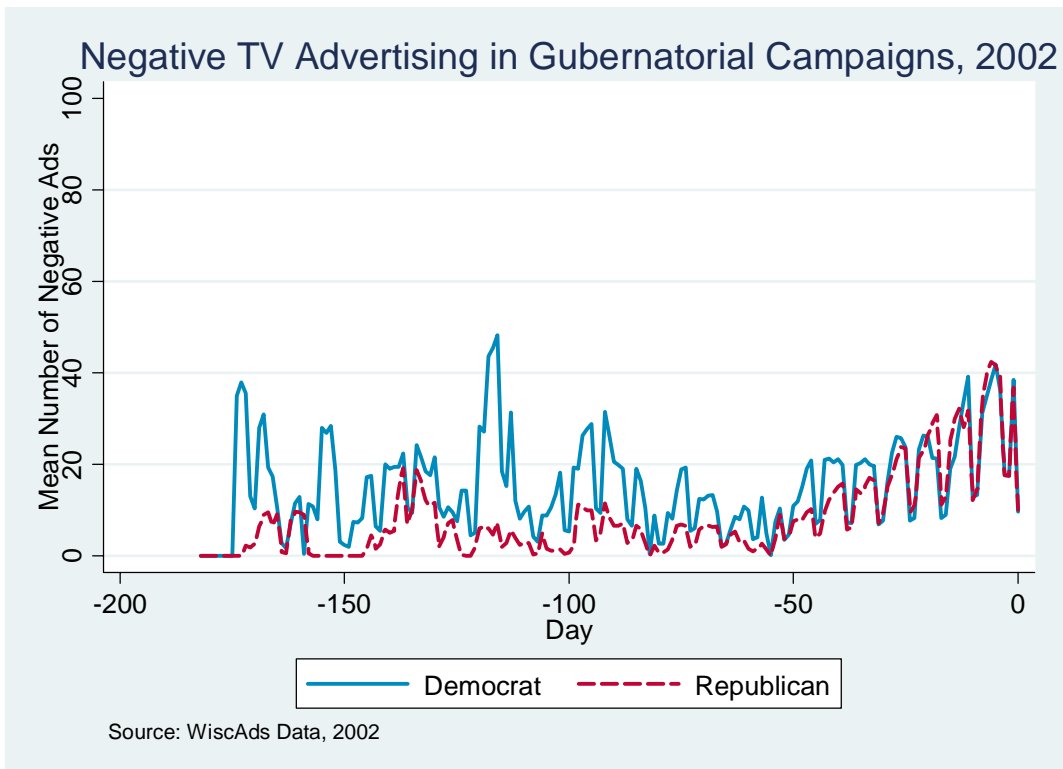
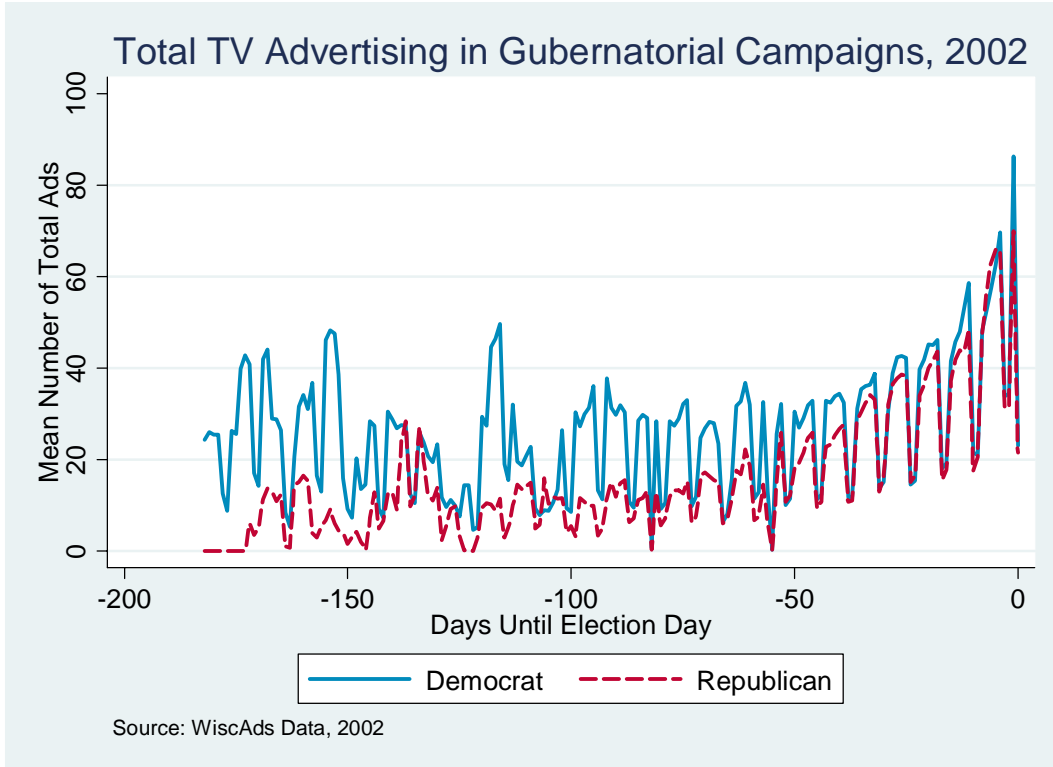
**Table 3: Decomposition of Forecast Error Variance Based on VAR Models of Gubernatorial Candidate TV Advertising**

<b>Total Advertising</b>	<b>Percent of Forecast Error Variance Explained by Innovations in Each Candidate's Behavior and by Innovations in the Opponent's Behavior</b>	
	<b>Candidate In Row Entered into VAR First</b>	<b>Candidate's Opponent Entered into VAR First</b>
Democrat	(93%, 7%)	(67%, 33%)
Republican	(91%, 9%)	(68%, 32%)
Incumbent	(93%, 7%)	(77%, 23%)
Challenger	(89%, 11%)	(69%, 31%)
Winner	(96%, 6%)	(73%, 27%)
Loser	(88%, 12%)	(65%, 35%)
<b>Total Negative Advertising</b>		
Democrat	(92%, 8%)	(78%, 22%)
Republican	(96%, 4%)	(82%, 18%)
Incumbent	(88%, 12%)	(77%, 23%)
Challenger	(93%, 7%)	(77%, 23%)
Winner	(93%, 7%)	(79%, 21%)
Loser	(95%, 5%)	(80%, 20%)

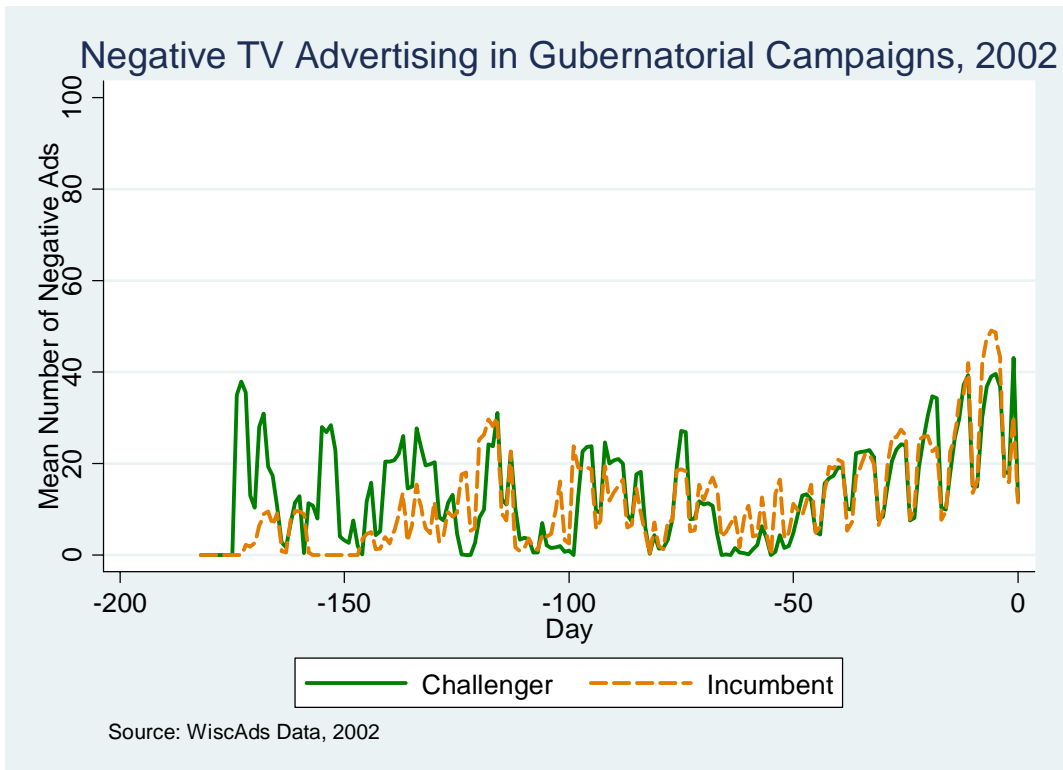
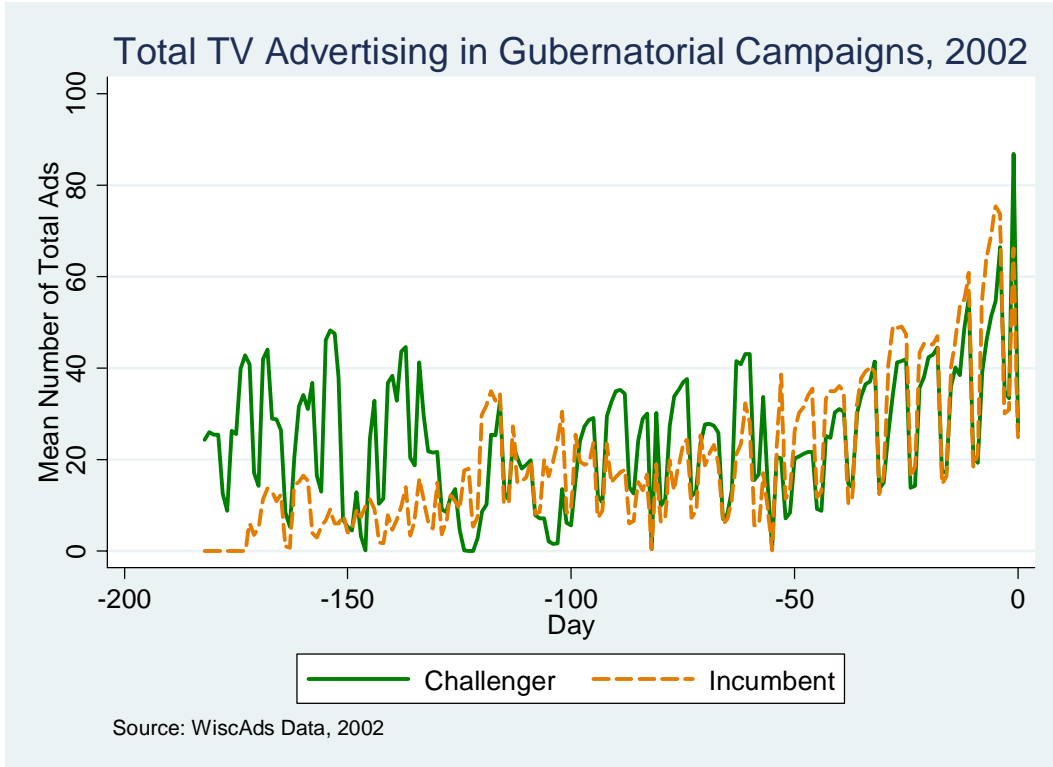
Table entries are percentages based on the moving average representation of the VAR model with orthogonalized innovations using the Choleski factorization. Both columns are presented because the order in which variables are considered in this process can matter. Each pair of entries refers to how much variance in the forecast errors of the variable under consideration in that row is accounted for by innovations in that candidate's advertising behavior and how much is accounted for by innovations in the opponent's advertising behavior. Entries are for forecasts 24 steps out so as to permit the forecasts to converge toward equilibrium. Thus, entries capture the long-run impact of innovations on forecasts of each variable. All VAR models included ten lagged values of each pair of advertising variables as well as a full set of fixed-effects dummy variables for the 66 DMAs.

Source: 2002 WiscAds data

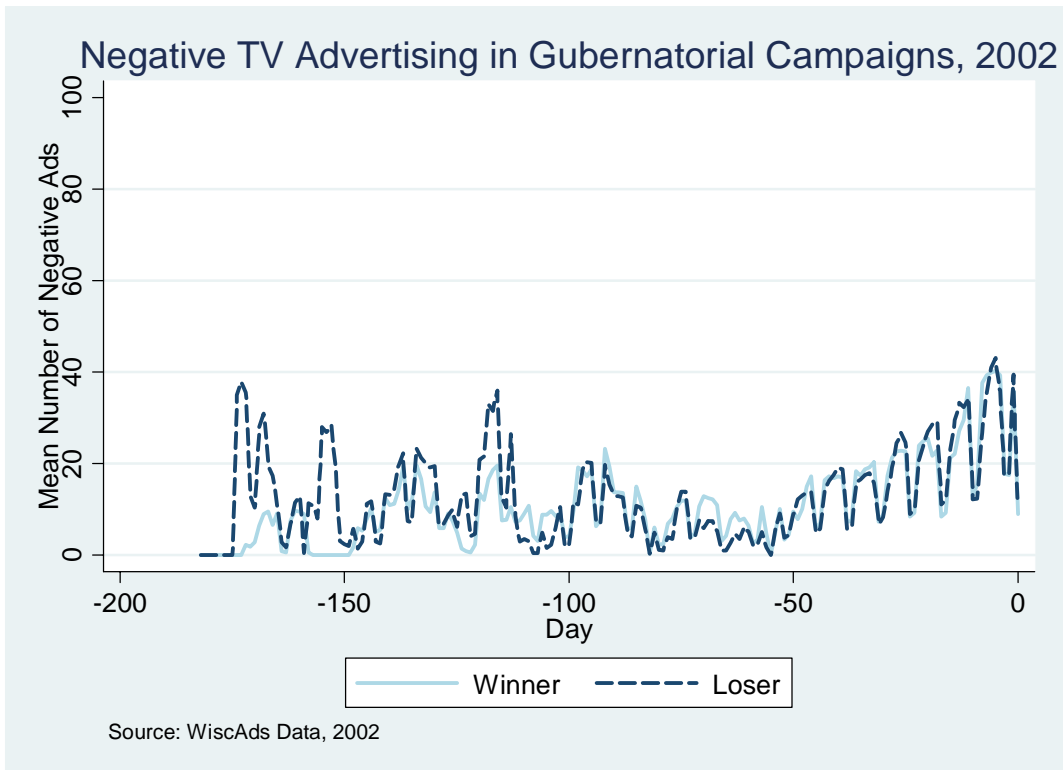
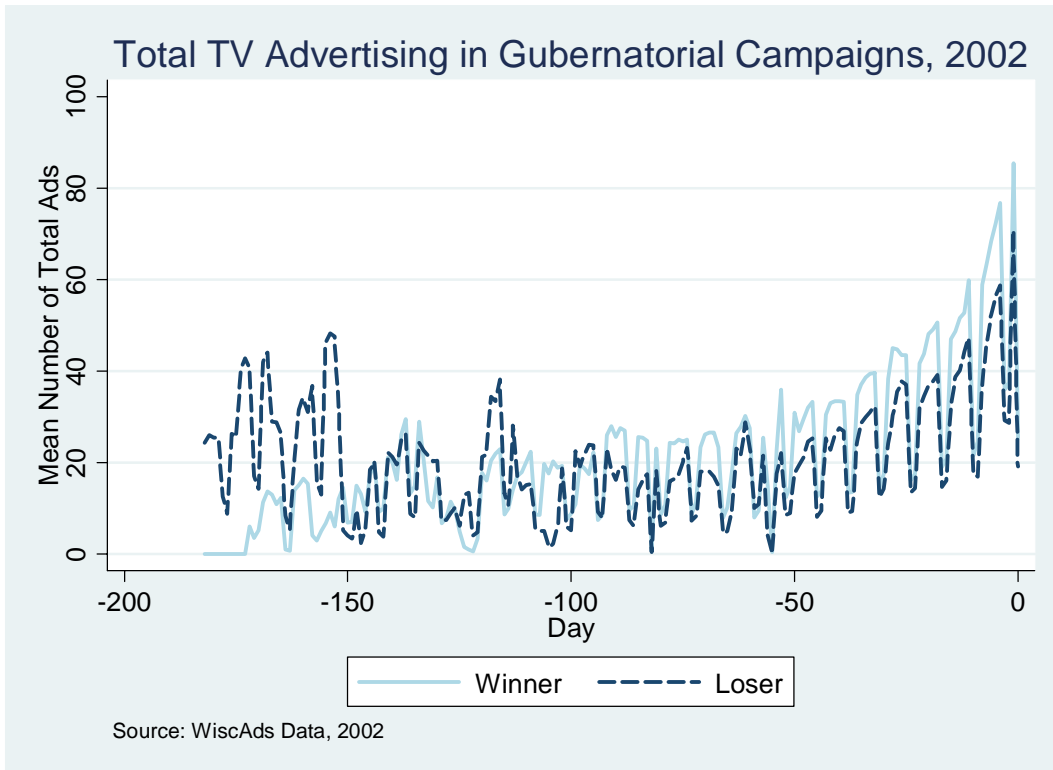
**Figure 1**



**Figure 2**



**Figure 3**



## Appendix

We report the full statistical results of our VAR models in Tables 1A through 3A of this Appendix. For comparison's sake, we include both the results estimated as a simple fixed effects panel VAR including a full set of dummy variables for the DMAs included in the analysis using RATS 6.1 as well as those based on the recommendations by Love (2001) and Love and Zicchino (2006) using code provided by Love and estimated using STATA/SE 9.2.. The comparison reveals no meaningful differences in the findings based on these two different approaches.

Table 1A: Full Results of Panel VAR Analysis, Total Advertising Effort and Total Negative Advertising Effort by Democrat and Republican Candidates for Governor

Independent Variables	Total Advertising Effort				Total Negative Advertising Effort			
	Fixed Effects Panel VAR*		Corrected Panel VAR**		Fixed Effects Panel VAR*		Corrected Panel VAR**	
	Democrat	Republican	Democrat	Republican	Democrat	Republican	Democrat	Republican
DEM <sub>t-1</sub>	.530(.016)	-.054(.013)	.533(.028)	-.032(.022)	.706(.015)	.008(.012)	.780(.088)	.239(.110)
DEM <sub>t-2</sub>	-.079(.020)	-.021(.016)	-.116(.026)	-.035(.017)	-.176(.019)	-.039(.015)	-.168(.036)	.009(.035)
DEM <sub>t-3</sub>	.194(.019)	.032(.016)	.185(.034)	.033(.018)	.192(.019)	.055(.015)	.210(.040)	.118(.040)
DEM <sub>t-4</sub>	-.069(.019)	-.015(.015)	-.066(.022)	-.017(.016)	-.049(.019)	-.012(.015)	-.023(.034)	.036(.034)
DEM <sub>t-5</sub>	-.014(.019)	.018(.015)	-.034(.021)	.006(.016)	-.006(.019)	.003(.015)	.014(.032)	.060(.032)
DEM <sub>t-6</sub>	.039(.019)	.013(.015)	.031(.022)	.010(.015)	.016(.019)	.003(.015)	.040(.032)	.057(.038)
DEM <sub>t-7</sub>	.453(.019)	.173(.016)	.439(.025)	.163(.018)	.267(.019)	.164(.016)	.286(.031)	.212(.036)
DEM <sub>t-8</sub>	-.233(.020)	-.071(.016)	-.246(.025)	-.088(.017)	-.272(.020)	-.127(.016)	-.275(.029)	-.151(.031)
DEM <sub>t-9</sub>	-.050(.021)	.004(.017)	-.063(.023)	.001(.016)	-.025(.020)	-.009(.016)	-.019(.029)	.016(.030)
DEM <sub>t-10</sub>	-.005(.017)	.017(.014)	-.025(.025)	.002(.016)	-.004(.016)	-.008(.013)	.044(.057)	.127(.066)
GOP <sub>t-1</sub>	-.019(.020)	.584(.016)	.073(.029)	.645(.031)	.038(.019)	.759(.015)	.108(.069)	.976(.078)
GOP <sub>t-2</sub>	.057(.025)	.023(.021)	.053(.026)	.003(.033)	.039(.026)	-.121(.020)	.027(.030)	-.123(.040)
GOP <sub>t-3</sub>	.001(.025)	.118(.020)	.011(.032)	.130(.031)	.026(.026)	.190(.021)	.024(.031)	.213(.044)
GOP <sub>t-4</sub>	-.044(.024)	-.101(.020)	-.009(.027)	-.063(.026)	-.124(.026)	-.104(.021)	-.116(.029)	-.075(.042)
GOP <sub>t-5</sub>	-.017(.025)	-.037(.020)	.005(.026)	-.026(.028)	.044(.027)	.003(.021)	.059(.037)	.070(.046)
GOP <sub>t-6</sub>	-.039(.025)	.040(.020)	-.006(.026)	.062(.025)	-.024(.027)	.031(.022)	-.014(.037)	.087(.044)
GOP <sub>t-7</sub>	.297(.025)	.473(.020)	.315(.034)	.488(.031)	.298(.028)	.278(.022)	.311(.037)	.327(.043)
GOP <sub>t-8</sub>	-.063(.026)	-.293(.021)	-.185(.030)	-.306(.028)	-.236(.028)	-.287(.022)	-.253(.043)	-.363(.055)
GOP <sub>t-9</sub>	-.056(.027)	-.078(.022)	-.065(.030)	-.094(.026)	.005(.029)	.061(.023)	-.006(.037)	.092(.041)
GOP <sub>t-10</sub>	.112(.022)	.053(.018)	.129(.036)	.052(.024)	.077(.023)	-.017(.018)	.103(.036)	.042(.041)

Table entries are regression coefficients with standard errors reported in parentheses.

\* Models estimated including a full set of fixed effects dummy variables for the DMAs included in the analysis, estimated using RATS 6.1.

\*\* Models estimated using procedures recommended by Love (2001) and Love and Zicchino (2006) using code provided by Love, estimated using STATA/SE 9.2

N=5,351

Source: 2002 WisdAds data

Table 2A: Full Results of Panel VAR Analysis, Total Advertising Effort and Total Negative Advertising Effort by Incumbent and Challenger Candidates for Governor

Independent Variables	Total Advertising Effort				Total Negative Advertising Effort			
	Fixed Effects Panel VAR*		Corrected Panel VAR**		Fixed Effects Panel VAR*		Corrected Panel VAR**	
	Incumbent	Challenger	Incumbent	Challenger	Incumbent	Challenger	Incumbent	Challenger
INC <sub>t-1</sub>	.682(.021)	.036(.023)	.720(.042)	.066(.029)	.778(.020)	.120(.021)	.929(.088)	.312(.108)
INC <sub>t-2</sub>	-.026(.026)	-.029(.028)	-.120(.040)	-.023(.029)	-.212(.025)	-.064(.026)	-.192(.053)	-.046(.039)
INC <sub>t-3</sub>	.158(.025)	.012(.027)	.168(.048)	.010(.033)	.212(.025)	.038(.026)	.241(.064)	.061(.042)
INC <sub>t-4</sub>	-.083(.024)	-.017(.026)	-.055(.036)	-.001(.026)	-.101(.024)	-.031(.025)	-.065(.051)	-.006(.041)
INC <sub>t-5</sub>	-.040(.024)	-.016(.026)	-.022(.031)	.005(.024)	-.005(.025)	-.015(.026)	.038(.046)	.033(.040)
INC <sub>t-6</sub>	.038(.024)	-.011(.026)	.053(.033)	.003(.026)	-.010(.025)	.004(.026)	.035(.047)	.050(.051)
INC <sub>t-7</sub>	.467(.024)	.277(.027)	.487(.036)	.291(.034)	.348(.025)	.215(.026)	.391(.046)	.262(.051)
INC <sub>t-8</sub>	-.319(.026)	-.124(.029)	-.325(.042)	-.131(.030)	-.371(.026)	-.201(.027)	-.389(.057)	-.224(.050)
INC <sub>t-9</sub>	-.031(.026)	-.005(.029)	-.042(.034)	-.015(.030)	.070(.027)	.025(.028)	.106(.053)	.063(.050)
INC <sub>t-10</sub>	.004(.022)	.033(.024)	.009(.033)	.034(.030)	-.055(.022)	.023(.023)	.034(.063)	.139(.059)
CHAL <sub>t-1</sub>	-.071(.019)	.486(.021)	-.037(.029)	.529(.030)	-.006(.020)	.666(.021)	.114(.072)	.833(.072)
CHAL <sub>t-2</sub>	.003(.025)	-.005(.027)	-.007(.024)	-.046(.041)	-.023(.026)	-.084(.027)	-.005(.040)	-.071(.043)
CHAL <sub>t-3</sub>	.018(.025)	.225(.027)	.023(.031)	.227(.056)	.090(.026)	.201(.027)	.120(.040)	.249(.048)
CHAL <sub>t-4</sub>	-.032(.024)	-.122(.027)	-.027(.027)	-.102(.034)	-.081(.027)	-.057(.028)	-.067(.037)	-.127(.047)
CHAL <sub>t-5</sub>	.011(.025)	.014(.028)	.004(.025)	.001(.030)	.101(.028)	.101(.029)	.133(.044)	.150(.047)
CHAL <sub>t-6</sub>	.015(.025)	.017(.028)	.020(.026)	.026(.031)	-.052(.028)	.036(.029)	-.037(.036)	.075(.044)
CHAL <sub>t-7</sub>	.199(.025)	.371(.028)	.196(.031)	.368(.037)	.224(.029)	.174(.030)	.236(.040)	.201(.047)
CHAL <sub>t-8</sub>	-.116(.026)	-.175(.029)	-.129(.029)	-.187(.032)	-.142(.029)	-.156(.030)	-.168(.043)	-.190(.048)
CHAL <sub>t-9</sub>	-.005(.027)	-.072(.029)	-.003(.027)	-.068(.033)	-.026(.030)	-.082(.031)	-.040(.036)	-.090(.042)
CHAL <sub>t-10</sub>	.050(.022)	.003(.024)	.046(.033)	.014(.029)	.070(.023)	.022(.024)	.113(.045)	.094(.056)

Table entries are regression coefficients with standard errors reported in parentheses.

\* Models estimated including a full set of fixed effects dummy variables for the DMAs included in the analysis, estimated using RATS 6.1.

\*\* Models estimated using procedures recommended by Love (2001) and Love and Zicchino (2006) using code provided by Love, estimated using STATA/SE 9.2

N=2,849

Source: 2002 WiscAds data

Table 3A: Full Results of Panel VAR Analysis, Total Advertising Effort and Total Negative Advertising Effort by Winning and Losing Candidates for Governor

Independent Variables	Total Advertising Effort				Total Negative Advertising Effort			
	Fixed Effects Panel VAR*		Corrected Panel VAR**		Fixed Effects Panel VAR*		Corrected Panel VAR**	
	Winner	Loser	Winner	Loser	Winner	Loser	Winner	Loser
WINNER <sub>t-1</sub>	.522(.016)	-.017(.016)	.575(.029)	.028(.024)	.706(.015)	.040(.017)	.842(.052)	.204(.066)
WINNER <sub>t-2</sub>	-.018(.020)	.026(.020)	-.040(.030)	.022(.019)	-.116(.019)	.007(.022)	-.109(.030)	.025(.030)
WINNER <sub>t-3</sub>	.211(.020)	.042(.019)	.226(.036)	.047(.024)	.196(.019)	.035(.022)	.226(.033)	.055(.030)
WINNER <sub>t-4</sub>	-.135(.018)	-.072(.018)	-.095(.023)	-.046(.019)	-.066(.019)	-.060(.021)	-.026(.031)	-.037(.028)
WINNER <sub>t-5</sub>	-.045(.019)	-.030(.019)	-.041(.022)	-.023(.019)	-.055(.020)	-.022(.022)	-.025(.029)	.009(.028)
WINNER <sub>t-6</sub>	.037(.019)	.009(.019)	.053(.022)	.024(.019)	.033(.020)	.015(.022)	.070(.031)	.054(.031)
WINNER <sub>t-7</sub>	.564(.019)	.253(.019)	.567(.027)	.258(.021)	.307(.020)	.231(.023)	.340(.029)	.270(.030)
WINNER <sub>t-8</sub>	-.286(.021)	-.130(.021)	-.301(.028)	-.138(.023)	-.322(.021)	-.215(.023)	-.341(.031)	-.244(.031)
WINNER <sub>t-9</sub>	-.060(.021)	-.006(.021)	-.087(.025)	-.026(.021)	.019(.021)	.024(.024)	.038(.029)	.038(.031)
WINNER <sub>t-10</sub>	.038(.018)	.066(.018)	.019(.025)	.062(.024)	.008(.017)	.041(.019)	.067(.035)	.120(.037)
LOSER <sub>t-1</sub>	-.060(.016)	.576(.016)	-.021(.021)	.593(.028)	.017(.014)	.751(.015)	.099(.043)	.901(.049)
LOSER <sub>t-2</sub>	.008(.020)	-.059(.020)	-.011(.020)	-.089(.026)	-.023(.018)	-.186(.020)	-.017(.021)	-.171(.037)
LOSER <sub>t-3</sub>	-.018(.020)	.125(.020)	-.015(.023)	.120(.031)	.042(.018)	.190(.020)	.059(.024)	.228(.041)
LOSER <sub>t-4</sub>	.016(.019)	-.025(.019)	.014(.020)	-.024(.025)	-.043(.018)	-.072(.020)	-.032(.023)	-.039(.035)
LOSER <sub>t-5</sub>	.043(.020)	-.009(.019)	.038(.018)	-.019(.023)	.049(.018)	.044(.020)	.076(.024)	.089(.034)
LOSER <sub>t-6</sub>	-.021(.020)	.027(.019)	-.017(.018)	.027(.022)	-.016(.018)	.007(.020)	.001(.028)	.045(.031)
LOSER <sub>t-7</sub>	.178(.020)	.366(.020)	.175(.023)	.361(.025)	.186(.018)	.255(.020)	.199(.028)	.286(.033)
LOSER <sub>t-8</sub>	-.079(.021)	-.212(.020)	-.105(.020)	-.224(.026)	-.112(.019)	-.250(.021)	-.133(.027)	-.278(.038)
LOSER <sub>t-9</sub>	-.024(.021)	-.072(.021)	-.017(.021)	-.075(.24)	-.015(.019)	-.009(.021)	-.016(.024)	-.001(.035)
LOSER <sub>t-10</sub>	.032(.018)	.004(.017)	.022(.023)	.003(.024)	.004(.015)	-.003(.017)	.036(.026)	.070(.036)

Table entries are regression coefficients with standard errors reported in parentheses.

\* Models estimated including a full set of fixed effects dummy variables for the DMAs included in the analysis, estimated using RATS 6.1.

\*\* Models estimated using procedures recommended by Love (2001) and Love and Zicchino (2006) using code provided by Love, estimated using STATA/SE 9.2

N=5,351

Source: 2002 WiscAds data