The Air War versus the Ground Game:

An Analysis of Multi-Channel Marketing in U.S. Presidential Elections

Doug J. Chung, Lingling Zhang

Harvard Business School, Harvard University, Boston, MA 02163, United States

dchung@hbs.edu, lzhang@hbs.edu

March 2016

Abstract

Firms increasingly use both mass-media advertising and targeted personal selling to promote products and brands. In this study, we jointly examine the effects of advertising and personal selling in the context of U.S. presidential elections, where the former is referred to as the "air war" and the latter as the "ground game." Specifically, we look at how different types of advertising— the candidate's own advertising versus outside advertising—and personal selling—in the form of field office operations—affect voter preference. Furthermore, we ask how these campaign activities affect voting decisions through their diverse effects on various types of people. We compiled a unique and comprehensive dataset from multiple sources that record vote outcomes and campaign activities for the 2004-2012 U.S. presidential elections. Individuals' voting preference is modeled via a random-coefficient aggregate discrete-choice model, in which we incorporate individual heterogeneity and use instrumental variables to account for the endogeneity concern associated with campaign resource allocation. Among the many results, we find that personal selling has a stronger effect on partisan voters than on nonpartisans, while a candidate's own advertising is better received by nonpartisans. We also find that outside ads behave very differently from candidate's own ads by mainly affecting partisan voters. Our findings may help candidates decide how to design effective campaigning by allocating resources both across multiple channels and within each channel, especially if the support from particular types of voters is weak.

Keywords: multi-channel marketing, personal selling, advertising, political campaigns, discrete-choice model, instrumental variables.

1 Introduction

It is no secret that multi-channel marketing has increasingly been regarded as a competitive strategy critical to market success. Firms that understand the effect of and the dynamics behind their marketing channels are likely to reach customers more effectively and, hence, win over their customers. Among the channels, mass-media advertising and personal selling are usually the biggest arsenal at firms' disposal. Advertising has the advantage of reaching a large-scale audience via standard and well-scripted communication messages. Its importance goes without saying: global advertising spending was reportedly around $128 billion in 2013.[1] Personal selling, on the other hand, happens at a micro level and takes the form of direct customer contacts, which may include regular and ad-hoc visits, distribution of fliers, and telemarketing, to name just a few. It often relies on a sales force to carry out the actual persuasion or mobilization, whether it is face-to-face or over the phone. Similar to advertising, personal selling is of great importance to many businesses. In the United States alone, the total spending on sales force has been reported to be more than four times the total spending on advertising (Zoltners et al. 2006), and approximately 11% of the nation's labor force is directly involved in sales or sales-related activities.[2] As advertising and personal selling are foremost in the minds of marketers, it is essential to understand the effect of the channels, in particular, the relative effectiveness of each on various types of consumers.

In this paper, we study mass-media advertising and personal selling in the context of U.S. presidential elections. Choosing the right product (the "president") every four years is perhaps among the most critical decisions faced by many consumers of this country (the "voters"). Presidential candidates carefully present themselves to people through strategic and expensive campaigns. The amount of marketing efforts behind each campaign is colossal: the 2012 election alone witnessed close to $2 billion spending in campaigning across the Democratic and Republican candidates, making it one of the most expensive elections in the U.S. history and perhaps

---

[1] *Nielsen*, 2013.
[2] *U.S. Bureau of Labor Statistics*, May 2013.

outnumbering any marketing campaigns that a consumer-packaged-goods company can possibly put together.[3]

Similar to the marketing of consumer-packaged-goods though, presidential campaigns have increasingly employed a multi-channel strategy. One notable phenomenon is the occurrence of large-scale personal selling efforts in the form of candidate's field operations during recent elections. President Barack H. Obama deployed an unprecedented field operation in 2008 such that many, including the Denver Post, attributed his election success to his on-the-ground efforts: "Obama's effective organization (of the field teams) could be a harbinger for how successful elections are won in battlegrounds in years to come."[4] Indeed, credit often goes to the winner's campaign for shaping the election results. For example, the day after President Obama was first elected, the *New York Times* claimed that "the story of Mr. Obama's journey to the pinnacle of American politics is the story of a campaign that was, even in the view of many rivals, almost flawless."[5] But, how much of this is true in reality? And if presidential campaigns are critical to voting outcomes, what can we marketers learn from them?

There are at least a couple of reasons why presidential elections provide a good setting for jointly studying the effect of advertising and personal selling. First, because campaign activities vary substantially between contested and non-contested states as well as across counties within each contested state, presidential elections yield the much-needed geographical data variation. And because the competitive landscape changes from one election to another, the changes in campaign resource allocation also provide data variation along the time dimension. Second, political campaigns primarily serve a short-term goal to make "sales" happen (i.e., win votes), rather than to build a brand or maintain customer relationships. Therefore, the potential long-term effect of advertising and personal selling is less relevant in our context, simplifying the analysis and allowing us to focus on the causal influence of the campaign effect.

---

[3] *The New York Times*, "The Money Race", 2012.

[4] Sherry Allison, "Ground Game Licked G.O.P." *The Denver Post*, November 5, 2008

[5] *The New York Times*, November 5, 2008.

In this study we are interested in two questions. First, how much do mass-media advertising and personal selling matter on voter's preference for presidential candidates? Second, how do those campaign activities affect voters through their diverse effects on various types of people? Answers to these questions not only help political campaign organizers but also marketers in general, as long as multi-channel marketing is engaged.

However, assessing the effects of advertising and personal selling turns out to be non-trivial, due to the challenge in obtaining comprehensive data and the difficulty of making causal inference. As far as advertising is concerned, much research has been conducted to understand its effect in consumer product marketing (Bruce 2008; de Kluyver and Brodie 1987; Dekimpe and Hanssens 1995; Givon and Horsky 1990; Lodish et al. 1995) as well as in political campaigns (Gordon and Hartmann 2013; Shachar 2009; Shaw 1999). A constant challenge is that advertising is often studied in isolation from other instruments of the marketing mix (Albers et al. 2010). The few exceptions in the context of political campaigning are Shachar (2009) and Shaw (1999). Shachar (2009) examined the relationship between the intensity of competition and two campaign activities—television advertising and grassroots campaigning—for the 1996-2004 presidential elections. His main finding is that close competition caused more campaigning, which further led to higher turnout rates. If anything, Shachar (2009) provides empirical evidence that campaign activities are endogenously determined according to the competition intensity. Built upon this finding, our paper addresses the endogeneity concern in estimating the causal effect of campaigning. More importantly, we also examine how the effect of campaigning varies by voter characteristics; hence, our results could provide more direct implication on allocating campaign resources. Shaw (1999) is another example studying those two campaign activities and found them to affect the statewide voting preferences. However, his results are generated via regression models on state-level observational data and may not adequately account for the endogeneity concern underlying campaign variables.

Compared to advertising, our knowledge on personal selling is even more limited, despite that it has long been regarded as an essential element of the marketing mix (Borden 1964; Weitz 1981). Many extant marketing papers only have aggregate-level measures on personal selling (e.g.,

4

Gatignon and Hanssens 1987; Narayanan et al. 2004) and hence cannot generate insights on where to allocate the sales force, an important implication for marketers aiming to yield the best possible outcomes. Researchers in political science also have difficulty collecting reliable data on personal selling. For example, Shachar (2009) used self-reported campaign contacts to measure grassroots efforts, which is restrictive in that one third of the states in his data had fewer than five respondents. Not surprisingly, a noisy measure like this prompted researchers to adopt an experimental design to study the effect of personal selling on voting. Gerber and Green (2000) conducted field experiments and found that face-to-face visits increase turnout rates. Alvarez et al. (2010), through another field experiment, concluded that delivering partisan messages in person can have an even bigger effect than previously reported. However, those results are not exempt from common critiques for experiments: data usually come with a limited scale and the external validity of the results may be questionable. With the recent developments in data collection methods, better measures of personal selling have now become available for political scholars. Masket (2009) examined the placement of Democratic field offices in the 2008 presidential election and found them to significantly boost the vote shares. Darr and Levendusky (2014) tracked the deployment of field offices in several recent presidential elections and quantified the magnitude to be around 1% vote share increase per one additional field office. However, neither studies adequately addressed the endogeneity concern associated with allocating field offices; hence, their results are correlational rather than causal.

Finally, empirical papers on the campaign effect largely leave out individual heterogeneity, perhaps because individual-level characteristics are challenging to obtain on a large scale. However, understanding how various marketing activities may have a diverse effect on different segments of individuals is essential for designing targeted marketing and allocating resources. For example, Carroll et al. (1985) jointly estimated the effect of salesforce and advertising on Navy enlistment through a large scale field experiment. As they pointed out, one limitation of their study is the inability to examine heterogeneous marketing effects using aggregated campaign data. We have reasons to believe that incorporating heterogeneity is important in the context of political elections, because people with varying predisposition may likely respond differently to different

marketing activities. One paper exploring this issue is Lovett and Peress (2015). They combined political advertising data with viewer profiles of television shows, and found that political advertising is primarily effective on the segment of swing voters. However, their paper only included the 2004 election and did not control for other campaign activities, both of which the authors acknowledged as a limitation.

To better understand the campaign effect in presidential elections, we set out to compile a unique and comprehensive dataset and carefully design our analysis to jointly examine advertising and personal selling while addressing endogeneity and consumer heterogeneity. Our data are integrated from multiple sources and include a total of 18,650 observations on vote outcomes and campaign activities. We collect detailed records of field operations for candidates from both parties, down to the county level. Our data on television advertising cover ad impressions at the designated-market-area (DMA) level and include not only the ads made by candidates but also those by outside political groups. The rapid growth of outside advertising in recent presidential elections, especially the 2012 one, has made it too important to be ignored. In addition, we control for the total candidate spending in digital campaigning—a relatively new channel that has started entering the candidates' marketing toolkit—as well as a large number of other control variables that signal the economic and political climate of the elections.

We model individuals' voting preference via a random-coefficient aggregate discrete-choice model, which allows the various campaign effects to differ by voter characteristics. Further, we use instrumental variables to account for the endogeneity concern associated with campaign activities. Our results show that field operations and advertising both have positive effects on voter preference. An addition of a field office would increase the vote share in a county by 1.143% for the Republican candidates and 3.305% for the Democrats, indicating a clear effect yet asymmetrical between the parties. We estimate the elasticity of candidate's own ads to be 0.059 for the Republicans and 0.081 for the Democrats, whereas the elasticity of outside ads is 0.032 and 0.045, respectively. We also find evidence that campaign effects depend on voters' baseline partisanship: field operations, often involving volunteers making face-to-face contacts with voters, are more effective among partisans than non-partisans, while candidate's own advertising is only

effective among non-partisans. Interestingly, we find that outside ads, which typically consist of negative and attacking messages, behave more like field operations than candidate's own ads, suggesting an interaction between the tone of ads and voters' partisan preferences.

To quantify the importance of campaign activities, we conduct counterfactual analyses using the parameter estimates. Overall, our estimates suggest that campaigns play an essential role in deciding the outcome of an election. Had field operations not been allowed in presidential elections, history would have been rewritten, with a different president being elected in 2008 and 2012. Interestingly, had the Democrats received more outside ads in 2004, the election would have ended up in a tie of 269 electoral votes on each side.

Our paper contributes to the literature in two ways. First, we jointly estimate the effect of mass-media advertising and personal selling, two of the most prominent marketing activities. Our data set includes almost all major campaign activities employed by recent presidential candidates and spans multiple election years, making it much more comprehensive than other extant data sets. One innovation of this paper is that we separate outside ads from candidate's own ads. To our best knowledge, this is one of the first attempts to systematically examine the effect of political ads sponsored by outside interest groups in presidential elections. Second, we carefully address the endogeneity concern for campaign activates and are able to make inference on the heterogeneous channel effect using only market-level aggregate data, which are more readily available than individual responses in many contexts. Therefore, our estimates can help allocate marketing resources both across different channels and within a channel across customer segments. This research has implications beyond presidential elections. If one may draw an analogy between voting for a candidate and choosing a product, the insights generated here could also be applied to consumer-packaged-goods industry. In particular, personal selling is key if a firm wants to engage its loyal customers ("partisans") and that mass advertising is the way to go if it wants to persuade casual customers ("non-partisans") to become power customers.

It is perhaps worthwhile to compare our paper with Gordon and Hartman (2013), which also studies the effect of advertising in U.S. presidential elections. This paper differs in at least four aspects: first, we have much more comprehensive data including almost all of the major

marketing instruments utilized by campaigns—mass media advertising, personal selling, and digital campaigning; second, we distinguish between candidate own and outside advertising, and find them to have different effects; third, we have actual GRP data whereas Gordon and Hartmann (2013) estimate their ad exposure data; lastly and perhaps most importantly, we incorporate consumer heterogeneity and examine how different campaign instruments affect different types of voters.

The remainder of the paper is organized as follows. Section 2 describes the campaign activities and the data used for empirical analysis. Section 3 specifies the model and discusses the identification. Section 4 presents the parameter estimates and the counterfactual results. Section 5 concludes.

2 Data

We compiled a unique dataset from multiple sources that includes actual voting outcomes and campaign activities for the 2004-2012 U.S. presidential elections. Our data are superior to those used in extant studies in at least four aspects. First, our data span a period of three presidential elections and, thus, the results are not confined to a particular combination of candidates. Second, our collection of multiple campaign activities encompasses a more comprehensive record of mass-media advertising and ground campaigning than ever seen before in previous studies. Knowing where and to what extent candidates choose to campaign enables us to assess the effects of various campaign activities after controlling for one another. Third, our unit of analysis is at the county level, which is as granular as it can be to reliably obtain the voting outcomes. In addition, we also measure campaign activities at a granular level when possible. By having disaggregated data we are able to take a finer look at the campaign allocation and curtail the potential aggregation bias. Finally, we collect data on the registered party affiliation at the county level, which enables to examine how campaign effects differ according to voter partisanship.

2.1 Election Votes

The dependent variable for this study is the number of votes cast for the presidential candidates in each county. We collected this variable from the CQ Press Voting and Elections Collection, a database that tracks major U.S. political elections.

We define each county as a "market" in which residents choose up to one "product" (candidate). In the subsequent analysis, we will use "market" and "county" interchangeably. We define a county's "market size" as the total number of resident citizens aged 18 and above, typically known as the Voting Age Population (VAP)[6]. We obtained the county-level age-specific population counts from the U.S. census database. The "market share" of each candidate is then the percentage of votes he or she receives out of the county VAP.

There are a total of 3,144 counties and county equivalents in the United States. We exclude Alaska from the analysis because its voting outcomes and population estimates are measured on different geographical units and hence are challenging to match. As a result, we end up with 3,110 counties from 49 states plus the District of Columbia, which is treated as a single market in the analysis. Table 1 lists the county-level summary statistics for vote outcomes. The Republican candidate, George W. Bush, won more of the popular votes in the 2004 election, and the Democratic candidate, Obama, won more of the popular votes in the 2008 and 2012 elections. The average county-level vote share is always higher for the Republican candidates. The Republicans won many less-populated counties in 2008 and 2012, although they still lost to the Democrats in the total popular votes and electoral votes at the national level.

< Table 1>

2.2 Ground Campaigning

To an average voter, presidential elections are perhaps most visible on the ground level through personal selling activities (henceforth, we will use ground campaigning and personal selling

---

[6] A perhaps better measure for the market size of a county is the Voting Eligible Population (VEP), which equals the VAP minus ineligible felons. This metric, however, is available only at the state level. For a good introduction on how to estimate the Voting Eligible Population, see the United States Elections Project (http://elections.gmu.edu/index.html).

interchangeably). In the early stage of each election, presidential candidates establish field operations to organize the ground-level voter outreach; in particular, campaigns set up field offices from which staff and volunteers coordinate their door-to-door canvassing efforts, conduct telemarketing campaigning, and organize other outreach activities. We measure the scale of a candidate's field operations by the number of field offices deployed in each county. We collected the 2004 and 2008 field office data from the "Democracy in Action" project at George Washington University[7] and the 2012 data from Newsweek Daily Beast[8], both of which scoured the Democratic and Republican campaign websites and gathered addresses for all the field offices. We then used the Geographic Information System (GIS) software to map the office addresses onto the corresponding county.

Table 2 displays the summary statistics for field operations. Across all elections, the Democratic candidates had an indisputable lead in establishing field operations: the ratio of the Democratic and Republican field offices was 3.51, 3.53, and 2.69 in 2004, 2008, and 2012, respectively. Furthermore, even between the Democratic candidates, field offices were more prominent in the Obama campaign than in the John Kerry campaign: while the latter had at least one field office in 237 (8%) counties, the former set up offices in 624 (20%) counties in 2008 and 439 (14%) in 2012.

< Table 2 >

It merits mentioning that we use the number of field offices in each county as a proxy of voters' exposure to candidates' field operations. This metric, becoming available only in recent elections, provides a more objective measure of field operations at a granular geographical unit than other alternative survey-based measures, which are prone to recall errors and non-response bias. Due to this advantage, the number of field offices has been used by several recent papers studying the effect of ground campaigning (e.g., Darr and Levendusky 2014; Masket 2009). However, it is not without limitations. For example, a field office may serve multiple purposes—

[7] The URL for the project is: http://www.gwu.edu/~action. Accessed on 8/2/2013.

[8] The explanation of the data tracking method can be found at http://newsbeastlabs.tumblr.com/post/34109019268/tracking-the-presidential-groundgame-as-the-two. Accessed on 8/6/2013.

coordinating voter contacts, organizing fund-raising events, or even laying groundwork to raise voter support for future party candidates—some of which may not be directly related to winning votes for the current election (Darr and Levendusky 2014). Yet, the primary goal for a field office during the general election should be around the target of "Race to 270". Therefore, the number of field offices should still indicate the degree to which a candidate uses ground campaigning to gain votes.

Nevertheless, a question may remain: how much does the number of field offices reflect the extent of voter exposures to ground campaigning. One way of assessing the validity of this metric is to correlate it with the number of voter contacts made by the ground campaign personnel, which we obtained from the American National Election Studies (ANES), a high-quality survey on voting and political participation. In the ANES 2004, 2008, and 2012 time series surveys, respondents were asked whether they had been contacted by a party about the campaign, and if yes, by which party. Based on the ANES responses we estimated the (weighted) number of respondents contacted by the Democratic and the Republican campaign teams, respectively. The correlation between voter contacts and the number of field offices was 0.76 for the Democrats and 0.73 for the Republicans, indicating that the number of field offices has a moderate to strong correlation with the self-reported individual exposure to ground campaigning. The ANES responses cannot be used in our analysis because they are only available at the census-region level. Therefore, we believe that the number of field office is the best proxy for field operations currently available to researchers. We acknowledge its limitations and think future research can benefit from improving the measurement for this variable.

2.3 Television Advertising

There are three types of ad sponsors in the U.S. presidential elections: the candidates, their party committees—namely, the Democratic National Committee (DNC) and the Republican National Committee (RNC)—and some outside political groups. Because the candidates and party committees often coordinate advertising efforts, we combine the ads from these two types and label them as the candidate's own advertisements.

The third type of player—outside political groups, also known as the Political Action Committees (PACs)—buys television ad spots to support their preferred candidates and to attack their rivals. Although they have played a role in presidential elections for decades, PACs particularly took on a much greater prominence in recent elections, partly because, in 2002, a campaign finance reform law set stricter restrictions on fund-raising and spending, hence the PACs stepped in to fill the gap. Especially in the 2012 election, a relatively new kind of organization, the Super PAC, emerged as a major advertiser. Super PACs are made up of independent PACs that support a candidate with unlimited—and often anonymous—donations from unions, companies, or individuals. Due to the large number of PACs advertising in the presidential elections, it is challenging to track all of their ads. Fortunately, we are able to obtain the data for the top ad spenders, which, combined, are responsible for more than 90% of the total ad spending by the PACs.

We measure advertising using the gross rating points (GRPs), which quantify advertising impressions as a percentage of the target audience being reached. For example, if an ad aired in the Des Moines-Ames area reaches 25% of the target population, it receives a GRP value of 25; if the same ad is aired five times, the GRP value would be 125 (=5×25). GRPs are a better measure of ad exposures than dollar spending because the cost of advertising varies significantly across markets. For example, the same amount of ad dollars would yield far less exposure in Los Angeles than in Kansas City. Hence, GRPs provide a measure of audience reach, independent of the advertising cost.

We obtained television advertising data from Nielsen Media Research. Nielsen divides the U.S. media market into 210 designated market areas (DMA): residents from the same DMA receive largely the same television offerings, including advertising. Therefore, our advertising metrics are measured at the DMA level. It is noteworthy that our outcome variable of interest is at the county level, with each county belonging to one and only one DMA. To link ad impressions to county-level votes, we assume that the percent of the audience reached in a county equals the percent of the audience reached in the DMA to which the county belongs. Take the Rochester-Manson City-Austin DMA, for example: This DMA consists of seven counties from Iowa (Cerro

12

Gordo, Floyd, Hancock, Howard, Mitchell, Winnebago, and Worth) and five counties from Minnesota (Dodge, Fillmore, Freeborn, Mower, and Olmsted). During the week of October 21, 2012, Obama campaign ads reached 1048.8% of the DMA population. By assuming that advertising impressions are homogeneous within a DMA, we assign the Democratic candidate's own GRP value to be 1048.8 for each of the twelve counties during that week.

Because voting preference is revealed on Election Day, we calculate the cumulative GRPs that each DMA has received since September 1 of that year and use this cumulative measure in the subsequent analysis. Table 3 presents the summary statistics for candidate's own advertising and PAC advertising, respectively. For candidate's own advertising, the Democratic candidates outnumbered the Republicans by 20%, 50%, and 40% in the three elections, respectively. Interestingly, the PACs, which had less advertising than the candidates in 2004 and 2008, played a much bigger role in the 2012 election. In particular, the PAC ads supporting Mitt Romney were responsible for roughly 46% of the total advertising for Romney and outnumbered the PAC ads supporting Obama by almost seven times. Even though the Obama campaign had more advertising than the Romney campaign, the PACs filled the gap; in the end, 25% more pro-Romney ads were aired than pro-Obama ads in the 2012 election.

< Table 3 >

2.4 Digital Campaigning

In addition to field operations and television advertising, we also collected online campaigning data for the three elections. Online digital campaigning in political elections started to attract the mainstream's attention during the 2004 election, when the Democratic candidate, Howard Dean, adopted the then-innovative web-based campaign initiatives to raise a remarkable level of support in the early stages of the election. Since then, online campaigning has appeared on the radar screens and the candidates have been experimenting to incorporate the Internet into their standards of campaign activities. Understandably, the 2004 race largely regarded the web as a tool for fund raising or for insider communication rather than for advertising; a small amount of resources was dedicated to online campaign activities. On the Democrats side, the Kerry camp

13

reportedly bought a $1.3 million[9] worth of online ads and the DNC $257,000; and on the Republicans side, the Bush campaign spent roughly $419,000 and the RNC $487,000[10]. In the next election cycle, a substantive increase in online campaigning was witnessed for candidates of both parties. In 2008, the online ad spending for the Obama campaign outnumbered that for the McCain campaign by 4:1, with roughly $16 million for the former and $4 million for the latter[11]. Digital campaigning grew more than three fold in the 2012 race: the Obama campaign spent $52 million on online ads, followed by $26.2 million by the Romney campaign.[12] We control for the total online campaign spending in our analysis.

2.5 Additional Variables

We include a rich set of control variables that reflect the economic and political climate and may influence voter preference (see Table 4 for summary statistics). First, the presidential incumbency status captures the advantage for the incumbent candidates, as inertia alone has been shown to be able to generate votes (Campbell 1992). We assign 1 to the incumbent presidential candidates and 0 otherwise.

Second, we control for three state-level variables: (1) the home state advantage for presidential candidates, (2) the home state advantage for vice-presidential candidates, and (3) the governor advantage of the state. The home state variables take a value of 1 if the candidates are from the focal state and 0 otherwise. The governor advantage variable is also an indicator: for each campaign-state-party combination, the observation receives 1 if the governor of the state is from the same party that year, and 0 otherwise.

Lastly, we also include three sets of county-level contextual factors. The first is the percentage of African American residents to capture the racial composition of a county. The second group of variables, indicating the socio-economic conditions of the county, includes the

[9] The 2004 and 2008 spending was inflated to the 2012 dollars.

[10] Pew Internet & American Life Project, 2004.

[11] Borrell Associates, 2014

[12] http://www.businessinsider.com/infographic-obama-romney-final-ad-spend-2012-11. Accessed on December 18, 2014.

median household income, the unemployment rate, the Gini index, the median house value, the percentage of residents dropping out of high school, and the percentage of residents living in poverty. Those variables are obtained from the U.S. Census Bureau databases. The third variable is the percentage of registered partisan voters, which we acquired from a proprietary database tracking election data[13]. Based on this variable, we simulate the individual voter-level partisanship; we describe the simulation in more detail in Section 3.1.

< Table 4 >

2.6 Model-free Evidence

2.6.1 Campaign Effects

In this section, we present some model-free evidence. We first examine how ground campaigning and television advertising are related to vote shares. To account for the large cross-sectional variation across counties, we calculate the changes in vote shares and campaign activities from one election to the next and then examine the relationship between the changes.

Figure 1 depicts the association between vote shares and ground campaigning. The vertical axis of the figure corresponds to the change in vote shares—i.e., $s_{cj,t+1} - s_{cj,t}$, where the vote share in county c for party j during election t is calculated as the vote counts for that party divided by county c's VAP. The horizontal axis is the difference in the number of field offices—i.e., $G_{cj,t+1} - G_{cj,t}$—and each dot corresponds to a county-party combination. We present the scatter plot and the best-fitting non-parametric polynomial curve with its 95% confidence interval. Figure 1 exhibits a positive relation: a candidate's vote share in a county increases with more field offices. The positive trend tails off and turns downward at the far right end; the decline is largely driven by a few outlier counties where the competition was intense and the candidates added five or more field offices. For example, in Broward County, Florida, the Obama campaign increased field offices

---

[13] Because not all states require voters to declare party affiliation during registration, we have partisan information for 27 states in 2004 and 2008 and 28 states in 2012. Data come from a repository tracking U.S. elections (http://uselectionatlas.org/), where partisan numbers are extracted from various official websites such as the state's Secretary of State and the Office of Elections.

from four in 2008 to ten in 2012; however, his vote share dropped from 36.6% to 35.7%, due to the intensity of the competition.

< Figure 1 >

Similarly, Figure 2 depicts the changes in vote shares against the changes in advertising. We plot in Figure 2a, the ads sponsored by the candidates and their national committees, and in Figure 2b, those by the PACs. The horizontal axis now corresponds to the changes in advertising GRPs in each county-party combination. Once again, we observe a positive trend: a candidate's vote share goes up with an increase in advertising; this holds true for both the candidate's own advertising and the PAC advertising.

Figures 1 and 2 also show that ground campaigning and television advertising vary across elections, indicating that we have a sufficient amount of variation in our data for identification.

< Figure 2 >

2.6.2 Voter Heterogeneity

Is there heterogeneity in campaign effect? Would voters from different segments respond differently to campaigns? To gain an initial answer to these questions, we turn our attention to voter partisanship, a characteristic essential for signaling voters' political predisposition (Campbell 1992). For each county, we calculate the percentage of resident citizens who are registered as either a Democrat or a Republican. We then categorize a county as a high (low)-Democratic county if the percentage of registered Democrats there is above (below) the mean, and vice versa for the high-Republican and low-Republican counties. Figure 3 depicts the relation between vote shares and ground campaigning, separated into counties with a low or high percentage of partisan support, respectively. Again, for illustration, we show a scatter plot and the best-fitting non-parametric polynomial with its 95% confidence interval. The solid and dashed lines represent counties with high and low partisanship, respectively. We see that while both lines exhibit a positive trend, the solid line has a much steeper slope, suggesting that ground campaigning seems to have a stronger effect in counties with a higher percentage of partisan voters. As Figure 3 only provides some initial suggestive evidence, we will in the next section specify how the effect of

various campaign activities may depend on a voter's partisanship, after we control for other potential predictors of voter preference.

< Figure 3 >

3. Model of Voter Preference

We posit that individual i from county c has latent voting utility that she associates with the candidate from party j during election t, denoted as u_{icjt}. An individual faces three voting options—the Democratic candidate, the Republican candidate, and the outside option, which corresponds to voting for an independent candidate or choosing not to vote. Individual i chooses the option that yields the highest utility, and the market shares for the three options are revealed from aggregating over individual choices. The conditional indirect utility is specified as

$$u_{icjt} = \Gamma_i(G_{cjt}, A_{cjt}) + \alpha_i + \eta X_{ct} + \xi_{mj} + \Delta\xi_{cjt} + \phi_t + \varepsilon_{icjt}. \quad (1)$$

The first component, $\Gamma_i(G_{cjt}, A_{cjt})$, captures how individual i's goodwill towards candidate j is affected by how much she is exposed to the candidate's ground campaigning, G_{cjt}, and mass-media advertising, A_{cjt}. Because individuals may have diverse tastes for campaigns, we allow the effect to be heterogeneous in tastes and denote it with a subscript i. We will explain the specification for the campaign effect in Section 3.1.

The second component, α_i, captures the remaining individual-specific heterogeneity in voting preference. It can be understood as the mean voting utility for i that is not explained by her exposures to campaigns. This term is further decomposed into three parts: (1) the grand mean across individuals, α_1; (2) the deviation from the mean that is attributed to observable individual characteristics, $\alpha_2 D_{ijt}$; and (3) the individual departure from the mean related to all other unobservable individual characteristics, $\sigma^\alpha \nu_i^\alpha$, where we assume that ν_i^α is from a standard normal distribution. The unobserved characteristics include, for example, whether the individual gets a salary increase or loses her health insurance, which probably would shape her taste towards

17

presidential campaigns but are usually missing from the data collection. We allow the three terms

to enter utility linearly such that $\alpha_i = \alpha_1 + \alpha_2 D_{ijt} + \sigma^\alpha \nu_i^\alpha$.

The first and second components in Equation (1) capture the voter heterogeneity that could

be attributed to observable or unobservable individual characteristics. The next four components

describe the utility specific to the candidates, markets, and elections, but common to all

individuals.

The term ηX_{ct} captures how the voting utility is affected by observable county-election

specific characteristics. Examples of such variables include the county's racial composition and

socio-economic conditions such as the median household income and the unemployment rate, all of

which may influence voter preference towards a candidate.

Next, u_{icjt} is also a function of unobservable characteristics related to a specific county-

party-election combination. This could be further decomposed into three parts: ξ_{mj}, $\Delta\xi_{cjt}$, and ϕ_t.

ξ_{mj} refers to the mean utility toward the candidate from party j across all the residents in the

same media market m. People from the same media market likely exhibit similar political

preferences due to exposures to the same media content (including news coverages), as well as to

similar contextual conditions such as economic well-being. It is challenging to control for all the

potential factors; thus, we use the fixed effect, ξ_{mj}, to absorb the cross-sectional variation among

media markets and candidates.

The fifth component, $\Delta\xi_{cjt}$, is the county-party-election specific deviation from the mean

utility, ξ_{mj}, which quantifies the hard-to-measure utility shifts over time. For example, when

Hurricane Sandy hit the Northeastern part of the United States right before the Election Day in

2012, President Obama promptly committed to the relief operations and was praised for his crisis

leadership, causing a positive boost in his support. Such unobserved factors would not be reflected

in ξ_{mj} but would be captured by $\Delta\xi_{cjt}$. It is noteworthy that this county-party-election specific

deviation is unobservable to the econometrician but is assumed to be observed by voters and

18

candidates. This causes an endogeneity problem for estimating the parameters in $\Gamma_i(G_{cjt}, A_{cjt})$. We will discuss our solution to this problem in Section 3.3.

The sixth component of the utility is ϕ_t, which captures the election-specific shocks to voting utility common to all county-party combinations. Finally, ε_{icjt} is the idiosyncratic utility shock that is assumed to be independently and identically distributed (i.i.d.) Type I extreme value across individuals, counties, candidates, and elections.

3.1 Specification of Campaign Effect

We postulate that the campaign effect, $\Gamma_i(G_{cjt}, A_{cjt})$, is a function of candidate's ground campaigning and mass-media advertising. As previously discussed, ground campaigning takes the form of field operations, G_{cjt}, and advertising has two primary types: own ads made by the candidates and their parties, A_{cjt}^o, and outside ads sponsored by the PACs, A_{cjt}^p. Both types of ads enter the model in log form to capture the diminishing return for advertising[14]. We allow those campaign activities to have a heterogeneous effect across individuals. To sum up, we specify the campaign effect in the following linear form:

$$\Gamma_i(G_{cjt}, A_{cjt}) = \beta_i G_{cjt} + \gamma_i A_{cjt}^o + \pi_i A_{cjt}^p . \qquad (2)$$

The parameter, β_i, captures the voter i's taste towards field operations and consists of three components: (1) the mean taste across individuals, β_1; (2) the deviation from the mean that could be attributed to observable individual characteristics, $\beta_2 D_{ijt}$; and (3) the individual departure from the mean related to all unobservable individual characteristics, $\sigma^\beta \nu_i^\beta$. Similarly, we decompose γ_i and π_i into three components such that

---

[14] We tested field operations in the log form and the quadratic form to examine a potential diminishing return for having more field offices. The linear form has the highest exploratory power to explain vote shares. This may be partially because the variable does not have enough variation to detect a non-linear effect: among counties with at least one field office, less than 5% had more than 4 offices.

$$\begin{aligned}
\beta_i &= \beta_1 + \beta_2 D_{ijt} + \sigma^\beta \nu_i^\beta \\
\gamma_i &= \gamma_1 + \gamma_2 D_{ijt} + \sigma^\gamma \nu_i^\gamma \quad , \quad (3) \\
\pi_i &= \pi_1 + \pi_2 D_{ijt} + \sigma^\pi \nu_i^\pi
\end{aligned}$$

where each unobserved characteristic ν_i is assumed to come from a standard normal distribution. The individual characteristic D_{ijt} that we examine here is voters' party affiliation, which is believed to be an important factor affecting political preference towards candidates. A voter may be affiliated with either the Democrats or the Republicans, or neither. Because we observe the aggregate data of party affiliation on the county level, we assume the partisan variable to follow a multinomial distribution of three categories (i.e., Democrats, Republicans, neither), where the empirical means of the categories correspond to the observed percentages of registered partisan voters for each county. For example, if a county had 30% registered Democrats and 35% Republicans, our simulated individual partisanship would have roughly 30% being labeled as the Democrats, 35% as the Republicans, and the remaining 35% as neither.

3.2 Distributional Assumptions and Implied Market Shares

From Equations (1), (2), and (3), the utility function can be rewritten as

$$\begin{aligned}
u_{icjt} &= \alpha_1 + \alpha_2 D_{ijt} + \sigma^\alpha \nu_i^\alpha + \left(\beta_1 + \beta_2 D_{ijt} + \sigma^\beta \nu_i^\beta \right) G_{cjt} \\
&+ \left(\gamma_1 + \gamma_2 D_{ijt} + \sigma^\gamma \nu_i^\gamma \right) A_{cjt}^o + \left(\pi_1 + \pi_2 D_{ijt} + \sigma^\pi \nu_i^\pi \right) A_{cjt}^p \quad . \qquad (4) \\
&+ \eta X_{ct} + \xi_{mj} + \Delta \xi_{cjt} + \phi_t + \varepsilon_{icjt}
\end{aligned}$$

We then rewrite Equation (4) as

$$\begin{aligned}
u_{icjt} &= \delta \left(G_{cjt}, A_{cjt}^o, A_{cjt}^p, X_{ct}; \theta_1 \right) \\
&+ \mu \left(G_{cjt}, A_{cjt}^o, A_{cjt}^p, D_{ijt}, \nu_i; \theta_2 \right) + \varepsilon_{icjt}
\end{aligned} \qquad , \qquad (5)$$

where $\theta_1 = (\alpha_1, \beta_1, \gamma_1, \pi_1, \eta, \xi_{mj}, \Delta \xi_{cjt}, \phi_t)$ and $\theta_2 = (\alpha_2, \beta_2, \gamma_2, \pi_2, \sigma^\alpha, \sigma^\beta, \sigma^\gamma, \sigma^\pi)$.

Hence, the utility is expressed in two parts: the mean utility across individuals,

$\delta_{cjt} = \alpha_1 + \beta_1 G_{cjt} + \gamma_1 A_{cjt}^o + \pi_1 A_{cjt}^p + \eta X_{ct} + \xi_{mj} + \Delta \xi_{cjt} + \phi_t$, and the individual departure from

the mean,

$$\mu_{icjt} = \left(\alpha_2 D_{ijt} + \sigma^\alpha \nu_i^\alpha \right) + \left(\beta_2 D_{ijt} + \sigma^\beta \nu_i^\beta \right) G_{cjt} + \left(\gamma_2 D_{ijt} + \sigma^\gamma \nu_i^\gamma \right) A_{cjt}^o + \left(\pi_2 D_{ijt} + \sigma^\pi \nu_i^\pi \right) A_{cjt}^p.$$

We assume that ε_{icjt} follows an i.i.d. type I extreme value distribution, and normalize the utility for the outside option to $u_{ic0t} = 0 + \varepsilon_{ic0t}$. Based on the distributional assumption of the idiosyncratic shocks and the utility specification stated above, we define the probability of voter i in county c voting for the candidate from party j during election t as

$$s_{icjt} = \frac{\exp\left(\delta\left(G_{cjt}, A_{cjt}^o, A_{cjt}^p, X_{ct}; \theta_1 \right) + \mu\left(G_{cjt}, A_{cjt}^o, A_{cjt}^p, D_{ijt}, \nu_i; \theta_2 \right) \right)}{1 + \sum_{k=1}^{2} \exp\left(\delta\left(G_{ckt}, A_{ckt}^o, A_{ckt}^p, X_{ct}; \theta_1 \right) + \mu\left(G_{ckt}, A_{ckt}^o, A_{ckt}^p, D_{ikt}, \nu_i; \theta_2 \right) \right)} . \tag{6}$$

We can obtain the county-level vote share by integrating over individuals such that $s_{cjt} = \int s_{icjt} dP(D) dP(\nu)$, where $P(D)$ and $P(\nu)$ are the distributions for the individual observable, D_{ijt}, and the idiosyncratic disturbances, ν_i, respectively. Again, D_{ijt} is the partisan indicator, which we simulated, county by county, from an empirical multinomial distribution $\hat{P}(D)$, with the category means being the observed percentages of registered partisans for each party in that county.

3.3 Identification and Estimation

Per our model specification, we examine voter's choice of presidential candidates and allow individual heterogeneity in campaign effects. The challenge here is that the choices are observed at the aggregated county level. To address this, we employ the estimation approach developed by Berry, Levinsohn, and Pakes (1995), typically referred to as "BLP", which has been used in various marketing applications (e.g., Chung 2013; Gordon and Hartmann 2013; Sudhir 2001). The parameters are estimated via the method of moments (GMM) to minimize the GMM objective function such that: $\hat{\theta} = \text{argmin} \ \ g(\theta)' W \cdot g(\theta)$, where $g(\theta) = Z' \cdot \Delta \xi_{cjt}$ is the moment condition, Z is the vector of instruments assumed orthogonal to $\Delta \xi_{cjt}$, and W is the weight matrix (Hansen 1982).

21

Typically, the vector of the right-hand-side observables in Equation (1) can be used to form Z. However, we are concerned with an endogeneity problem. The county-party-election specific deviation from the mean utility, $\Delta\xi_{cjt}$, is observable to the candidates and PACs, and hence likely plays a role in determining the level of each campaign activity, G_{cjt}, A^o_{cjt}, and A^p_{cjt}, causing a correlation between the error term and the campaign variables. For example, negative shocks (such as negative word-of-mouth, slow economic growth, and certain demographic shifts) of $\Delta\xi_{cjt}$ may decrease voter preference towards a candidate, who is rightfully incentivized to increase the campaign intensity. Vice versa, in relatively safe counties where he or she sees sufficient voter support, a candidate may want to retain just the minimum level of campaigning and allocate the precious resources to where the competition is more intense. Shachar (2009) provides empirical evidence that candidates do more campaigning when the competition is more intense. Without accounting for this endogenous behavior, we may underestimate the true campaign effect.

A common approach to address endogeneity is to choose instruments that are correlated with the campaign activities but exogenous to $\Delta\xi_{cjt}$. The instruments we choose for advertising are the third-quarter DMA-level ad prices in the year before each election. The argument for the validity of those instruments is that price changes affect advertising cost and hence shift the amount of advertising, but the cause of the price fluctuation is assumed to be outside the system, i.e., independent of $\Delta\xi_{cjt}$. We use ad prices from the previous year instead of from the election year to reduce the possibility that price changes are due to the changing demand of advertising in an ad-filled election year.

Our ad-price data come from the Kantar Media SRDS TV and Cable Source, and we collected prices for three dayparts: prime access, prime, and late news. Although invariant across candidate own ads and PAC ads, the ad costs are able to instrument both types of ads through the difference in airtime for each type. Using data from the University of Wisconsin Advertising Project (Goldstein and Rivlin 2008) we found that candidate's own ads were aired more during the prime access and the prime dayparts than PAC ads, while the latter more frequently appeared during the late news daypart (see Appendix A). Therefore, the costs for different dayparts have

varying effects on the two types of ads, providing the variation needed for identification. In particular, the unique exogenous variation in the ad price for prime access time and prime time helps identify candidate's own ads and the unique variation in the costs for late news daypart helps identify the effect for PAC ads. However, the instruments are constant across parties and would not provide any between-party variation, so that the first-stage fitted values for advertising (candidate's own ads and PAC ads) conditional on the instruments and the other covariates would be the same for the Democrats and Republicans. Hence, we include the interactions between the Democratic indicator and each of the ad cost instruments, which add between-party variation in the first-stage fitted values for the endogenous ad variables to help identification.

We use the real estate rental price in each county the year before the election to instrument field operations. The interaction with the Democratic indicator is also included to provide the between-party variation. The identification argument is similar to that of using lagged ad prices to instrument advertising. Specifically, lagged rental prices affect the demand for office rental and, hence, should be correlated with the number of field offices, but not directly correlated with the unobservable utility shocks. Rental prices may not be valid instruments if some unobservable local economic conditions, say, an expected business boost, caused both an increase in the previous year's rent and a change in residents' candidate preference. By including a rich set of socio-economic variables for each county, we believe we have reasonably offset this potential bias because $\Delta\xi_{cjt}$ now captures utility shocks not explained by the socio-economic shifts.

In addition to ad prices and rental costs, we included the interactions between rental price and each of the three ad prices. The rational is to increase the first-stage predictive power hence increase the estimation precision in the final model (Angrist and Pischke 2008). Our final vector of the GMM instruments contains the lagged real estate price, the lagged ad prices, the interactions between the Democrat indicator and the cost shifters, the interactions among the cost shifters, and all of the exogenous variables in Equation (1) including the fixed effects. Because partisan information is available for slightly more than half of the states, we form separate moments for states with and without this variable, so that only the states with the partisan information contribute to the estimation of the random coefficients. Heuristically, the variation in vote shares

for counties with different partisan density but the same campaign activities helps identify the mean of the random campaign effect distribution. For example, if two counties both have one more Democratic field office from one election to another, and if the one with a higher percentage of Democrats also sees a bigger change in vote share for the Democratic candidate, the partisan variable would be identified to positively moderate the effect for field operations. The same logic applies to how partisans and non-partisans respond to the ad effect.

4 Results

4.1 Parameter estimates

We estimate four specifications and present the results in Table 5. The first two specifications estimate the effect of ground campaigning and advertising in an ordinary least squares (OLS) regression with and without the DMA-party fixed effects, respectively. The third specification incorporates the instruments, and the fourth allows heterogeneous campaign effects across individual voters, which is our full model.

We begin with a brief discussion of the OLS estimates (see columns 1 and 2). First, adding fixed effects increased the model R-squared from 0.39 to 0.66; therefore, in the subsequent analyses, we always include the fixed effects. The OLS estimates in column 2 provide benchmark values of the campaign effect: without accounting for endogeneity, field operations and advertising–both the candidate and party ads and PAC ads–are positively correlated with vote shares. We also observe a positive and significant association between digital campaigning and vote outcomes.

< Table 5>

Before discussing IV estimates in column 3, we first summarize some diagnostic statistics for the instruments. We estimated the first-stage regression equations and the reduced-form regression equation as outlined in Angrist and Pischke (2008) and present the results in Table 6. The first-stage regression results indicate a clear effect of the instruments on the three endogenous campaign variables—field operations, candidate's own ads, and PAC ads. The partial F statistics are 26.15, 36.88, and 11.58, respectively. The instruments also have sufficient power to explain the

24

vote shares after controlling for all the covariates in the reduced-form regression model. Those results provide initial evidence for the robustness of our instruments.

< Table 6>

After applying the instruments, we find the effect for field operations to be bigger than the corresponding OLS estimate; the direction of the change is expected with the presence of endogeneity. When candidates deploy more field offices in more intense competition, the OLS estimate would be attenuated towards zero, as is the case here. The IV estimate for candidate's own ads is also larger than the OLS estimate and is significantly positive. The IV estimate for PAC ads, although positive and larger than the OLS estimate, is no longer significant at 0.05 level.

Our final model (column 4 in Table 5) incorporates voter heterogeneity; in particular, we examine how the effect of various campaign activities depends on voter partisanship. The first column under specification (4) lists the parameter estimates for non-partisan voters; the second column is the estimated interaction effect with voter partisanship; and the third column corresponds to $\hat{\sigma}$, the estimated unobserved heterogeneity in each campaign effect.

We discover some interesting patterns regarding the effect of campaign activities in different voter segments. First, we estimate the effect of field operations to be 0.361, positive and significant for non-partisans and the effect is even stronger for partisan voters. In contrast, candidate's own advertising is found to have a positive and significant effect for non-partisans (0.121, p<0.01) but the effect reduces to being indistinguishable from zero for partisan voters (-0.052, p>0.10). That is, candidate's own ads are only effective for voters on the margin, i.e., those who have not yet developed a partisan affiliation with either party. Interestingly, PAC ads are found to be effective only among partisans (0.180=0.013+0.167, p<0.01) and the effect is null among non-partisans (0.013, p>0.10). After controlling for partisanship, we find that the remaining variation in the effect of field operations and PAC ads is no longer significant across individuals. Candidate's own ads, on the other hand, still have heterogeneous effect among voters, suggesting that there may be additional voter segments along other dimensions of individual characteristics. Finally, voters' partisanship is found to have a strong main effect (0.558, p<0.01):

not surprisingly, independent from the campaign effects, partisans tend to favor the candidates from their party. Nevertheless, our estimates indicate that campaign activities still influence voting outcomes beyond voters' baseline preference.

Among the control variables, we find some initial evidence that digital campaigning is positively associated with the candidate's vote shares; the IV estimate is 0.107 (p<0.10), and the final estimate is positive although insignificant at 0.10 level after incorporating individual heterogeneity. We also find that counties with fewer African American residents, lower median household income, lower unemployment rate, lower high school dropout rate, and lower poverty rate tend to have higher vote shares for the Republican candidates; in contrast, counties with more African Americans, higher high school dropout rate, higher median household values, and higher poverty rate tend to favor the Democratic candidates.

4.2 Elasticity Estimates

In this section, we present the elasticities of various campaign activities. The field-operation elasticity, derived from the utility specification, is

$$
\zeta_{jk,ct}^{\beta} = \frac{\partial s_{j,ct} G_{k,ct}}{\partial G_{k,ct} s_{j,ct}} =
\begin{cases}
\dfrac{G_{j,ct}}{s_{j,ct}} \displaystyle\int \beta_i s_{ij,ct} (1 - s_{ij,ct}) dP(D) dP(\nu) \text{ if } \; j = k \\[2em]
-\dfrac{G_{k,ct}}{s_{j,ct}} \displaystyle\int \beta_i s_{ij,ct} s_{ik,ct} dP(D) dP(\nu) \text{ if } \; j \neq k
\end{cases},
$$

which depends on the individual-specific taste parameter for field operations, β_i, integrated over individual voters. Elasticities for advertising are defined similarly.

Table 7 presents the elasticity estimates based on the estimates of specification (4) in Table 5. The numbers in the diagonal refer to the percentage change in vote share in response to a 1% increase in the party's own campaign efforts; and those in the off-diagonal correspond to the change in a party's vote share resulting from a 1% increase in the rival's campaign.

We begin with the elasticity estimates for advertising, as they are more straightforward to interpret. The elasticity for candidate's own ads is estimated to be 0.059 and 0.081 for the Republicans and Democrats, respectively: a 1% increase in the candidate's own advertising would

result in a roughly 0.059% increase in vote shares for the Republicans and 0.081% for the Democrats. It is nontrivial to compare our estimates to others, as not many studies have carefully addressed both campaign endogeneity and voter heterogeneity as we do here. The paper closest to ours is Gordon and Hartmann (2013), which also uses ad costs to instrument advertising. Our elasticities roughly double their estimates of 0.033% for the Republicans and 0.036% for the Democrats. The difference may be because Gordon and Hartmann (2013) categorize ads by the target candidate regardless of the sponsors and hence their ad effect is a composite effect of candidate's own ads, PAC ads, and other "hybrid/coordinated" ads. Our estimated elasticity for candidate's own ads should be greater than theirs when candidate ads have a stronger effect than other types of ads, as is what we find here. Furthermore, the fact that Gordon and Hartmann (2013) estimated ad GRPs while we directly observed the ad variables may also explain some discrepancy between our estimates. Another recent empirical paper on presidential advertising, Lovett and Peress (2015), estimated the ad effect size to be a 3.0% increase in vote share if the party can increase individual ad exposures by one standard deviation. It is hard to directly compare their numbers to ours, because of the use of different ad metrics. Nevertheless, their finding that ads are more effective among swing voters is qualitatively consistent with what we find.

The cross-ad elasticity estimates for candidate's own ads are noticeably smaller than the own-ad elasticities. If the Democrats raise their campaign ads by 1%, the Republican's vote share would decrease by 0.033%; the decrease is estimated to be 0.051% for the Democrats if the Republicans increase their campaign ads by 1%.

The average effect for PAC ads is found to be smaller than that for the candidate's own ads. The own-elasticity estimates are 0.032% for Republicans and 0.045% for the Democrats, and the cross-elasticity estimates are -0.011% and -0.020%, respectively.

For field operations, we calculated the percentage change in vote shares in response to one additional field office[15]. We find that the elasticity is much higher for the Democrats than for the

---

[15] The addition of one field office can be understood as a proxy for the average amount of voter contacts associated with a typical field office. The fact that the number of field offices is highly correlated with the

Republicans: with one additional field office, the vote share is estimated to rise by 3.305% for the Democrats (versus 1.143% for the Republicans), suggesting that the Democratic field offices are more effective in driving vote shares than the Republican's. Similarly, the cross elasticity estimates reveal that the Democratic field offices are also more effective in converting Republican-leaning voters to the Democratic candidates, rather than the other way around (-1.889% versus -0.529%).

It is challenging to benchmark our field-operation elasticity estimates as empirical studies on this topic are scarce. In one exception, Darr and Levendusky (2014) identified a 1.04% boost in county-level vote shares with the presence of a Democratic field office, which corresponds to one third of our elasticity estimate for the Democrats. It is worth noting that Darr and Levendusky (2014) used an OLS model without adjusting for the potential correlation between field office deployment and the unobserved voter preference. As we have discussed, when field operations are condensed in competitive counties, ignoring this endogeneity concern may lead to underestimating the true effect for field offices. Our estimate is directionally consistent with what one would expect when treating field operations as endogenous. Indeed, the field-office elasticity is estimated to be 0.95% based on our OLS estimates, very similar to the estimate in Darr and Levendusky (2014).

< Table 7>

4.3 Counterfactual Analysis

With the structural parameter estimates we are now ready to answer the "what if" questions: what the election results would have been had the candidates campaigned differently. These counterfactual questions are crucial for understanding the true causal effect of campaign activities as causal effect is defined as the difference between factual and counterfactual inferences. For example, to pin down the extent to which each campaign activity matters to an election, we could eliminate that particular campaign activity while keeping others intact, predict the winner for each state, and then compare the results to the true state winners. We report the various counterfactual results in Table 8.

---

self-reported voter contacts suggests that there may be a somewhat narrow distribution for the amount of voter contacts behind each field office. We thank an anonymous reviewer for raising this question.

First of all, our results highlight the importance of field operations for the Democrats. Had neither party set up any field offices, the Republicans would have won the 2008 and 2012 elections. In other words, the Democratic field operations were responsible for a large portion of their total popular votes in 2008 and 2012. Without field operations, the Democrats would have lost seventeen states (Colorado, Florida, Indiana, Iowa, Maine, Michigan, Minnesota, Nevada, New Hampshire, New Mexico, North Carolina, Ohio, Oregon, Pennsylvania, Virginia, Washington, and Wisconsin) in 2008 and fifteen states (California, Colorado, Florida, Illinoi, Iowa, Michigan, Minnesota, Nevada, New Hampshire, New Mexico, Ohio, Pennsylvania, Virginia, Washington, and Wisconsin) in 2012. After all, there is truth to the popular claim that Obama owed the victories to his unprecedented field operations.

As far as the candidate's own ads are concerned, zero advertising would have changed the results for some states; for example, the Republicans would have won Indiana in 2008 and four states (Connecticut, New Hampshire, Virginia, and Washington) in 2012. However, the national results would have remained the same for all three elections. This suggests that television advertising may not be a deterministic factor for driving the election results. The finding is somewhat expected, considering that the ad elasticity estimates are with a similar magnitude for the Democrats and Republicans and that the two parties had somewhat comparable levels of television ads. These counterfactual results also seem to suggest that the effect of field operations is more substantial than the ad effect, consistent with the finding in Carroll et al. (1985). Although in a different setting of Navy enlistment, they found that the elasticity of field salesforce was large and significant (i.e., 0.44%) while advertising was not significant.

How about the ads sponsored by PACs? Not surprisingly, we find that eliminating the outside ads barely moved the needle on the election results in 2004 and 2008, perhaps explained by the modest amount of PAC ads in those elections. However, if the 2012 election had allowed zero outside ads (without changing the actual amount of candidate advertising), the Democrats would have won with a much larger margin. The finding that the Democrats benefited more from banning outside ads could provide interesting insights into the consequences of the "People's Pledge," pioneered in the 2012 Massachusetts Senate race. According to the pledge, the

Republican candidate, Scott Brown, and the Democratic candidate, Elizabeth Warren, agreed not to accept any outside ads, aiming to curb the influence of third parties. Warren defeated Brown; thus, there has been a lot of speculation regarding whether the pledge had helped the Democrats more than the Republicans. Our counterfactual analysis suggests that banning PAC ads in presidential elections is more beneficial to the Democrats. To the extent that our finding can be extended to a Senate race, one may conjecture that part of Warren's success is attributed to eliminating the outside ads.

Currently, PACs are prohibited from directly coordinating their advertising efforts with candidates. We also conducted a counterfactual analysis to understand the effect of this policy (row 5 in Table 8). Had PACs been allowed to donate their ad spots to the candidates— in other words, the GRPs of the candidates' own ads would have become the sum of the GRPs from the candidate campaign and from the leaning PACs— the Republican candidates would have won significantly more states, changing the election results for 2008 and 2012. This is primarily because of the large amount of PAC ads that the Republicans received in the two recent elections. One caveat of this counterfactual analysis is that PAC ads typically are broadcasted during less popular dayparts. Even if PACs gave all their ad spots to the candidates, in reality, their ads may not be as effective as the candidate's own ads, which more frequently aired during better dayparts. Hence, the consequences of eliminating PAC ads perhaps would be bounded by the two counterfactual scenarios that we conducted: simply removing the PAC ads and transferring all the PAC GRPs to the candidates.

It is noteworthy that our counterfactuals are not based on full equilibrium outcomes, in the sense that, when one activity is removed from the campaign mix, we retain the level of the other activities. Those partial equilibrium results are under the assumption that candidates do not adjust the amount of other campaign activities with the absence of the focal activity. A full equilibrium counterfactual analysis would require us to have a supply-side model that solves the new equilibrium level for all the remaining activities given a fixed campaign budget, which is

beyond the scope of the current study. Nevertheless, the partial equilibrium analysis still sheds light on the respective effect of each campaign activity while controlling for others.[16]

< Table 8 >

If there were a chance to relive the history, what would it take for the losing parties to change their fate? In particular, could the Republicans have won the 2008 and 2012 elections if they had enhanced their field operations in swing states, as the public seemed to suggest?[17]

To answer this question, we conducted a counterfactual analysis to calculate the fewest *additional* field offices needed for the Republicans to win the national election. The computation took two steps. First, for each swing state that the Republicans lost, we used the model estimates to solve for the fewest additional field offices needed for the Republicans to win more popular votes in the state, holding constant the number and locations of the Democratic field offices and the other campaign activities.[18] The optimal numbers of field offices are presented in Table 9. In the second step, assuming that the cost of setting up a field office is constant across states, we selected the optimal combination of swing states that required the fewest additional field offices to reach the 270 electoral votes. The optimal combination takes into account the number of additional field offices per state and the electoral votes that each state carries and, hence, represents the most cost-effective way to allocate field operations in order to win the election.

To reach the 270 goal that year, the McCain campaign would have had to set up at least fourteen additional offices: two in Florida, one in Indiana, one in Nevada, one in North Carolina,

---

[16] We thank an anonymous reviewer for pointing this out.

[17] For example, days after President Obama was first elected in 2008, the *Washington Times* published an article claiming that "one of the keys to Mr. Obama's success was building an unprecedented ground game." Four years later, the *New York times* (April 17) ran an article saying that the extent to which "Mr. Romney can match the Obama's footprint [in the ground game] in the swing states may prove critical in deciding the election."

[18] The procedure, say for Colorado in 2008, goes as follows. First, we retain the value of the Democratic field operations in Colorado. Second, we solve for the number of Republican field offices per county, which minimizes the total number of field offices given that the Republicans would win the majority of votes. For the 53 counties in which the Republicans did not have an office in 2008, we restrict the value to fall between 0 and 10, as less than 0.5% of the counties in our sample ever had more than ten field offices. For the 11 counties with at least one office that year, we bound the variable between the current value and 10.

three in Ohio, and six in Pennsylvania, conditional that the candidates locate the offices where they are expected to be the most effective, i.e., among partisans. Winning these states would have brought in a total of 99 electoral votes. Four years later, it would have taken fewer additional field offices for the Republicans to win the election, given that the Romney campaign had already invested more in field operations: Romney could have won by adding merely six more field offices: one in Florida, one in Nevada, two in Ohio, and two in Virginia.

< Table 9 >

We then examine whether advertising could have helped the losing party in each election, and if so, by how much. Our analysis shows that advertising could have played a critical role in deciding the election, but only in a close competition such as the 2004 one. If his campaign had increased the ad coverage by 50% in New Mexico (worth of $1.0 million spending) and 4.3 times in Virginia (worth of $0.6 million spending), Kerry could have won additional 18 ECs, enough to help him reach the 270 goal and claim the victory! The Democrats-leaning PACs could have also helped Kerry win three more states by spending an additional $0.03 million (the equivalent of 50% more GRPs) in New Mexico, $0.11 million (50% more GRPs) in Iowa, and $0.37 million (1.7 times more GRPs) in Nevada. Had that happened, the 2004 election would have resulted in a 269 to 269 tie. As directed by the 12th Amendment, members of the House of Representatives would have had to choose the president that year. To break the tie, the Democrats-leaning PACs would need to spend another $1.1 million to win Colorado, which seems feasible given that year's total PAC ads budget of $7.0 million in favor of the Democrats.

However, when the winner has a big competitive advantage, it is unlikely for a losing party to change the results solely through increasing advertising, at least not with a reasonable advertising budget. For example, for the 2008 election, the Republicans could have won Indiana with an extra budget of $1.1 million, North Carolina with $3.8 million, Iowa with $7.3 million, Florida with $11.8 million, Virginia with $11.9 million, and Ohio with $16.4 million. The extra spending adds up to $52.3 million, roughly half of McCain's total campaign ad spending during the general election period; however, this would still make him short of 270 by 4 ECs. Similarly, if

the PACs supporting McCain had spent $6.8 million more, they could have won 48 additional electoral votes (i.e., North Carolina, Ohio, and Virginia); but this still could not have made up for the additional 97 electoral votes that he needed to win the election. In 2012, the Republicans could have increased their own ads to win New Hampshire ($1.2 million more spending, the equivalent of 1.8 times more GRPs), Virginia ($8.4 million more spending, doubling the existing GRPs), and Ohio ($10.6 million more spending, the equivalent of 80% more GRPs). Or, the PACs could have helped Romney win Florida ($7.4 million more spending), Minnesota ($5.6 million), New Hampshire ($2.7 million), and Pennsylvania ($7.6 million). That additional spending would have exceeded one third of the total Republican-leaning PAC ad spending that year, but still could not have reached the 270 goal. And it would be prohibitively expensive for Romney to win more states simply by increasing advertising, being it the candidate's own ads or outside ads.

5 Conclusion

We study the effect of mass-media advertising and personal selling—in the form of field operations—in the context of U.S. presidential elections. By linking various campaign activities to county-level vote results, we offer a comprehensive identification of the causal effect for various types of campaign activities. Different from most extant studies, we separate candidate campaign ads from those sponsored by outside political groups and examine how the ad effect varies by these types. Our results generate insights into the effectiveness of each campaign activity for different voter segments: field operations and outside ads are more effective for partisan voters, while candidate's own ads are only effective among non-partisans. Furthermore, our results can easily be generalized to domains other than presidential campaigns and provide guidance to managers on resource allocation between personal selling and mass media advertising. That is, if one thinks of a candidate as a product—you either buy Obama or you buy Romney—then the logic would hold the same for a company. If you want your loyal customers to buy more, then personal selling is key. If you want your neutral customers to become customers, mass advertising is the way to go. If you have a limited salesforce, then you could possibly put out some negative ads against competitors, as PACs do.

With our parameter estimates, we predict counterfactual election results under several hypothetical scenarios. Overall, we find that political campaigns play an essential role in shaping the election results, contrary to the "minimum effect of campaigning" view, which claims that most voters already have their minds made up and, hence, campaigns barely move the needle in terms of voting outcomes. We show that ground campaigning was critical to the Democrats: if neither party had implemented any ground operations, the Republicans would have won the 2008 and 2012 elections. We also find that advertising can play a critical role in a close election but not so when one party has a big advantage: with a modest amount of additional ads, the Democrats would have won the 2004 election but the results would have been largely the same for the next two elections.

Some of the results merit further discussions. First, the finding that PAC ads behave similarly to field operations rather than candidate's own ads is surprising at a first glance. While candidate's own ads are found to be more effective for non-partisan voters, the opposite is true for PAC ads. We think that this is perhaps due to the difference in ad content: PAC ads are predominately negative and tend to attack rivals rather than promote the preferred candidates. Such a strong negative tone may work better to reinforce a partisan's beliefs than to persuade an undecided voter. This is complementary to Finkel and Geer (1998), which also found that voter partisan predisposition moderates the effect of negative ads.

Second, the finding that the Democratic field operations are more effective than the Republican's is also worth a closer examination. The field-operation own elasticity for the Democrats is estimated to be 2.9 times as large as that for the Republicans. We believe this is perhaps due to the quality of voter outreach activities resulting from the data available on voters and the techniques used to target and persuade them[19]. For example, personal voter interactions like door-to-door visits could be more powerful than indirect contacts such as telemarketing and door hangers. This is best echoed by a quote from an Obama field director in 2012: "Many field campaigns have historically favored quantity over quality. We do not. These are not phone calls

[19] In the same vein, we acknowledge that field offices even from the same party may have heterogeneous effects due to operational differences.

made from a call center. They are done at the local level by our neighborhood team leaders, members and volunteers, who are talking to people in their communities." [20] Despite the importance, detailed data on how field teams operate are challenging to obtain, especially at the county level. We acknowledge this data limitation and believe that future research could benefit from improving measuring the operation of ground campaigning.

In the same vein, our advertising measurement also has its limitation. In particular, we assume that the individuals from the same DMA (hence county) face homogeneous ad exposures, while in reality people may endogenously decide how much advertising to watch. We do not think this assumption would explain our main finding that candidate's own ads are only effective on non-partisans. The null effect on partisans is not due to the lack of ad exposures, because partisans tend to be more attentive and mindful to political ads than non-partisans (Finkel and Geer 1998). However, the difference in individual ad impressions could help explain the remaining variation in the ad effect, which could be interesting to explore further.

We would also like to point out that in this study we use the total spending of each party to measure the level of their digital campaigning. Note that the term, digital campaigning, is an umbrella concept encompassing various forms of campaign activities on digital platforms. Google search words, text-based banner display ads, online video ads, and social media ads are just several common examples that have entered the toolkit of presidential campaigns. Thus, we believe that examining the mechanism and role of digital campaigning in presidential elections is an important and fruitful direction for future work.

---

[20] *CNN*, "Analysis: Obama won with a better ground game." November 7, 2012.

References

Albers, S., M. K. Mantrala, and S. Sridhar. 2010. Personal selling elasticities: A meta-analysis. *Journal of Marketing Research* **47**(5), 840–853.

Alvarez, R. M., A. Hopkins, and B. Sinclair. 2010. Mobilizing Pasadena Democrats: measuring the effects of partisan campaign contacts. *The Journal of Politics* **72**(1), 31–44.

Angrist, Joshua D., and J. Pischke. 2008. *Mostly harmless econometrics: An empiricist's companion.* Princeton, NJ: Princeton University Press.

Berry, S., J. Levinsohn, and A. Pakes. 1995. Automobile prices in market equilibrium. *Econometrica* **63**(4), 841–890.

Borden, N. H. 1964. The concept of the marketing mix. *Journal of Advertising Research* **4**(2), 2–7.

Bruce, N. I. 2008. Pooling and dynamic Forgetting effects in multitheme advertising: Tracking the advertising sales relationship with particle filters. *Marketing Science* **27**(4), 659–673.

Campbell, J. E. 1992. Forecasting the presidential vote in the states. *American Journal of Political Science* **36**(2), 386–407.

Carroll, V. P., A. G. Rao, H. L. Lee,, A. Shapiro, and B. L. Bayus. 1985. The Navy enlistment marketing experiment. *Marketing Science* **4**(4), 352–374.

Chung, D. J. 2013. The dynamic advertising effect of collegiate athletics. *Marketing Science* **32**(5), 679–698.

Darr, J. P., and M. S. Levendusky. 2014. Relying on the ground game: The placement and effect of campaign field offices. *American Politics Research* **42**(3), 529–548.

De Kluyver, C. A., and, R. J. Brodie. 1987. Advertising-versus-marketing mix carryover effects: An empirical evaluation. *Journal of Business Research* **15**(3), 269–287.

Dekimpe, M. G., and D. M. Hanssens. 1995. The persistence of marketing effects on sales. *Marketing Science* **14**(1), 1–21.

Finkel, S. E., and J. G. Geer. 1998. A spot check: Casting doubt on the demobilizing effect of attack advertising. *American Journal of Political Science* **42**(2), 573–595.

Gatignon, H., and D. M. Hanssens. 1987. Modeling marketing interactions with application to salesforce effectiveness. *Journal of Marketing Research* **24**(3), 247–257.

Gerber, A. S., and D. P. Green. 2000. The effects of canvassing, telephone calls, and direct mail on voter turnout: A field experiment. *The American Political Science Review* **94**(3), 653–663.

Givon, M., and D. Horsky. 1990. Untangling the effects of purchase reinforcement and advertising carryover. *Marketing Science* **9**(2), 171–187.

Gordon, B. R., and W. R. Hartmann. 2013. Advertising effects in presidential elections. *Marketing Science* **32**(1), 19–35.

Goldstein, Kenneth, and Joel Rivlin. 2008. *Presidential advertising Combined File.* Madison, WI: The University of Wisconsin Advertising Project, The Department of Political Science at The University of Wisconsin-Madison.

Hansen, L. P. 1982. Large sample properties of generalized method of moments estimators. *Econometrica* **50**(4), 1029–1054.

Lodish, L. M., M. Abraham, S. Kalmenson, J. Livelsberger, B. Richardson, M. E. Stevens, and B. Lubetkin. 1995. How TV advertising works : A meta-analysis of 398 real world split cable TV advertising experiments. *Journal of Marketing Research* **32**(2), 125–139.

Lovett, M., and M. Peress. 2015. Targeting political advertising on television. *Quarterly Journal of Political Science*, 10(3), 391–432.

Masket, S. E. 2009. Did Obama's ground game matter? The influence of local field offices during the 2008 presidential election. *Public Opinion Quarterly* **73**(5), 1023–1039.

Narayanan, S., R. Desiraju, and P. K. Chintagunta. 2004. Investment implications for pharmaceutical role expenditures : Interactions marketing-mix. *Journal of Marketing* **68**(4), 90–105.

Shachar, R. 2009. The political participation puzzle and marketing. *Journal of Marketing Research* **XLVI**, 798–815.

Shaw, D. R. 1999. The effect of TV ads and candidate appearances on statewide presidential votes, 1988-96. *The American Political Science Review* **93**(2), 345–361.

Sudhir, K. 2001. Competitive pricing behavior in the auto market : A structural analysis. *Marketing Science* **20**(1), 42–60.

Weitz, B. A. 1981. Effectiveness in sales interactions: a contingency framework. *Journal of Marketing* **45**(1), 85–103.

Zoltners, A. A., P. Sinha, and S. E. Lorimer. 2006. *The Complete Guide to Sales Force Incentive Compensation: How to Design and Implement Plans That Work.* New York: AMACOM.

Table 1: Summary Statistics for Vote Outcomes by County

Year	Party	N	Mean	SD	Min	Max	Total
Votes							
2004	Democrat	3111	18,902	65,678	18	1,907,736	58,802,968
	Republican	3111	19,866	47,586	82	1,076,225	61,804,121
2008	Democrat	3106	22,289	77,146	8	2,295,853	69,230,895
	Republican	3106	19,221	44,883	94	956,425	59,701,115
2012	Democrat	3108	21,127	74,225	5	2,216,903	65,661,169
	Republican	3108	19,537	44,789	84	885,333	60,721,119
Vote Share							
2004	Democrat	3111	0.22	0.08	0.04	0.58	
	Republican	3111	0.35	0.09	0.05	0.76	
2008	Democrat	3106	0.25	0.10	0.04	0.64	
	Republican	3106	0.33	0.09	0.04	0.78	
2012	Democrat	3108	0.22	0.10	0.02	0.70	
	Republican	3108	0.33	0.10	0.02	0.73	
Combined Votes							
2004		3111	38,768	109,874	155	2,983,961	120,607,089
2008		3106	41,511	118,264	159	3,252,278	128,932,010
2012		3108	40,664	114,908	144	3,102,236	126,382,288
Turnout Rate							
2004		3111	0.57	0.09	0.19	0.98	
2008		3106	0.58	0.09	0.16	0.90	
2012		3108	0.55	0.09	0.15	0.99	

Note: We calculate the turnout rate as the sum of votes for the Democratic and the Republican candidates divided by the number of resident citizens aged 18 and above. The vote share for each candidate is calculated as the ratio of the focal candidate's received votes divided by the number of resident citizens aged 18 and above.

Table 2: Ground Campaigning by County

		N	Mean	SD	Min	Max	Total
Number of Field Offices							
2004	Democrat	3,111	0.10	0.45	0	12	313
	Republican	3,111	0.03	0.23	0	5	89
2008	Democrat	3,106	0.28	0.75	0	11	874
	Republican	3,106	0.08	0.46	0	17	247
2012	Democrat	3,108	0.24	0.93	0	21	750
	Republican	3,108	0.09	0.37	0	6	278
Presence of Field Offices							
2004	Democrat	3,111	0.08	0.27	0	1	237
	Republican	3,111	0.02	0.14	0	1	65
2008	Democrat	3,106	0.20	0.40	0	1	624
	Republican	3,106	0.06	0.24	0	1	192
2012	Democrat	3,108	0.14	0.35	0	1	439
	Republican	3,108	0.07	0.26	0	1	222

Note: The unit of observation is county. Field operations are measured by the number of field offices in each county. We also report the number of counties that had at least one field office.

Table 3: Television Advertising by DMA

		N	Mean	SD	Min	Max	Total
Candidate Advertising (GRPs)							
2004	Democrat	206	1,420.4	2,374.1	0	8,933	292,611
	Republican	206	1,885.9	2,764.0	0	8,440	388,501
2008	Democrat	206	3,809.9	3,797.8	255	13,838	784,848
	Republican	206	2,075.3	2,422.7	77	8,452	427,517
2012	Democrat	206	2,232.2	4,143.7	0	15,779	459,827
	Republican	206	1,320.7	2,576.5	0	9,535	272,055
Party Advertising (GRPs)							
2004	Democrat	206	1,942.0	2,211.0	0	7,561	400,054
	Republican	206	868.0	1,271.1	0	5,858	178,814
2008	Democrat	206	1,766.5	2,324.9	0	12,277	363,905
	Republican	206	1,553.5	1,890.5	0	11,035	320,013
2012	Democrat	206	1,063.8	1,604.2	0	7,270	219,144
	Republican	206	1,069.4	1,774.5	0	11,044	220,291
Candidate and Party Advertising (GRPs)							
2004	Democrat	206	3,362.5	4,268.0	0	16,120	692,665
	Republican	206	2,754.0	3,204.2	0	11,579	567,316
2008	Democrat	206	5,576.5	4,760.6	255	18,418	1,148,754
	Republican	206	3,628.8	3,713.1	77	17,965	747,530
2012	Democrat	206	3,296.0	4,941.1	0	19,849	678,971
	Republican	206	2,390.0	3,611.8	0	19,597	492,346
PAC Advertising (GRPs)							
2004	Democrat	206	255.9	505.0	0	2,248	52,726
	Republican	206	394.4	866.2	0	4,023	81,250
2008	Democrat	206	159.4	407.3	0	2,513	32,830
	Republican	206	217.2	435.7	0	2,188	44,736
2012	Democrat	206	254.3	694.6	0	3,840	52,378
	Republican	206	2,030.9	2,714.9	67	12,137	418,356
Total Advertising (GRPs)							
2004	Democrat	206	3,618.4	4,627.9	0	16,726	745,390
	Republican	206	3,148.4	3,773.8	0	12,413	648,566
2008	Democrat	206	5,735.8	4,951.8	255	19,592	1,181,583
	Republican	206	3,846.0	3,965.4	77	19,704	792,267
2012	Democrat	206	3,550.2	5,533.5	0	22,943	731,349
	Republican	206	4,420.9	6,091.8	67	29,295	910,702

Note: We measure television advertising using gross rating points (GRPs), which correspond to the percentage target population reached in each DMA. For PAC advertising, we obtained data for the top spenders, which were responsible for more than 90% of the total PAC ad spending for each election. The total number of DMAs excludes those in Alaska.

Table 4: Summary Statistics of Additional Variables

	N	Mean	SD	Min	Max
Incumbent status					
2004	6,222	0.50	0.50	0	1
2008	6,212	0.00	0.00	0	0
2012	6,216	0.50	0.50	0	1
Home state advantage for presidential candidates					
2004	6,222	0.04	0.20	0	1
2008	6,212	0.02	0.14	0	1
2012	6,216	0.02	0.14	0	1
Home state advantage for vice-presidential candidates					
2004	6,222	0.02	0.14	0	1
2008	6,212	0.00	0.02	0	1
2012	6,216	0.01	0.11	0	1
Governor advantage					
2004	6,222	0.50	0.50	0	1
2008	6,212	0.50	0.50	0	1
2012	6,216	0.50	0.50	0	1
Percentage of African American residents					
2004	6,222	0.09	0.14	0	0.87
2008	6,212	0.09	0.15	0	0.86
2012	6,216	0.09	0.15	0	0.86
Median household income ($)					
2004	6,222	46,458.1	12,257.3	20,193	121,266
2008	6,212	46,528.0	12,332.4	19,744	122,822
2012	6,216	44,901.4	11,549.5	19,624	122,844
Unemployment rate					
2004	6,222	0.07	0.03	0	0.36
2008	6,212	0.08	0.03	0	0.28
2012	6,216	0.09	0.04	0	0.27
Gini index					
2004	6,222	0.43	0.04	0	0.62
2008	6,212	0.43	0.04	0	0.67
2012	6,216	0.44	0.04	0	0.60
Median house value ($)					
2004	6,222	139,215.1	100,886.0	31,463	1,070,185
2008	6,212	141,710.5	95,805.9	17,148	1,014,468
2012	6,216	129,529.0	77,297.9	19,400	944,100
Dropout rate					
2004	6,222	0.07	0.06	0	0.58

2008		6,212	0.07	0.05	0	0.60
2012		6,216	0.06	0.05	0	0.63
Poverty rate						
2004		6,222	0.15	0.07	0	0.52
2008		6,212	0.16	0.07	0	0.53
2012		6,216	0.17	0.07	0	0.49
Percentage of registered partisans						
2004	Democrat	1,318	0.35	0.17	0.06	0.98
	Republican	1,318	0.33	0.16	0.03	0.90
2008	Democrat	1,319	0.35	0.16	0.06	1.00
	Republican	1,319	0.33	0.15	0.03	0.93
2012	Democrat	1,349	0.31	0.16	0.02	0.97
	Republican	1,349	0.33	0.15	0.03	0.87

Note: County-level control variables are obtained from the American Community Survey database. Data on registered voters by party are compiled from various official government sources. Some states do not require voters to declare party affiliation, hence, we have a smaller sample size for this variable.

Table 5: Parameter Estimates

	(1)	(2)	(3)	(4)		
	Est (SE)	Est (SE)	Est (SE)	Est (SE)	Partisan	Sigma
Field operations	0.074***	0.038***	0.368***	0.361***	0.119***	0.106
	(0.011)	(0.006)	(0.053)	(0.077)	(0.042)	(0.232)
Candidate own ads	0.015***	0.006***	0.063***	0.121***	-0.173***	0.108***
	(0.001)	(0.001)	(0.009)	(0.011)	(0.005)	(0.008)
PAC ads	0.022***	0.008***	0.012	0.013	0.167***	0.000
	(0.001)	(0.001)	(0.021)	(0.028)	(0.004)	(0.1806)
Digital campaigning	0.064***	0.147***	0.107*	0.032		
	(0.018)	(0.014)	(0.063)	(0.083)		
Year 2008	-0.111***	-0.276***	-0.388**	-0.299		
	(0.035)	(0.028)	(0.164)	(0.212)		
Year 2012	-0.324***	-0.584***	-0.470***	-0.296		
	(0.060)	(0.045)	(0.167)	(0.222)		
Incumbent status	0.009	-0.044***	-0.067	-0.002		
	(0.010)	(0.008)	(0.068)	(0.087)		
Home state advantage for Presidential candidates	0.025	0.057***	0.061**	-0.032		
	(0.019)	(0.019)	(0.024)	(0.031)		
Home state advantage for Vice-Presidential candidates	-0.113***	-0.078***	-0.079**	-0.114***		
	(0.029)	(0.026)	(0.033)	(0.040)		
Governor advantage	0.091***	0.011*	-0.001	-0.014		
	(0.007)	(0.006)	(0.010)	(0.012)		
Percentage AAs	-0.181***	-0.982***	-1.049***	-1.008***		
	(0.043)	(0.060)	(0.055)	(0.079)		
Percentage AAs X Democrat	1.242***	2.655***	2.401***	2.451***		
	(0.063)	(0.082)	(0.087)	(0.129)		
Median household income	-0.050	-0.182***	-0.313***	-0.339***		
	(0.040)	(0.051)	(0.049)	(0.072)		
Median household income X Democrat	-0.671***	0.108	-0.018	0.001		
	(0.025)	(0.073)	(0.065)	(0.098)		
Unemployment rate	-0.020***	-0.014***	-0.014***	-0.013***		
	(0.002)	(0.002)	(0.002)	(0.003)		
Unemployment rate X Democrat	0.030***	0.025***	0.026***	0.025***		
	(0.003)	(0.003)	(0.003)	(0.004)		
Gini index	0.028	0.319**	-0.111	-0.015		
	(0.173)	(0.158)	(0.165)	(0.226)		
Gini index X Democrat	0.352	0.931	0.273	0.242		

	(1)	(2)	(3)	(4)	(5)	(6)
	(0.252)	(0.222)	(0.237)	(0.332)		
Median house value	-0.190***	-0.084	-0.077***	-0.036		
	(0.017)	(0.024)	(0.021)	(0.031)		
Median house value X Democrat	0.542***	0.374	0.343***	0.326***		
	(0.023)	(0.035)	(0.031)	(0.047)		
Dropout rate	-0.357***	-0.586	-0.530***	-0.625***		
	(0.089)	(0.082)	(0.079)	(0.110)		
Dropout rate X Democrat	-0.778***	-0.027	0.008	-0.040		
	(0.144)	(0.125)	(0.112)	(0.158)		
Poverty rate	-0.031***	-0.035	-0.036***	-0.040***		
	(0.002)	(0.002)	(0.001)	(0.002)		
Poverty rate X Democrat	-0.002	0.024	0.022***	0.022***		
	(0.002)	(0.002)	(0.002)	(0.003)		
Intercept	2.112***	1.164**	3.206***	3.978***	0.558***	0.575***
	(0.438)	(0.478)	(0.826)	(1.186)	(0.031)	(0.089)
DMA-Party Fixed Effects	No	Yes	Yes	Yes		
Instruments	No	No	Yes	Yes		
N	18,650	18,650	18,650	18,650		
R^2	0.39	0.66				

*** $p<0.01$; ** $p<0.05$; * $p<0.10$

Note: We report results from four specifications. Column (1) estimates the marginal effects of ground campaigning and television advertising in OLS without fixed effects and column (2) with fixed effects. Column (3) estimates the marginal effects with instruments. Column (4) further incorporates voter heterogeneity in campaign effects.

Table 6: Diagnostic Results for Instruments

Endogenous variable:	First-stage regression			Reduced-form regression
	Field operations	Candidate own ads	PAC ads	Vote shares (log)
Rent	-0.219*	-1.934***	-0.367	-0.382***
	(0.104)	(0.426)	(0.384)	(0.067)
Ad price I	0.569	9.101**	-6.677*	1.067*
	(0.728)	(2.990)	(2.692)	(0.472)
Ad price II	-2.672***	-23.325***	-5.881**	-1.929***
	(0.544)	(2.234)	(2.011)	(0.353)
Ad price III	1.844**	14.006***	12.750***	0.788
	(0.633)	(2.597)	(2.338)	(0.410)
Rent X Democrat	0.324***	0.214	0.617**	0.477***
	(0.057)	(0.235)	(0.212)	(0.037)
Democrat X Ad price I	-0.008	-1.791***	-0.047	-0.022
	(0.083)	(0.341)	(0.307)	(0.054)
Democrat X Ad price II	0.101	0.143	-0.286	0.039
	(0.074)	(0.304)	(0.274)	(0.048)
Democrat X Ad price III	-0.087	1.167***	0.697*	0.002
	(0.074)	(0.304)	(0.274)	(0.048)
Rent X Ad price I	-0.098	-0.911*	0.861*	-0.135
	(0.107)	(0.438)	(0.394)	(0.069)
Rent X Ad price II	0.411***	3.182***	1.026***	0.276***
	(0.079)	(0.324)	(0.291)	(0.051)
Rent X Ad price III	-0.264**	-2.301***	-1.924***	-0.128*
	(0.093)	(0.381)	(0.343)	(0.060)
Control variables	Yes	Yes	Yes	Yes
R^2	0.28	0.62	0.70	0.67
Partial F	26.15	36.88	11.58	22.35
Partial R^2	0.01	0.02	0.01	0.01

Note: Control variables include all the exogenous variables as reported in Table 5.

Table 7: Elasticity Estimates for Ground Campaigning and Advertising

		1% increase from	
	Focal party	Republican	Democrat
Candidate own ads	Republican	0.059	-0.033
	Democrat	-0.051	0.081
PAC ads	Republican	0.032	-0.011
	Democrat	-0.020	0.045
		One additional office from	
	Focal party	Republican	Democrat
Field operations	Republican	1.143	-1.889
	Democrat	-0.529	3.305

Note: The elasticities are computed based on estimates from our full model. The diagonal estimates are the own elasticities and the off-diagonal elements are the cross elasticities.

Table 8: Predicted Total Electoral Votes for Counterfactual Analyses

|	2004		2008		2012	
	Democratic	Republican	Democratic	Republican	Democratic	Republican
actual	252	**286**	**365**	173	**332**	206
zero field operations	193	**345**	168	**370**	99	**439**
zero candidate own ads	243	**295**	**353**	185	**296**	242
zero PAC ads	249	**289**	**351**	187	**430**	108
PAC ads rolled over to						
candidate own ads	210	**328**	245	**293**	120	**418**

Note: For zero field operations, we assigned zero field office to each party candidate without changing other campaigning activities. Similar steps were taken for the other counterfactual conditions except for the last one, where we assumed that PAC GRPs became the candidate's. The reported numbers are the total final electoral votes won by each party candidate. The predicted winner of each election is in bold. For Alaska we used the actual results for each election.

Table 9: Predicted Optional Field Offices

|	2008			2012		
State	Existing	Optimal	State	Existing	Optimal	
Colorado (9)	11	15	Colorado (9)	14	17	
Florida* (27)	0	2	Florida* (29)	48	49	
Indiana* (11)	0	1	Michigan (16)	23	26	
Iowa (7)	16	20	Minnesota (10)	0	2	
Michigan (17)	14	19	Nevada* (6)	12	13	
Minnesota (10)	13	16	New Hampshire (4)	9	10	
Nevada* (5)	12	13	Ohio* (18)	38	40	
New Hampshire (4)	4	6	Oregon (7)	0	4	
New Jersey (15)	1	9	Pennsylvania (20)	24	27	
New Mexico (5)	10	13	Virginia* (13)	28	30	
North Carolina* (15)	18	19	Wisconsin (10)	24	27	
Ohio* (20)	9	12				
Oregon (7)	0	5				
Pennsylvania* (21)	17	23				
Virginia (13)	18	21				
Wisconsin (10)	9	14				

Note: We report the optimal field operations that could have helped the Republicans win each battleground state. States with an asterisk make up the optimal state combination that requires the fewest field offices to win 270 electoral votes. We list the electoral votes in parentheses.

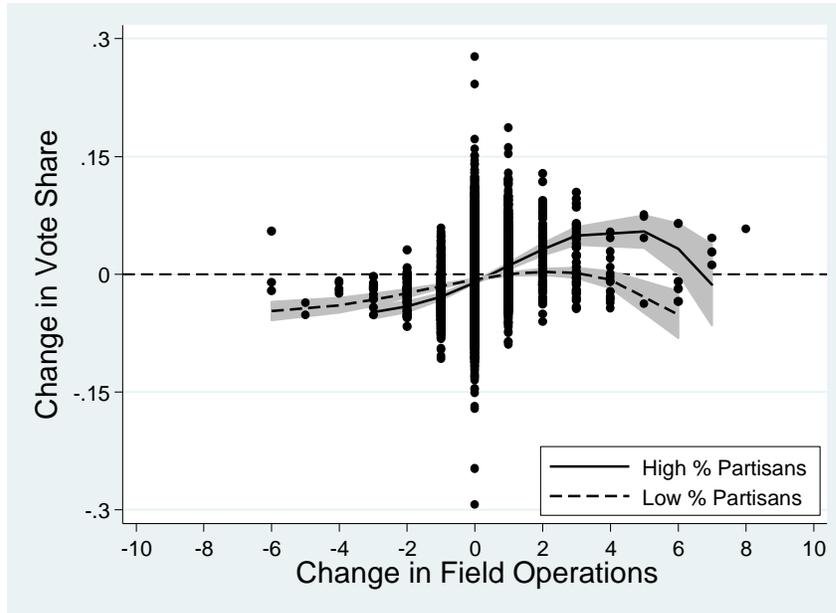## Figure 1: Vote Shares versus Ground Campaigning
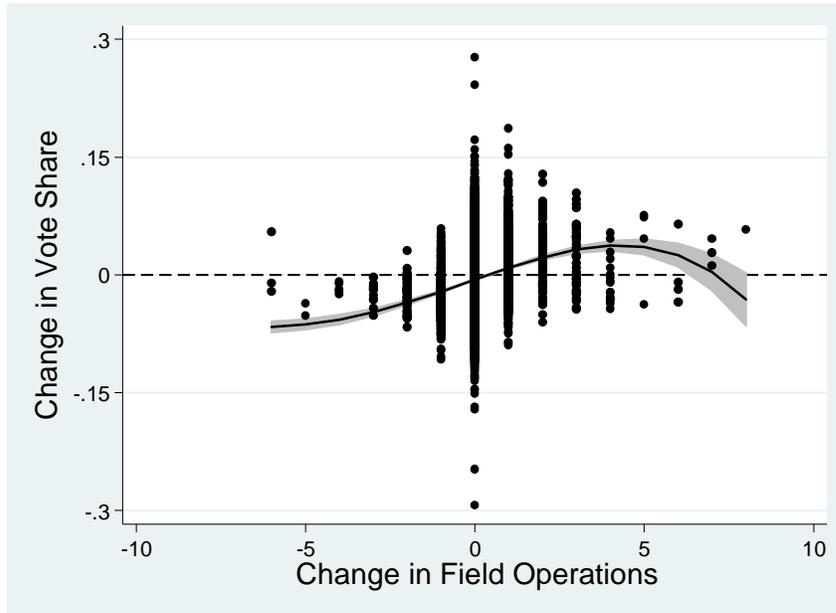
Note: Each dot corresponds to a county-party combination. The line is the best-fitting non-parametric polynomial curve with its 95% confidence interval.

Figure 2: Vote Shares versus Television Advertising
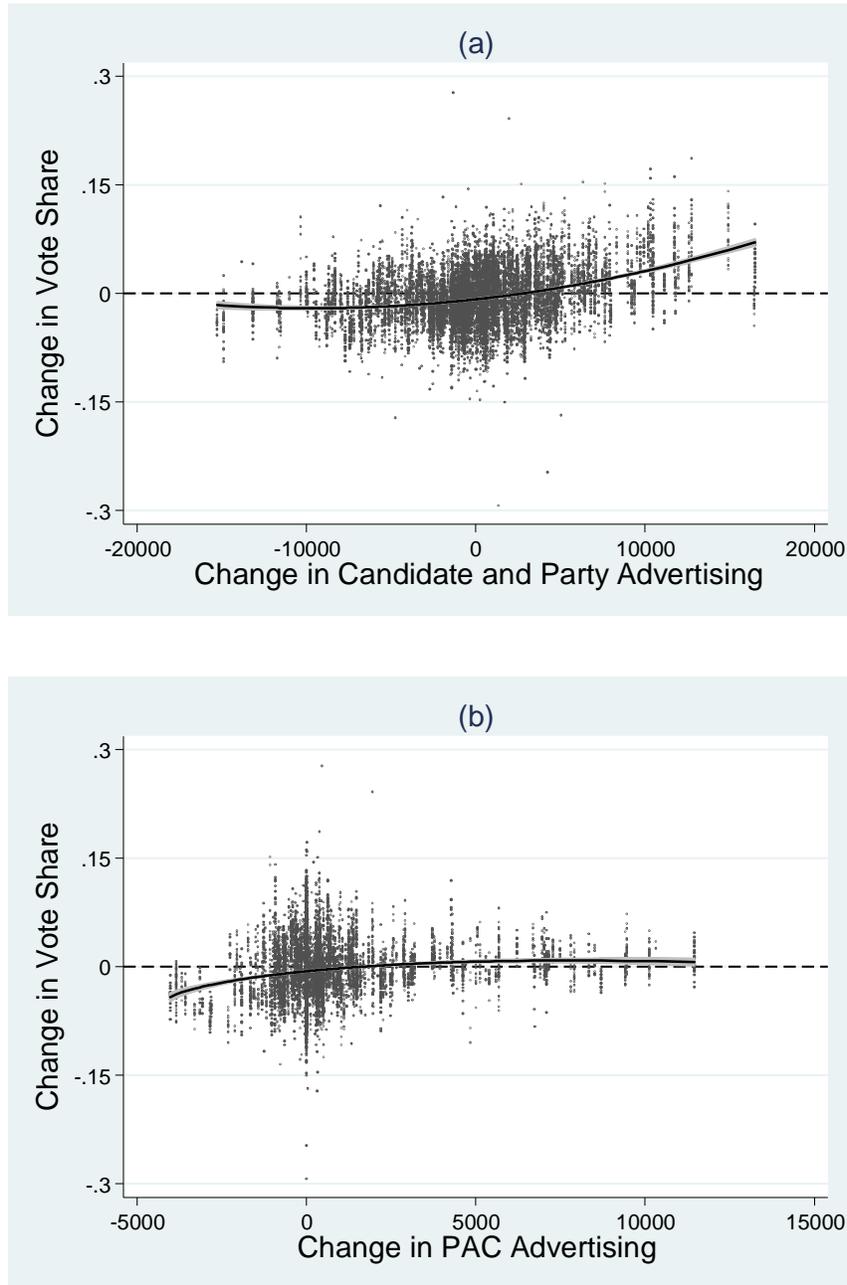
(a)

(b)

Note: Each dot corresponds to a county-party combination. The line is the best-fitting non-parametric polynomial curve with its 95% confidence interval.

Figure 3: Effect of Ground Campaigning for Low-Partisan and High-Partisan Counties

Note: Each dot corresponds to a county-party combination. The line is the best-fitting non-parametric polynomial curve with its 95% confidence interval.

Appendix: Distribution of air time for candidate own and PAC ads

Graphs by year
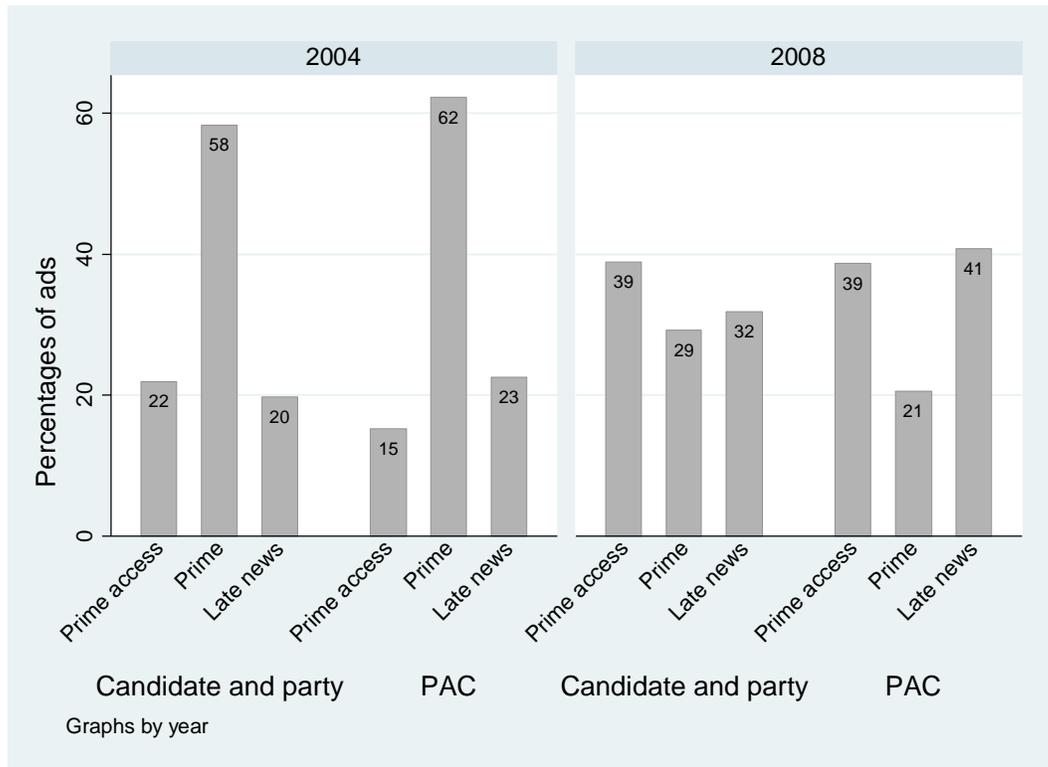
Note: We turned to the University of Wisconsin Advertising Project for the air timing variable from the 2004 and 2008 presidential elections. The percentages of ads by day parts and sponsors are depicted in the above bar charts. Overall, we found that PAC ads appeared more frequently in the late news day part than the ads sponsored by candidates and party committees (i.e., 23% versus 20% in 2004 and 41% versus 32% in 2008; the differences were significant, chi-square tests, $p < 0.001$). Unfortunately, the air timing data are not available for the 2012 election.