

**The Effect of Convenience Voting on Election Outcomes:
Implications for Public Policy and the Study of Momentum in Campaigns**

Marc Meredith and Neil Malhotra*

* Assistant Professor, Department of Political Science, University of Pennsylvania, email: marcmere@sas.upenn.edu and Assistant Professor, Graduate School of Business, Stanford University, email: neilm@stanford.edu.

Abstract

Voting-by-mail (VBM) provides voters the opportunity to cast ballots without being exposed to the information revealed in the final weeks leading up to Election Day. We assess whether the resulting informational differences between VBM and polling place voters affect electoral outcomes. We overcome the identification problem caused by the self-selection of voters into VBM by exploiting an election administration policy in California in which some precincts are assigned to be VBM-only based on an arbitrary threshold of the number of registered voters. Analyzing the 2008 California presidential primary, we show that VBM both increases the probability of selecting withdrawn candidates and affects the relative performance of candidates remaining in the race. Our findings have implications both for public policy and for the study of campaign effects and momentum in American elections.

On the evening of September 30, 2004, George W. Bush and John Kerry met for the first of their three presidential debates. A *Newsweek* poll of registered voters watching the debate found that Kerry resoundingly won; 61% said he did a better job compared to only 17% who selected Bush. Prior to the debate, Bush was leading Kerry 54%-43% in the poll; after the debate, Kerry had taken a 47%-45% lead, a substantial eleven-point swing (CNN 2004). However, Kerry's debate victory could not help him win the votes of some individuals living in battleground states like Iowa and Ohio who cast their ballots via convenience voting *prior* to the debate.¹ Bush's narrow victories in these two states helped propel him to a second term.

Those individuals in Iowa and Ohio voting prior to the first 2004 presidential debate are part of a growing segment of the United States electorate using convenience voting.² Convenience voting is defined as any form of voting other than traditional polling place voting, of which vote-by-mail (VBM) and early in-person voting are the most common.³ Thirty-four states allow voters to cast no-excuse VBM or early in-person ballots, and the remainder allow VBM if voters have certain excuses for why they cannot vote in-person.⁴ In a number of these states convenience voters make up an increasingly substantial portion of the electorate; in California, for example, the percent of mail voters in the presidential primary increased from less than ten percent in 1988 to 23.4, 34.3, and 41.7 percent in 2000, 2004, and 2008, respectively.⁵

There is significant heterogeneity across states in when VBM ballots are distributed; in Georgia ballots are distributed 45 days prior to Election Day compared to 15 days prior in Alaska.⁶ Distributing VBM ballots weeks before Election Day gives citizens flexibility in

¹ Early and absentee voting in Iowa began on September 23, 2004, and in Ohio on September 28, 2004.

² A survey of the literature on convenience voting is provided by Gronke et al. (2008).

³ Some past work has referred to mandatory mail balloting as vote-by-mail (VBM) and individuals selecting a mail ballot as absentee voting. In this paper we use the term vote-by-mail to refer jointly to both forms of mail ballots.

⁴ Retrieved from www.earlyvoting.net/states/abs_laws.php on 9/23/2008.

⁵ Retrieved from www.sos.ca.gov/elections/hist_absentee.htm on 9/23/2008.

⁶ Georgia Code 21.2.384 and Alaska Code Sec. 15.20.040 and Sec. 15.20.045 respectively

deciding when to vote. However, it also gives people the opportunity to make choices in the absence of a significant amount of campaign information, creating the possibility for what we call “information loss.” We use the term information loss broadly to refer to any vote changing information that is revealed between when VBM voters cast ballots and Election Day. Put another way, information loss occurs when voters are marginal with respect to some information, but cast their ballot prior to its revelation.⁷ This information could come in many forms: candidate withdrawals, election results in other states, debate performances, campaign advertisements, endorsements from newspapers and public figures, polls, and election coverage by the mass media.

In this paper we explore the effect of VBM on information loss in the 2008 California presidential primary, which took place on “Super Tuesday” (February 5th). We do this by examining how mail balloting affects two quantities: (1) the vote shares of candidates who withdrew from the race prior to Election Day; and (2) the relative vote shares of candidates who remained in the race. First, three major candidates—John Edwards, Rudy Giuliani, and Fred Thompson—abandoned their bids for their parties’ nomination in the interval between the distribution of VBM ballots and Election Day. Candidate withdrawals provide a straightforward test of the effect of VBM on information loss because withdrawals have an unambiguously negative effect on the likelihood of voting for candidate. Moreover, because withdrawals are easily identified temporally, estimates of the effect of VBM on support for withdrawn candidates inform us of the potential information loss from more traditionally studied aspects of the campaign, such as debates or advertising, that occur in the final weeks prior to Election Day. We expect that information loss will cause withdrawn candidates to perform significantly better

⁷ Note that this does not necessarily equate voting weeks before Election Day with information loss, because many voters will almost certainly vote for a given candidate no matter what additional information is revealed in the final weeks of the campaign.

on VBM than on polling place ballots. Second, the relative standing of candidates remaining in the race changed substantially from when VBM ballots were distributed and Election Day.

Barack Obama's standing relative to Hillary Clinton improved after his larger-than-expected victory in the South Carolina primary. In contrast, Mike Huckabee went from being the recent victor of the Iowa caucus to having almost no chance of winning the Republican nomination.

Given the presumed importance of momentum in presidential primaries, we expect that information loss will cause Huckabee and Clinton to perform relatively better among VBM voters than polling place voters.

Estimating the causal effect of VBM on candidate choice is complicated by a selection problem. Because convenience voters differ both observably and non-observably from polling place voters, we cannot causally ascribe raw differences in candidate preferences to the voting method.⁸ In this study, we address this identification problem by taking advantage of an election administration policy in California, previously identified by Kousser and Mullin (2007), which produces exogenous differences across precincts in the number of VBM voters.⁹ Briefly, the California Election Code permits county elections officials to declare precincts with 250 or fewer registered voters as mail-only precincts. Further, because California often has several overlapping districts—and consequently a plethora of ballot forms—these small precincts are often in dense urban areas, along with more rural portions of the state. Our analysis leverages this discontinuity by testing how differences in the use of VBM in precincts with slightly more than 250 voters versus precincts with slightly less than 250 voters translate into differences in candidate performance. Because this specific cutoff is arbitrary (it could have easily been

⁸ Previous research has generally shown that precinct day voters are younger, less educated, and less partisan (Patterson and Caldeira 1985; Dubin and Kalsow 1996; Stein 1998; Baretto et al. 2006; Stein et al. 2004, though see Neeley and Richardson 2001 for an alternate account).

⁹ Kousser and Mullin (2007) study of the effects of mandated VBM on turnout.

selected to be 200 or 300, for example), restricting our analysis to precincts in the narrow region of the caliper around the discontinuity mitigates omitted variables bias.

This research design produces two main results. First, we show that VBM both statistically and substantively increases the vote shares of withdrawn candidates. On the Democratic side, John Edwards received about four percentage points more of the vote on VBM ballots. This finding suggests that about 40 percent of marginal supporters of Edwards did not incorporate information about his withdrawal—which occurred six days prior to Election Day—on VBM ballots.¹⁰ On the Republican side, Rudy Giuliani and Fred Thompson also received a significantly larger vote share on VBM ballots, even though in Thompson’s case he withdrew sixteen days prior to the election.

Second, we show that VBM affects the relative performance of candidates that remain in the race. Consistent with trends in prediction market and polling data as well as theories of momentum in sequential elections, Clinton and Huckabee performed relatively better among VBM voters. Our point estimates indicate that the difference between Clinton and Obama’s vote shares was about ten percentage points larger on VBM ballots relative to polling place ballots. Given that roughly 40 percent of ballots were cast by mail in this race, this suggests that the presence of mail balloting increased the final difference between Clinton and Obama’s vote shares by four percentage points. Our point estimates also indicate that Mike Huckabee outperformed John McCain and Mitt Romney by about five percentage points on VBM ballots relative to polling place ballots.

Our findings have a number of implications for the study of elections. From a public policy perspective, they reveal that significant information loss occurs even for information

¹⁰ Marginal in this case refers to voters who would vote for Edwards if he remained in the race, but not if he withdrew from the race.

revealed more than two weeks prior to Election Day. Our results also suggest that voters may underestimate the likelihood that changes in momentum will shift their candidate preferences in the interval between the distribution of ballots and Election Day. Moreover, our results provide support—using actual vote choice data—for theoretical models and empirical explorations of sequential primaries that highlight the importance of past contests on future election results (e.g. Abramson et al. 1992; Aldrich 1980; Ali and Kartik 2008; Callander 2007; Klumpp and Polborn 2006), and the central role of “momentum” in determining election outcomes (e.g. Bartels 1988; Kenney and Rice 1994; Knight and Schiff 2007).¹¹ Finally, our findings highlight a new method that can be broadly applied to study campaign effects.

The paper proceeds as follows. The first section details the 2008 California presidential primary. The following sections present our principal hypotheses, describe the discontinuity produced by Section 3003 of the California Election Code, and discuss the econometric methods to test them. The final two sections present the results and discuss their implications.

I. The 2008 California Presidential Primary

California was one of the twenty-four states holding at least one primary or caucus on February 5, 2008. On the Democratic side, eight candidates appeared on the ballot: Mike Gravel, John Edwards, Joe Biden, Barack Obama, Chris Dodd, Hillary Clinton, Bill Richardson, and Dennis Kucinich, although only Obama, Clinton, and Gravel remained in the race. Clinton edged Obama 51.5 to 43.2 percent, netting her approximately 55 percent of the state’s Democratic convention delegates. On the Republican side, eleven candidates appeared on the ballot: Mike Huckabee, Duncan Hunter, Tom Tancredo, Fred Thompson, Rudy Giuliani, Sam Brownback, John Cox, John McCain, Mitt Romney, Ron Paul, and Alan Keyes, although only Huckabee, McCain, Romney, Paul, and Keyes remained in the race. McCain won the

¹¹ A survey of the literature on momentum in primary elections is provided by Norrander (1996).

Republican race with 42.3 percent of the vote and nearly all of the available Republican convention delegates, with Romney and Huckabee finishing second and third with 34.6 and 11.7 percent of the vote, respectively.

Figure 1 provides a timeline of the important events leading up to the California primary. On November 6, 2007, 88 days before Election Day, the total number of voters registered in a precinct determined the precinct's eligibility for mail-ballot only status. The first votes in both the Democratic and Republican presidential nominating contests were cast in the Iowa caucuses on January 3, 2008. Four days later, one day before the New Hampshire primary, California counties began distributing VBM ballots to both registered voters choosing to vote-by-mail and to all registered voters in mail-ballot only precincts. These VBM ballots required receipt by county officials by 8:00 P.M. PST on Election Day to be counted and could be returned either via mail or dropped off at any polling place in the county.

Figure 1 shows that a number of candidates withdrew from the race after the distribution of VBM ballots, but prior to Election Day. Fred Thompson withdrew from the Republican race on January 20, 2008, sixteen days prior to the California primary, after finishing third with about 16 percent of the vote in the South Carolina primary. Rudy Giuliani followed suit on January 30, 2008 after finishing third in the Florida primary with about 15 percent of the vote. John Edwards dropped out of the Democratic race on the same day after finishing third with eighteen and fourteen percent of the vote in South Carolina and Florida, respectively. These candidates had built high expectations in these primaries among the media, donors, and voters, and their poor performances led them to exit the nominating contest.

Figure 2 shows that the relative positions of candidates remaining in the race also changed considerably after the distribution of VBM ballots, but prior to Election Day. The top

panel of the figure shows how the prices of contracts from Intrade paying \$1 if Hillary Clinton and Barack Obama won the Democratic nomination varied over this time period. The Clinton contract appreciated following her 51%-45% victory in the Nevada caucuses, but returned to close to its previous level following her larger than expected 55%-27% loss to Obama in the South Carolina primary. The bottom panel shows how the prices of similar contracts paying \$1 if John McCain, Mitt Romney, and Mike Huckabee won the Republican nomination varied over the same time period. McCain's victories in the South Carolina and Florida primaries substantially increased the value of his contract, while Romney's victories in the Michigan primary and the Nevada caucuses left him as the only other candidate with a non-trivial chance of winning the Republican nomination. Huckabee's contract dropped from about \$0.17 when VBM ballots were distributed to less than \$0.01 on Election Day after he failed to win any primary or caucus in this time span after his initial victory in Iowa.

We find similar patterns when examining public opinion polling data. The top panel of Figure 3 illustrates the difference in the percentage of Californians expressing support for Obama and Clinton over time, as measured by polls conducted in the state in the month prior to Election Day. The upward sloping black trend line indicates that the percentage of voters supporting Obama relative to Clinton increased between the distribution of VBM ballots and Election Day. The trend lines in the middle and bottom panels of Figure 3 show that Huckabee lost support relative to McCain and Romney, and that Romney gained support relative to McCain over this same time period.

II. Hypotheses

We expect that voters using VBM will cast ballots earlier than is optimal for full information aggregation. In other words, VBM voters may not incorporate vote-relevant

information from sources such as other elections, debates, or campaign advertising because they voted prior to the revelation of this information. There are a number of reasons to expect this phenomenon. A well-established literature in behavioral economics shows that people tend to be overconfident in decision making (e.g. Svenson 1981; Camerer and Lovallo 1999) and that overconfidence can affect behavior and judgment (e.g. Barber and Odean 2001; Daniel et al. 1998). As a result, voters may underestimate the likelihood that they will want to switch their votes prior to Election Day. Moreover, traditional economic theories of expected utility posit that some people are risk-averse (Samuelson 1963), and consequently may meet deadlines early to absolutely ensure that their ballot reaches on time.¹² For instance, people tend to pay off credit card bills far before the deadline even though the payment can accrue interest for the consumer before it is due. Finally, to the extent voting provides consumptive rather than investment benefits, individuals may choose to consume the act of voting as soon as possible and be excited to express their viewpoints (Fiorina 1976).

These effects may be particularly likely to occur in primary elections, where late-breaking information is more likely to affect vote choice. Unlike general elections, voters often cannot rely on longstanding attachments and information that is known well before ballots are mailed out. For instance, while partisanship (Campbell et al. 1960) and issue positions (Carmines and Stimson 1980) strongly affect vote choices in general elections, in primaries party labels are constant and candidates often take similar stances on public policy questions. Moreover, contested primaries often do not feature incumbents, meaning that citizens cannot retrospectively evaluate government performance (Fiorina 1981). Analyzing a longitudinal panel survey conducted during the 2008 nominating contests, Henderson and Hillygus (2009) find that a

¹² Although risk-aversion could also work in the opposite fashion if voters are risk-averse about choosing the correct candidate.

majority of voters did not solidify their vote intentions until the week before the election. We would also expect weaker effects of VBM in general elections since strong partisans are more likely than Independents to vote early (Stein et al. 2004), and these voters tend to more resistant to campaign effects (Fournier et al. 2004).

Figure 4 presents the date of receipt of VBM ballots in Inyo County and Plumas County for the 2008 California presidential primary.¹³ The picture suggests the possibility of significant information loss; in both counties over half of the VBM ballots were returned more than seven days prior to Election Day. However, the early return of VBM ballots is only a necessary, and not sufficient, condition for the existence of information loss.¹⁴ Many voters' candidate choices are not marginal with respect to almost any information that may be revealed in the final weeks of the campaign. For example, some voters prefer voting for withdrawn candidates as a protest or expressive vote. Indeed, Edwards and Huckabee received more than seven and ten percent of the vote in the West Virginia primary on May 13, 2008, respectively, months after each withdrew from the race. If most ballots returned early are from non-marginal voters, then little information loss will occur even though a substantial percentage of ballots are returned early. Therefore, additional evidence is needed to show that the pattern in Figure 4 is associated with substantial information loss.

We first investigate whether VBM affects the vote share of the major candidates that withdrew from the race in the interval between the distribution of ballots and the primary. We expect that a significant number of Edwards, Giuliani, and Thompson supporters voted for these

¹³ Unfortunately, similar data for the 2008 California presidential primary is not available for most other counties. Similar data are available for elections in other states at <http://www.earlyvoting.net/blog/>.

¹⁴ An elections official in Colusa County illustrated this point in an interview. She observed that the return of ballots tended to be bi-modal, with one peak occurring immediately after the distribution of ballots, and the other peak just before the election. Her belief from conversations with voters was that ballots cast immediately after the distribution of ballots were from voters with more certain candidate preferences than ballots cast just prior to the election.

candidates on VBM ballots, although they would have voted for other candidates on Election Day having known that they had dropped out. We therefore predict that VBM voters will be more likely than polling place voters to support one of these three withdrawn candidates.

We also investigate the effect of VBM on the relative performance of candidates remaining in the race. We expect that momentum changes in the time period between the distribution of ballots and Election Day illustrated in Figures 2 and 3 will cause a significant number of former Huckabee supporters to switch to supporting McCain or Romney on Election Day.¹⁵ We therefore predict that VBM voters will be more likely to support Huckabee relative to McCain or Romney than polling place voters.¹⁶ Similarly, we also expect that the increased support for Obama leading up to Election Day illustrated in Figure 3 will cause VBM voters to be less likely to support Obama relative to Clinton.

III. Description of the Data Generating Process

Data

Our analysis uses precinct-level election returns from the 2008 February Presidential Primary for 40 of the 58 counties in California.¹⁷ We supplement our precinct-level vote totals with demographic data constructed by aggregating individual voting records from the California Statewide Voter File and census block demographic data to the consolidated precinct-level (e.g. precincts from which mail-only status is assigned and election results are reported). Using correspondences obtained from either the Berkeley Statewide Voter Database or directly from the counties, we map individuals' voter file records to the consolidated precincts to construct

¹⁵ This may occur both because of strategic voting considerations (Abramson et al. 1992) and changes in perceptions of the relative quality of Huckabee, McCain, and Romney (Mutz 1999).

¹⁶ The predicted effect of VBM on support for Romney relative to McCain is ambiguous given the increased momentum for McCain shown in Figure 2 and the polling trend favoring Romney shown in Figure 3.

¹⁷ We were unable to obtain a breakdown of the percentage of VBM and polling place ballots at the precinct-level in Orange, San Mateo, and Tuolumne counties, so we impute the county average for all traditional polling places.

precinct-level measures of age, gender, length of registration, and partisan identification. Using additional correspondences obtained from the Berkeley Statewide Voter Database, we aggregate census block data to the consolidated precincts to construct measures of the percent rural and percent white, black, Asian, and Hispanic.¹⁸ We drop precincts for which we are unable to match any registrants from the voter file or populated census blocks from our analysis, leaving us with a final sample of 16,859 precincts, of which 2,507 are mail-only and 14,352 are traditional polling places.

Identification Strategy

The difficulty with studying the effects of VBM on election outcomes is that it is difficult to construct comparable groups of individuals using VBM and polling place voting. In most states individuals choose to use VBM or vote at the polling place. Therefore, a comparison of VBM and polling place outcomes is likely to confound the effects of VBM with selection bias. Conversely, if VBM is mandatory, comparison are made by looking within states across time (e.g., comparing Oregon before and after mandatory VBM) or within time across state (e.g. comparing Oregon and Washington). Differences in the political environment and the characteristics of the electorate between t and $t+1$ or across states are potential confounds of such analyses.

Our analysis takes advantage of an election administration policy in California that results in a small subset of the state being forced to VBM, while the remainder of the state is allowed to choose between VBM and polling place voting. Section 3003 of the California Election Code specifies that a precinct can be categorized as a mail-only precinct if 88 days prior

¹⁸ Because precinct boundaries are independent of census block boundaries, some census blocks are contained in multiple precincts. In such cases we allocate demographics to precincts as a percentage of the census block population contained in each precinct.

to an election there are fewer than 250 registrants.¹⁹ A precinct is a geographic grouping of registered voters that consists of no more than 1000 voters that use the same ballot form.²⁰ In VBM-only precincts everyone uses VBM, instead of the mix of VBM and traditional polling place voting in a normal precinct.²¹

In practice the determination of mail-only precincts is slightly more complicated than suggested by Section 3003. We observe a substantial number of mail-only precincts with more than 250 registrants on Election Day. In order to determine the source of these discrepancies, we interviewed election officials from most of the counties in our dataset. The election officials provided us with a number of reasons why we would observe mail-only precincts with more than 250 registrants. First, the statement of the vote reports the number of registrants on Election Day, while mail-only status was determined based on the number of registrants on approximately November 6, 2007. Second, a number of counties (Butte, El Dorado, Merced, Napa, Riverside, Santa Clara) told us that they did not count permanent absentee voters in determining whether a precinct was eligible to be mail-only.²² The logic here is that including permanent VBM voters would be “double counting” because they are not expected to visit the polling place on Election Day. Other counties told us that results were reported at a different level of aggregation than what is used to determine mail-only status.²³ Finally, multiple county elections officials cited the

¹⁹ Section 3003 also states that precincts are not allowed to be divided in order to conform to the 250 registrant requirement.

²⁰ Because of new registrants entering existing precincts after boundaries are drawn, there are more than 1000 registrants in some precincts.

²¹ Voters in VBM-only precincts have the option of dropping their state-issued VBM ballot at a traditional polling place on Election Day. However, given that these polling places are located further from VBM-only voters’ normal polling locations, the additional costs of locating and travelling to the nearest polling place to engage in in-person voting likely encourages many voters in VBM-only precincts to mail their ballots prior to Election Day (see Brady and McNulty 2004).

²² Riverside also said that it used 350 registrants rather than 250 registrants as its threshold.

²³ We drop all counties that excluded absentee voters or reported results at a different level of aggregation than what was used to determine mail-only status. The one exception is Santa Clara county, which provided us with a copy of exact counts of excluded absentee voters by precinct. Table A1 in the Appendix (see end of manuscript) lists reasons we drop each excluded county.

non-availability of a suitable polling place location as a reason for making a precinct with more than 250-registrants mail-only. For example, a county official told us that a precinct with more than 250 registrants was mail-only because a highway divided a precinct into two parts. Multiple counties made military bases VBM regardless of the registration due to security concerns.

The presence of both mandatory and non-mandatory VBM precincts allows us to compare the outcomes in mail-only precincts and traditional precincts in the same state at the same time. Such comparisons overcome a number of the identification concerns discussed above. Individuals who would otherwise choose to vote at traditional polling places are forced to VBM in mail-only precincts, creating differences in the level of VBM voting that is not generated by selection. Moreover, we compare voters facing the same political environment. However, because precincts with a small number of registrants are not randomly selected from the universe of precincts, we are still concerned that the underlying characteristics of the electorate are different in mail-only and traditional precincts. In the next section we develop two estimation techniques to account for the differences in the types of voters in mail-only and traditional precincts.

IV. Description of Methods

We use two different types of instrumental variables (IV) regression specifications to account for differences in the types of voters in VBM-only and traditional precincts. Our first methodological approach uses the full set of precincts but preprocesses the data using Mahalanobis distance matching (Ho et al. 2007). Our second approach employs a fixed effects (FE) specification that is based upon a regression discontinuity design (RDD).

Matching

Similar to Kousser and Mullin (2007), we perform within-county Mahalanobis distance

matching to generate a control group of traditional polling place precincts (hereafter, “traditional”) with nearly identical voter file and census blocks characteristics as mail-only precincts (hereafter, “VBM-only”). The primary advantage of this technique is that we control for differences in the observable characteristics without imposing strict functional form assumptions.

We observe significant differences between VBM-only and traditional precincts on almost every observable characteristic prior to matching. Define $c(j)$ as a function that returns the county index of precinct. Let Y_j be an observable characteristic of voters in precinct j , $\lambda_{c(j)}$ be a county specific fixed effect, and $Mail_j$ be an indicator for whether precinct j is VBM-only. The second column of Table 1 reports the estimates of β obtained by estimating equation (1):

$$Y_j = \lambda_{c(j)} + \beta Mail_j + \varepsilon_j \quad (1),$$

across a number of observable voter characteristics when observations are weighted by the square root of the number of 2008 primary votes in the precinct. Table 1 indicates that VBM-only precincts are about 30 percentage points more rural than traditional precincts. It also shows that VBM-only precincts contain fewer minorities and older and more conservative registrants.

We substantially improve the balance on the observable voter characteristics of VBM-only and traditional precincts by performing one-to-one Mahalanobis distance matching; however, we continue to find some significant differences. Column (2) of Table 1 reports estimates of equation (1) on the matched sample when VBM-only observations are weighted by the square root of the number of votes in the precinct in 2008 and traditional observations are weighted by the square root of the number of votes in their matched counterpart. Because we match with replacement, we cluster standard errors by precinct. We find substantially small and statistically insignificant differences on most of the matched variables. However, we still find

VBM-only precincts are five percentage points more rural. Differences in the percentage of registrants between the ages of 30 and 44 and the percentage of voters who registered after November 6, 2007 (“late registrants”) are also statistically significant at the 95 percent-level.

We obtain balance on all observable voter characteristics when we apply a caliper restriction to the matches. Our caliper restriction drops any match where any of the eighteen observable characteristics of the VBM-only precinct and the matched traditional precinct differ by more than one standard deviation. Column (3) of Table 1 shows that on none of the observable variables do we observe a significant difference at the $p < .10$ level between VBM-only and traditional precincts. The similarity of all eighteen voter characteristics variables bolsters our claim that differences in the voting outcomes observed between VBM-only and traditional precincts in the caliper-matched sample in the next section are not caused by differences in the types of voters, but rather by the voting method *per se*.

Fixed Effects

While matching assures balance on the observables, matching may not produce unbiased estimates if all factors that jointly affect treatment status and outcomes are not matched upon (Arceneaux et al. 2006).²⁴ Thus we also develop a fixed effects (FE) technique to account for differences in the types of voters in VBM-only and traditional precincts that is motivated by a regression discontinuity design (RDD).

A standard RDD is potentially feasible when a treatment, like VBM-only status, is assigned by a discontinuous function of a continuous forcing variable, such as the number of registrants. The first stage of a RDD compares the difference in the assigned treatment when the forcing variable is just above relative to just below the discontinuous threshold (e.g., the

²⁴ For example, Butte, El Dorado, Napa, and Riverside are included in Kousser and Mullin’s (2007) sample, but the percent of permanent absentee voters is not one of the matched variables.

difference in the percentage of ballots cast by mail in precincts with slightly less than 250 registrants relative to precincts with slightly more than 250 registrants). The second stage of a RDD compares the difference in outcomes when the forcing variable is just above relative to just below the discontinuous threshold. In its ideal application, we can attribute any difference in the outcomes to difference in treatment because places just above and below the threshold are otherwise similar.

Data limitations prevent us from performing a standard RDD analysis. Let $Forcing_Registered_j$ be the number of registrants in a precinct on the day on which VBM-only status is determined. A standard RDD analysis compares the limit of the treatment and outcome functions as $Forcing_Registered_j$ approaches 250 from below with the limit of the treatment and outcome functions as $Forcing_Registered_j$ approaches 250 from above (Hahn, Todd, and Van der Klaauw 2001). Unfortunately, we do not observe $Forcing_Registered_j$ directly, but instead approximate it with $Forcing_j = Election_Registered_j - Late_Registered_j$, which is the number of registrants on Election Day minus the number of registrants observed in the voter file registering between November 17, 2007, and January 21, 2008. As Figure 5 illustrates, there is a change in the percentage of VBM-only precincts as $Forcing_j$ crosses the 250-registrant threshold (hereafter, “250-threshold”). However, Figure 5 also shows that measurement error generated by approximating $Forcing_Registered_j$ with $Forcing_j$ causes misclassification near the discontinuity. This misclassification at the discontinuity prevents us from being able to use traditional a RDD analysis.²⁵

Because we cannot perform a standard RDD analysis, we develop a FE specification that utilizes the variation generated by the discontinuous assignment of the treatment. The

²⁵ For example, suppose that a treatment is assigned if $Forcing_Registered_j$ is greater than C and $Forcing_j = Forcing_Registered_j + \varepsilon_j$, where ε_j is distributed from a mean zero symmetric distribution. The limit on the probability of receiving the treatment as $Forcing_j$ approaches C from both above and below will be .5.

motivation taken from RDD is that we would like to compare precincts with values of $Forcing_j$ just below 250 to precincts with values of $Forcing_j$ just above 250. Define b as the bandwidth parameter from which we set bounds on the values of $Forcing_j$ used in this comparison (e.g. compare precincts with values of $251 - b$ and 250 to precincts with values of $Forcing_j$ between 251 and $250 + b$). Unfortunately, Table A2 in the Appendix shows that even when b is relatively small, voter characteristics are substantially different in places with values of $Forcing_j$ just above and below the 250-threshold. To account for these differences in voter characteristics, we develop a FE specification that compares precincts with values of $Forcing_j$ near the 250-threshold to geographically proximate precincts well above the 250-threshold. The idea is that we can use the geographically proximate precincts well above the 250-threshold to approximate the counterfactual difference in outcomes in precincts just above and below the 250-threshold if there was no difference in mail balloting.

We find few observable differences in the characteristics of voters in precincts just above and just below the 250-threshold in our FE specification. Define $t(j)$ to be a function that returns the index of the primary census tract of precinct j (e.g. the census tract which contains a plurality of the population living in precinct j). Let Y_j be an observable characteristic of voters in precinct j , $\lambda_{t(j)}$ be a census tract fixed effect, $\lambda_{c(j)}I(251-b \leq Forcing_j \leq 250+b)$ be a county-specific indicator for having a value of $Forcing_j$ near the 250-threshold, and $I(Forcing_j \leq 250)$ be an indicator for the value of forcing being below the threshold. Table 2 reports the estimates of β obtained by estimating equation (2):

$$Y_j = \lambda_{t(j)} + \lambda_{c(j)}I(251-b \leq Forcing_j \leq 250+b) + \beta I(251-b \leq Forcing_j \leq 250) + \varepsilon_j \quad (2),^{26}$$

using $b = \{50, 75, 100\}$ across a wide number of voter characteristics when observations are

²⁶ Equation (2) is similar to a difference-in-difference specification. Let t and t' be precincts in county c . Suppose precincts $\{1, 2\}$ are in census tract t and precincts $\{3, 4\}$ are in census tract t' , and that $251-b \leq Forcing_1 \leq 250 \leq Forcing_3 \leq 250+b \leq Forcing_2, Forcing_4$. In this case, $\beta = (Y_1 - Y_2) - (Y_3 - Y_4)$.

weighted by the square root of the number of 2008 primary votes in the precinct.²⁷ On only a small number of variables do we observe significant values of β , and even in these cases the differences are generally substantively small. Figure A1 in the Appendix shows that this balance is not unique to the chosen bandwidths of b , although balance does appear to be slightly worse as b gets larger. This lack of significant differences in voter characteristics suggests that the effects of VBM identified using $I(251-b \leq Forcing_j \leq 250)$ as our instrument in the next section are not caused by differences in the types of voters (see Dunning 2008).

V. Results

Assessing Effects of VBM on Support for Withdrawn Candidates

We find that candidates who withdrew from the election in the days before Super Tuesday received greater support among VBM voters, suggesting late campaign information loss (as defined above). Table 3 presents the effects of VBM on John Edwards' vote share. As a baseline for comparison, we first estimate an OLS regression with Edwards' vote share simply regressed on the percentage of VBM ballots in the precinct, along with county fixed effects. As shown in column (1) of Table 3, the estimate of β is .081, implying that in a precinct that is wholly VBM, John Edwards received, on average, 8.1 more percentage points of the vote as compared to a precinct that entirely consists of polling place voters. In columns (2)–(4) of Table 3 we present IV estimates of the effects of mail balloting using VBM-only status as the instrument for percentage of VBM ballots for the full sample, the matched sample, and the caliper-matched sample. The first row of coefficients indicates that being a VBM-only precinct has significant first-stage explanatory power over the percentage of VBM ballots; in the caliper-matched sample VBM-only precincts cast 50.2 percentage points (s.e. = 0.6 percentage points) more ballots by

²⁷ When estimating equation (2), we restrict the sample to precincts with $251-b \leq Forcing_j$ and to census tracts that contain a precinct in at least two of these three ranges: $251-b \leq Forcing_j \leq 250$, $251 \leq Forcing_j \leq 250+b$, $251-b \leq Forcing_j$.

mail. Using this difference in mail ballots in VBM-only and traditional precincts as an instrument, we obtain a point estimate of 4.1 percentage points on the effect of VBM on Edwards vote share in the caliper-matched sample, which is highly statistically significant at conventional levels ($p < .001$, two-tailed in all cases).²⁸

We find similar results using the FE specification. Columns (5) – (7) of Table 3 report estimates using three different bandwidths, b (50, 75, and 100). Even with an extremely narrow bandwidth of 50, we find a first-stage increase of 31.7 percentage points in the percentage of mail ballots (s.e. = 2.6 percentage points) from having a value of $Forcing_j$ below the 250-threshold on the percentage of mail ballots. We obtain point estimates for the effect of VBM on Edwards vote share of between 3.7 and 4.4 percentage points, which are again highly statistically significant at conventional levels ($p < .001$, two-tailed). The top panel of Figure 6 indicates that these point estimates are not sensitive to the choice of bandwidth. Thus, we find that VBM voters were less likely to incorporate information about Edwards exit from the race into their vote choices. This indicates that the opportunity to submit votes early caused a substantial number of Democratic primary voters to essentially “waste” their votes. As mentioned above, because of our identification strategy, this difference can be causally attributed to the timing of the vote, not to unobserved characteristics of VBM voters.²⁹

Similar results were observed in the Republican primary, with Giuliani and Thompson receiving significantly greater support among VBM voters. Table 4 presents estimates of the effect of VBM on Republican candidates’ vote shares. We first analyze results obtained using

²⁸ Our findings are subject to standard caveats regarding ecological inference since we do not observe individual vote choices and the timing of these individual choices. To interpret these as individual-level parameters, we need to assume that individuals who would also VBM in traditional precincts were unaffected by being in a VBM-only precinct.

²⁹ One alternative explanation for this result is that VBM supporters of Edwards choose not to vote at the polling place. However, we find no statistically significant effect of mail on turnout if we replicate our analysis with turnout rate as the dependent variable.

matching. We find in the caliper-matched sample that moving from a precinct with no VBM ballots to all VBM ballots increases Giuliani's and Thompson's vote shares by 3.1 and 2.5 percentage points ($p < .001$, two-tailed), respectively. The FE specification point estimates tend to be slightly smaller and somewhat sensitive to the bandwidth (see Figure 6(b) and Figure 6(c)), suggesting a gain of about 2 to 3 percentage points for Giuliani and 1.5 to 2 percentage points for Thompson. These estimated effects are statistically significant at the 95% level for larger bandwidths (roughly $b > 75$).

When interpreting our results, it is important to consider the local average treatment effect (LATE) property of IV estimation. IV estimates the treatment effect for those whose treatment status is affected by the instrument, which in this case are voters who would choose to vote in a polling place if they were not forced to VBM. The IV results do not provide any insight about whether similar patterns would hold for those voters who choose to VBM. However, the cross-sectional correlations between mail voting and the vote shares of Edwards, Giuliani, and Thompson suggest that similar effects likely hold for voters selecting to VBM.

We would like to know what these results tell us more generally about voters' responses to late campaign information. To assess this, we would ideally estimate what percentage of Edwards, Giuliani, and Thompson supporters did not incorporate information about their exit when casting VBM ballots. To make this calculation, we need to know the baseline levels of support that Edwards, Giuliani, and Thompson had prior to dropping out of the race. While the precinct-level election data cannot provide these baselines directly, we can approximate what they likely were using previous election results and polling data. The California Field Poll, taken between January 13th and January 20th, found Edwards receiving about 10 percent support on the Democratic side, and Giuliani and Thompson receiving about 11 and 9 percent support on the

Republican side, respectively. These levels of support are broadly consistent with other polls and primary election results observed over this time period. If we assume that each candidate had about ten percentage points of support between when VBM ballots were mailed and his exit from the race, our estimates suggest that about 40 to 50 percent of Edwards' supporters (i.e., 4 - 5 divided by 10) and 15 to 30 percent of Giuliani's and Thompson's supporters would have voted differently if they had not been using VBM. Yet, it is important to note that a majority of these candidates' supporters—and perhaps a majority of early voters—cast their votes knowing the critical candidate field information. Although VBM may not affect most voters, it does seem to produce information loss among a sizeable portion.

To speculate about what these results tell us about VBM and campaign effects more generally, note that Thompson exited the race sixteen days before Election Day and Edwards and Giuliani exited six days before Election Day. Therefore, our results suggest that around 20 percent of VBM voters did not incorporate events that occurred two weeks before an election into their voting decision, while up to 50 percent of VBM voters did not incorporate information that was revealed in the final week of the campaign. Given that potentially relevant campaign information has come out in the last week of recent presidential campaigns, convenience voting may have important effects on general electoral outcomes. For instance, in the 2000 election, Karl Rove's internal data suggested that George W. Bush lost 4 million evangelical votes due to the news of his DUI conviction, which Bush acknowledged five days before the election (Denton 2005). Additionally, internal analyses by Kerry advisors Mary Beth Cahill and Mark Mellman suggested that the release of an al Qaeda tape featuring Osama bin Laden three days before the 2004 election primed terrorism in voters' minds, reducing Kerry's vote share (Harvard Institute of Politics 2006). Our results show that a significant proportion of the electorate may not

incorporate potentially vote relevant late campaign information as a consequence of convenience voting.

Assessing Momentum with Remaining Candidates

We find that Barack Obama performed worse relative to Hillary Clinton among VBM voters. We first use the matching approach to examine how VBM affected the relative vote shares of Obama and Clinton in the Democratic primary (see bottom row of Table 3). The naïve OLS specification in column (1) shows a large negative correlation between the relative performance of Obama and the usage of VBM. The IV specifications continue to show this negative relationship; the point estimate indicates that VBM causes an 8.6 percentage point reduction in the difference between Obama's and Clinton's vote shares in the caliper-matched sample ($p < .001$). Similarly, columns (5) – (7) of Table 3 show estimates using the FE approach ranging between a 10.2 and 15.3 percentage point reduction. As shown in Figure 7(a), this negative effect is robust across various bandwidths around the threshold, although it decreases somewhat as b gets larger.

There are a number of potential explanations for the negative effect of VBM on Obama's performance. Figures 2 and 3 suggest that Obama may have gained some momentum following his victory in the South Carolina primary that was lost on some VBM voters. Additionally, Obama may have been more likely to gain the support of Edwards' former supporters. Finally, campaign advertising or debates may also have affected the relative standing of Clinton and Obama. Any or all of these explanations are potential mechanisms for the results observed in the bottom row of Table 3.

Our point estimates suggest that the use of VBM may have had a substantial effect on the final vote margin in the California Democratic primary. Clinton beat Obama by about eight

percentage points. Roughly 40 percent of ballots were cast by mail in the Democratic race. Being forced to VBM increased Clinton's vote share relative to Obama's by about 10 percentage points. If we extrapolate our estimates to apply to those who select into VBM, about half of the eight percentage point final margin would have been erased if only polling place voting was used.³⁰

We also find that Mike Huckabee performed significantly better among VBM voters, consistent with him receiving a burst of momentum following his surprise Iowa caucus victory, which had dissipated by the time of Super Tuesday a month later. Table 4 presents regression results of the effect of VBM on the difference between Huckabee's and McCain's vote share. The naive OLS regression in column (1) shows a large negative correlation between Huckabee's relative performance and the use of VBM. However, consistent with our information loss hypothesis, the sign flips when we isolate the effect via IV in columns (2) – (4). In the caliper-matched sample we find a significant positive effect of 3.2 percentage points ($p < .05$). Using the FE approach, we obtain positive effects around 5 percentage points. Applying a bandwidth of 100, the effect of VBM on Huckabee's vote share relative to McCain is statistically significant at the $p < .10$ level. As shown in Figure 7b, this effect is robust to various bandwidth selections.³¹

Our finding that Huckabee's support was significantly greater when voters were not exposed to late campaign information builds upon existing literature on momentum in sequential elections such as presidential primaries. This literature suggests that performance in early contests provides candidates with momentum that assists them in later elections. California voters received their ballots on January 7th, only four days after Huckabee's victory in the Iowa caucus. Thus, VBM voters had the opportunity to cast ballots immediately after the Iowa victory

³⁰ Let x be margin if only polling place voting is used. Plugging in parameters, $.4(10 + x) + .6x = 8$, or $x = 4$.

³¹ We also calculated treatment estimates of Huckabee's momentum using Romney's vote share as the baseline. As shown in Table 4 and Figure 7c, we obtained very similar results as when we compare Huckabee to McCain.

and before a number of subsequent elections in which Huckabee performed poorly. Consistent with past results in the laboratory and in surveys, we show that observing these poor election performances caused a significant reduction in the likelihood of supporting Huckabee. Hence, voters may be holding something akin to “running tallies” of previous election results in determining their vote choice. Moreover, the fact that voters may underestimate the extent to which future information may sway their votes calls into question assumptions of pure rationality made by several recent papers that have attempted to formalize the idea of momentum in sequential elections (e.g. Callander 2007).

One alternative explanation for Huckabee’s worse performance relative to McCain among polling place voters is that former Giuliani and Thompson voters disproportionately switched to voting for McCain. To assess this, we also examined the vote share of Romney relative to McCain. If Giuliani and Thompson supporters went predominantly for McCain, we would expect Romney to perform relatively better than McCain among VBM voters. However, unlike what we observed with Huckabee, we found small and generally insignificant estimates of the effect of VBM on Romney’s relative performance to McCain (see bottom rows of Table 4). Thus, while the switching behavior of former Giuliani and Thompson voters may explain some portion of the gap between Huckabee and McCain on VBM ballots (e.g. Romney and McCain split their support), the magnitudes of the coefficients in Table 4 are such that it cannot explain it entirely. Thus, we conclude that some Huckabee VBM supporters would have voted for Romney or McCain in the polling place on Election Day.

VI. Conclusion

Hopeful of increasing turnout and decreasing costs, elections officials around the county have been greatly increasing their use of convenience voting in recent years. Most of the

resistance to this increase has been based on the grounds that VBM and in-person early voting jeopardize the sense of community generated by Election Day and increase the potential for voter fraud (Addonizio et al. 2007; Gronke et al. 2008). In this paper we document an additional phenomenon not often discussed when considering the adoption of convenience voting: the potential for late campaign information loss. Exploiting an election administration policy that creates an arbitrary discontinuity, we found that withdrawn candidates perform significantly better in the 2008 California presidential primary in precincts where VBM ballots are mandated. Moreover, the relative performance of remaining candidates is affected by VBM as well.

These findings speak directly to public policy concerns about the effects of convenience voting, which have been touted as a mechanism for making voting easier and enhancing participation. Whereas existing research has focused on turnout implications (e.g. Southwell and Burchett 2000; Berinsky et al. 2001; Kousser and Mullin 2007) or the partisan impacts (e.g. Stein 1998; Baretto et al. 2006; Dyck and Gimpel 2005; Berinsky 2005), this paper addressed a totally unexplored question: Does convenience voting adversely affect citizen decision making by eliminating late campaign information? We find that VBM voters did not fully incorporate information about candidate withdrawals and momentum. This suggests that mail voters presumably failed to incorporate other potentially vote relevant pieces of late information, such as the results of the South Carolina primary or the Democratic debate that took place in Los Angeles a few days before the election. Moreover, while this analysis focuses on a single election, we believe that the estimates are informative about information loss in other contexts.³²

We believe that our results also have implications for the design of electoral systems.

Convenience voting began as early as late September in a number of states in the 2008

³² One caveat is that there are likely to be fewer marginal voters in general elections than primary elections. In other words, voters may be less likely to change their vote choice in general elections due to the massive influence of party cues.

presidential election. This resulted in the first votes being cast prior to the first presidential debate in a number of states. Given the patterns observed in this paper, elections officials may need to have more extensive discussions about when to begin early voting, given the tradeoff between information loss and convenience. This may be particularly important in primaries, where momentum plays an important role in affecting voter choice and candidates often drop out of the race. States might want to wait until closer to Election Day to send out mail ballots, or instruct people on ballots to make sure to wait until they are ready to make a decision before voting.

Finally, our findings suggest a new method for studying how events during the campaign affect vote choice. A number of recent papers have used a variety of methods, including surveys, laboratory experiments, and observational studies, providing evidence that rejects the traditional “minimal effects” hypothesis of campaigns effects (e.g. Geer and Lau 2006; Hillygus and Jackman 2003; Holbrook 1996). We complement this literature by showing that voters significantly changed their vote choices in response to the campaign environment, leveraging data from outside the survey context. Moreover, our findings suggest a method for future research on campaign effects. Specifically, we find that if the selection process for VBM or early in-person voting ballot can be modeled, one can compare differences between mail and polling place voters to study the effect of late campaign information (see also Montalvo 2008). To this end, we hope to extend the methodology developed in this paper to study the effects of other late campaign events such as advertisements, thereby providing causally-identified evidence from elections to supplement data collected in the laboratory or in surveys.³³

³³ For example, our method could potentially be used to identify the effects of late persuasive campaign mailings, like those examined by Gerber, Kessler, and Meredith (2008).

References

- Abramson, Paul R., John H. Aldrich, and David W. Rhode. 1992. "'Sophisticated' Voting in the 1998 Presidential Primaries." *American Political Science Review*. 86: 55-69.
- "Absentee and Early Voting Laws." The Early Voting Information Center. 21 Feb. 2008. Reed College. Retrieved 26 Sept. 2008 <<http://www.earlyvoting.net/states/abslaws.php>>.
- Addonizio, Elizabeth, Donald Green, and James M. Glaser. 2007. "Putting the Party Back into Politics: An Experiment Testing Whether Election Day Festivals Increase Voter Turnout." *PS: Political Science & Politics*. 40: 721-727.
- Aldrich, John H. 1980. "A Dynamic Model of Presidential Nomination Campaigns." *American Political Science Review*. 74: 651-69.
- Ali, S. Nageeb., and Navin Kartik. 2007. "Social Learning in Elections." Manuscript. University of California, San Diego.
- Arceneaux, Kevin, Alan S. Gerber, and Donald P. Green. 2006. "Comparing Experimental and Matching Methods Using a Large-Scale Voter Mobilization Experiment." *Political Analysis*. 14: 37-62.
- Barber, Brad and Terrence Odean. 2001. "Boys Will Be Boys: Gender, Overconfidence, and Common Stock Investment." *Quarterly Journal of Economics*. 116: 261-292.
- Baretto, Matt A., Matthew J. Streb, Mara Marks, and Fernando Guerra. 2006. "Do Absentee Voters Differ From Polling Place Voters? New Evidence from California." *Public Opinion Quarterly*. 70: 224-34.
- Bartels, Larry M. 1988. *Presidential Primaries and the Dynamics of Public Choice*. Princeton, NJ: Princeton University Press.
- Berinsky, Adam J. 2005. "The Perverse Consequences of Electoral Reform in the United States." *American Politics Research*. 33: 471-91.
- Berinsky, Adam, Nancy Burns, and Michael Traugott. 2001. "Who Votes By Mail? A Dynamic Model of the Individual-Level Consequences of Vote-By-Mail Systems." *Public Opinion Quarterly*. 65: 178-97.
- Brady, Henry E., and John E. McNulty. 2004. "The Costs of Voting: Evidence from a Natural Experiment." Presented at the Annual Meeting of the Society for Political Methodology.
- Callander, Steven. 2007. "Bandwagons and Momentum in Sequential Voting." *Review of Economic Studies*. 74: 653-84.

- Camerer, Colin and Dan Lovallo. 1999. "Overconfidence and Excess Entry: An Experimental Approach." *American Economic Review*. 89: 306-318.
- Campbell, Angus, Philip E. Converse, Warren E. Miller, and Donald Stokes. 1960. *The American Voter*. New York: Wiley.
- Carmines, Edward G., and James A. Stimson. 1980. "The Two Faces of Issue Voting." *American Political Science Review*. 74: 78-91.
- Daniel, Kent, David Hirshleifer, and Avaniidhar Subrahmanyam. 1998. "Investor Psychology and Security Market Over- and Under-Reactions." *Journal of Finance*. 53: 1839-1886.
- Denton Jr., Robert E. 2005. "Religion, Evangelicals, and Moral Issues in the 2004 Presidential Campaign." *The 2004 Presidential Campaign : A Communication Perspective*. Ed. Robert E. Denton. New York: Rowman & Littlefield. 255-82.
- Dubin, Jeffrey A., and Gretchen A. Kalsow. 1996. "Comparing Absentee and Precinct Voters: Voting on Direct Legislation." *Political Behavior*. 18: 393-411.
- Dunning, Thad. 2008. "Improving Causal Inference: Strengths and Limitations of Natural Experiments." *Political Research Quarterly*. 61: 282-293.
- Dyck, Joshua J., and James G. Gimpel. 2005. "Distance, Turnout, and the Convenience of Voting." *Social Science Quarterly*. 86: 531-48.
- Fiorina, Morris P. 1976. "The Voting Decision: Instrumental and Expressive Aspects." *Journal of Politics*. 38: 390-413.
- Fiorina, Morris P. 1981. *Retrospective Voting in American National Elections*. New Haven, CT: Yale University Press.
- Fournier, Patrick, Richard Nadeau, Andre Blais, Elisabeth Gidengil, and Neil Nevitte. 2004. "Time-of-Voting Decision and Susceptibility to Campaign Effects." *Electoral Studies*. 23: 661-81.
- Geer, John, and Richard R. Lau. 2006. "Filling in the Blanks: A New Method for Estimating Campaign Effects." *British Journal of Political Science*. 36: 269-90.
- Gerber, Alan S., Daniel P. Kessler, and Marc Meredith. 2008. "The Persuasive Effects of Direct Mail: A Regression Discontinuity Approach." *NBER Working Paper* 14206.
- Gronke, Paul, Eva Galanes-Rosenbaum, Peter A. Miller, and Daniel Toffey. 2008. "Convenience Voting." *Annual Review of Political Science*. 11: 437-55.

- Hahn, Jinyong, Petra Todd, and Wibert Van der Klaauw. 2001. "Identification and Estimation of Treatment Effects with a Regression-Discontinuity Design." *Econometrica*. 69: 201-09.
- Harvard Institute of Politics. 2006. *Campaign for President: The Managers Look at 2004*. Ed. Harvard Institute of Politics. Lanham, MD: Rowman & Littlefield.
- Henderson, Marc, and D. Sunshine Hillygus. 2009. "The Dynamics of Vote Decision in the 2008 Presidential Election." Working paper. Harvard University.
- Hillygus, D. Sunshine, and Simon Jackman. 2003. "Voter Decision Making in Election 2000: Campaign Effects, Partisan Activation, and the Clinton Legacy." *American Journal of Political Science*. 47: 583-96.
- "Historical Absentee Ballot Use in California." Elections and Voter Information. California Secretary of State. 26 Sept. 2008 <http://www.sos.ca.gov/elections/hist_absentee.htm>.
- Ho, Daniel E., Kosuke Imai, Gary King, and Elizabeth A. Stuart. 2007. "Matching as Nonparametric Preprocessing for Reducing Model Dependence in Parametric Causal Inference." *Political Analysis*. 15: 199-236.
- Holbrook, Thomas M. 1996. *Do Campaigns Matter?* Minneapolis, MN: Sage.
- Kenney, Patrick J., and Tom W. Rice. 1994. "The Psychology of Political Momentum." *Political Research Quarterly*. 47: 923-38.
- Klumpp, Tilman, and Mattias K. Polborn. 2006. "Primaries and the New Hampshire Effect." *Journal of Public Economics*. 90: 1073-114.
- Knight, Brian, and Nathan Schiff. 2007. "Momentum and Social Learning in Presidential Primaries." National Bureau of Economic Research Working Paper #13637.
- Kousser, Thad, and Megan Mullin. 2007. "Does Voting By Mail Increase Participation? Using Matching to Analyze a Natural Experiment." *Political Analysis*. 15: 1-18.
- Montalvo, Jose G. 2008. "Voting after the Bombing: Can Terrorist Attacks Change the Outcome of Democratic Elections?" Manuscript. Universitat Pompeu Fabra.
- Mutz, Diana C. 1999. *Impersonal Influence: How Perceptions of Mass Collectives Affect Political Attitudes*. New York: Cambridge University Press.
- Neeley, Grant W., and Lilliard E. Richardson, Jr. 2001. "Who Is Early Voting? An Individual Level Examination." *Social Science Journal*. 38: 381-92.
- Norrander, Barbara. 1996. "Presidential Nomination Politics in the Post-Reform Era." *Political Research Quarterly*. 49: 875-915.

- Patterson, Samuel C., and Gregory A. Caldeira. 1985. "Mailing In the Vote: Correlates and Consequences of Absentee Voting." *American Journal of Political Science*. 29: 766-89.
- Samuelson, Paul A. 1963. "Risk and Uncertainty: A Fallacy of Large Numbers." *Scientia*. 98: 108-113.
- Southwell, Priscilla L., and Justin L. Burchett. 2000. "The Effect of All-Mail Elections on Voter Turnout." *American Politics Research*. 28: 72-79.
- Stein, Robert M. 1998. "Early Voting." *Public Opinion Quarterly*. 62: 57-69.
- Stein, Robert M., Jan E. Leighley, and Chris Owens. 2004. "Voting, Early Voting, and Party Mobilization: Is Timing Everything?" Paper presented at the Annual Meeting of the Midwest Political Science Association, Chicago, IL.
- Svenson, Ola. 1981. "Are We All Less Risky and More Skillful Than Our Fellow Drivers?" *Acta Psychologica*. 47: 143-148.

Figure 1: Timeline of Events

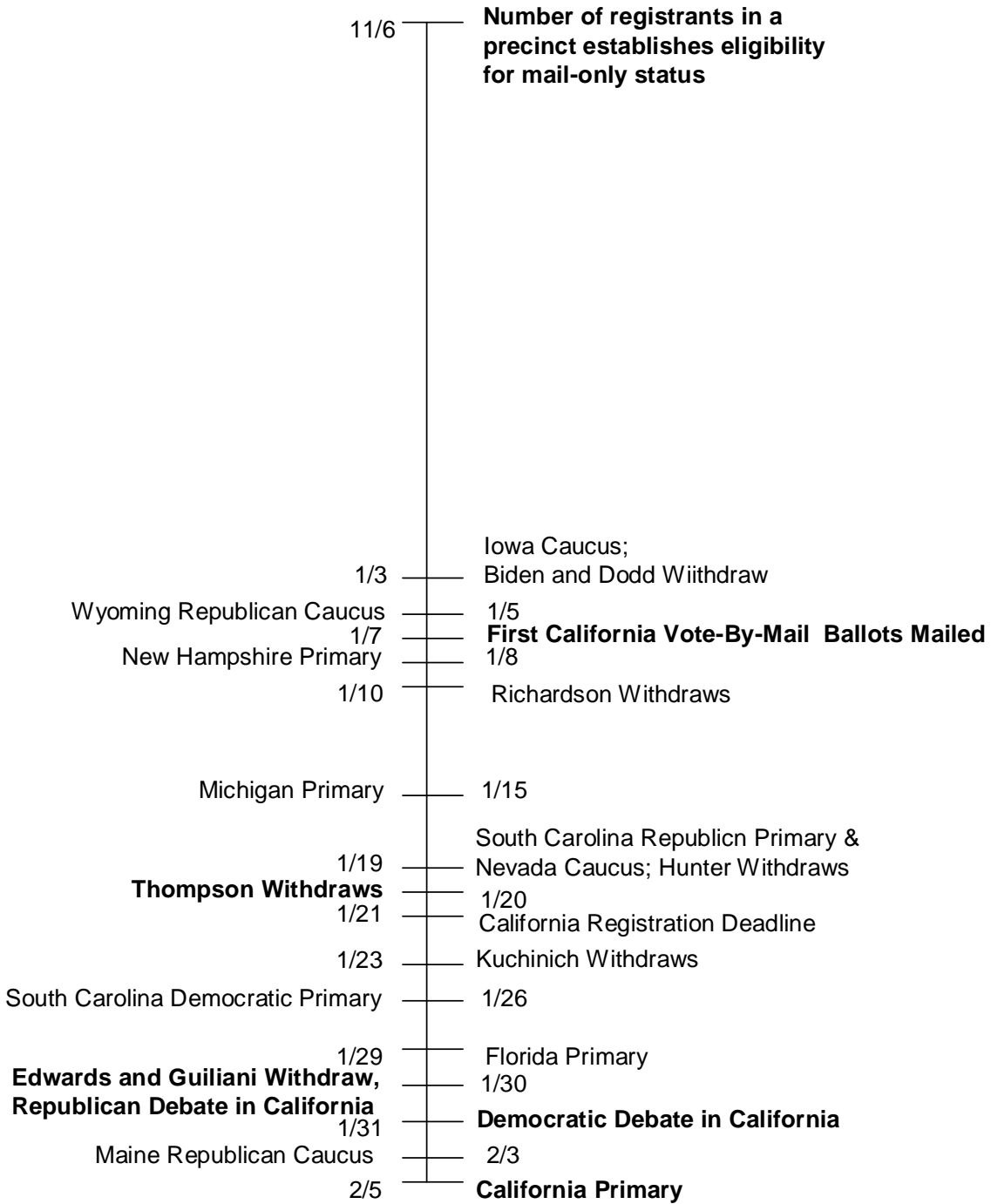


Figure 2: Median Price of \$1 Contract on Intrade on Candidate to Win Nomination

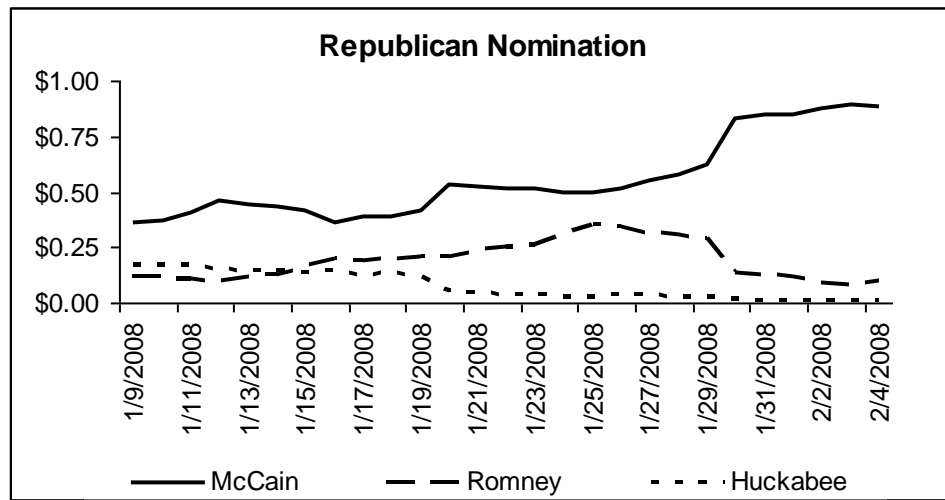
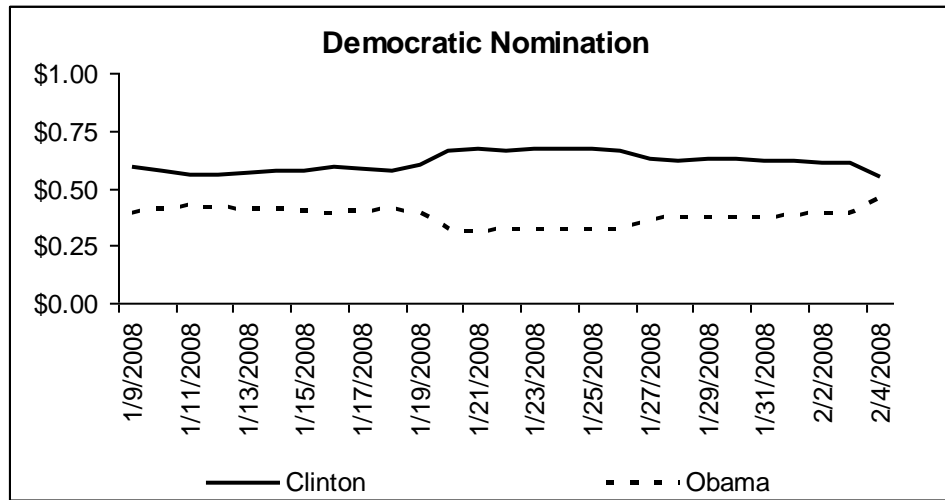
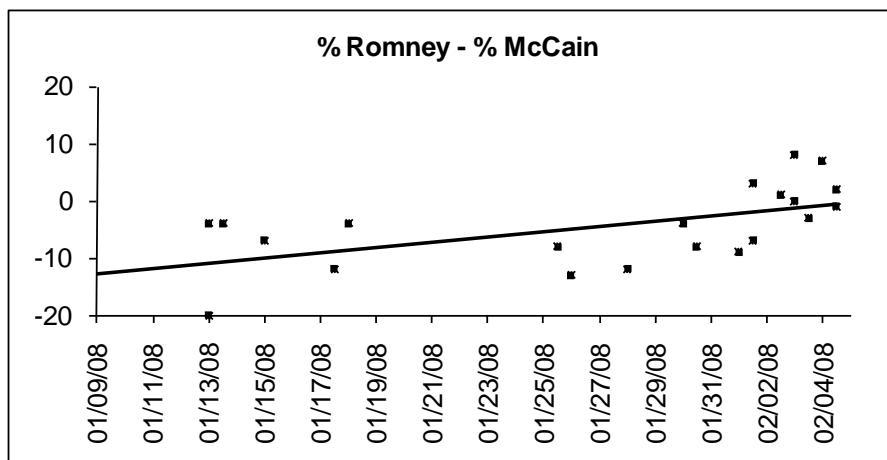
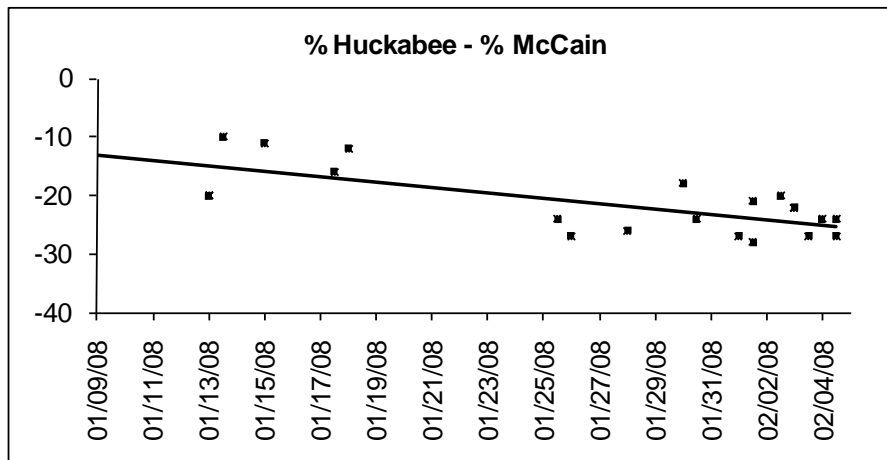
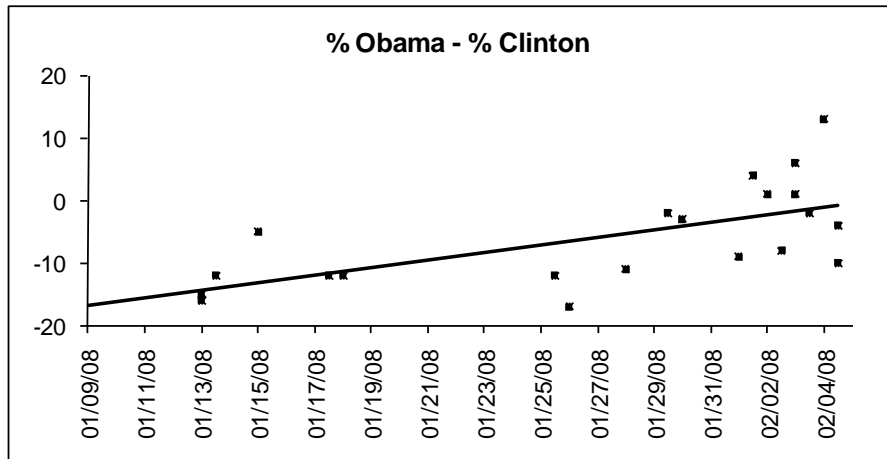


Figure 3: Difference in the Percent of Californians Supporting Candidates in Pre-Election Polls by Date of Poll



Poll date is the median date that the poll was in the field. Black lines indicate linear trend. Data obtained from <http://www.pollster.com/polls/ca/08-ca-rep-pres-primary.php> and <http://www.pollster.com/polls/ca/08-ca-dem-pres-primary.php> on 12/5/2008.

Figure 4: CDF of Mail Ballot Return Date in the 208 California Presidential Primary

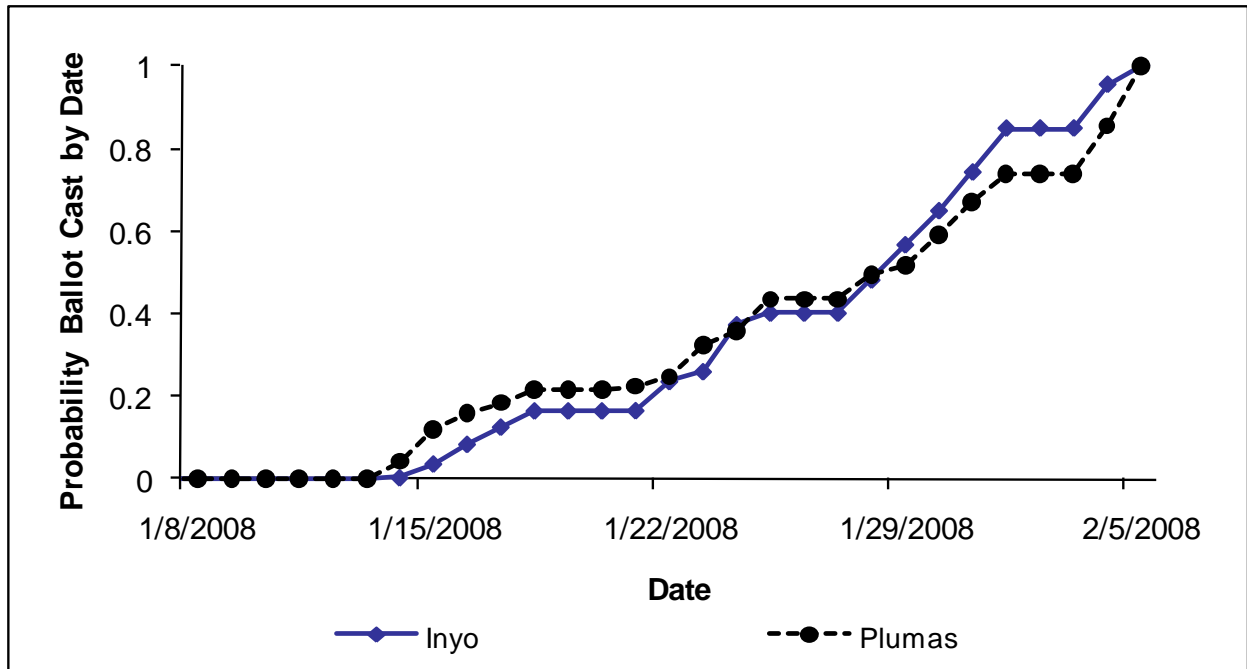


Figure 5: Illustration of 250-Registrant Discontinuity

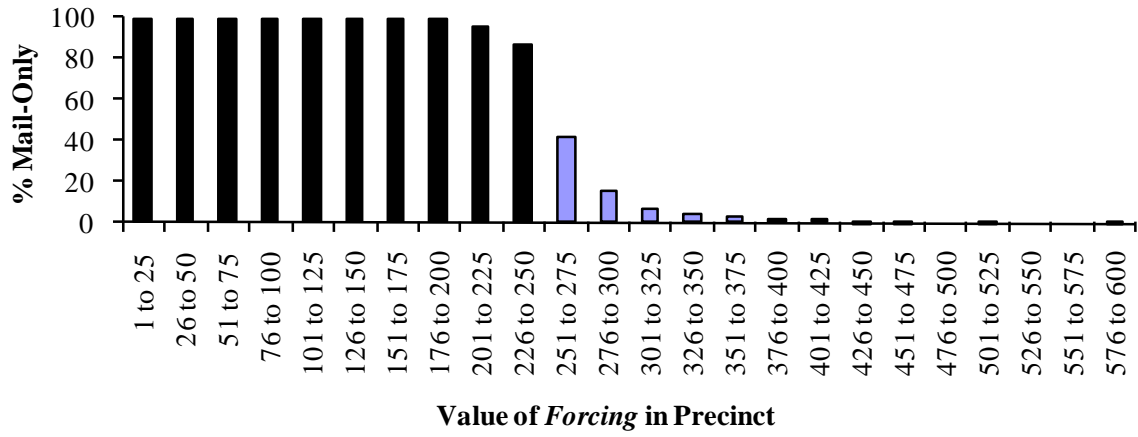
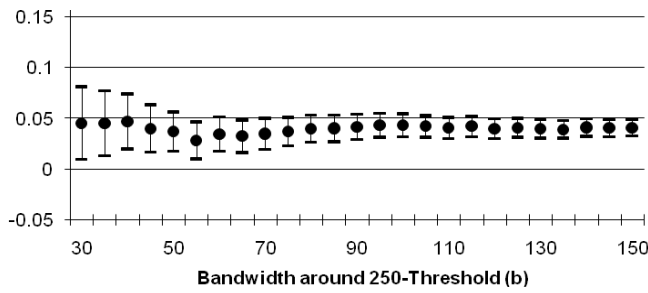
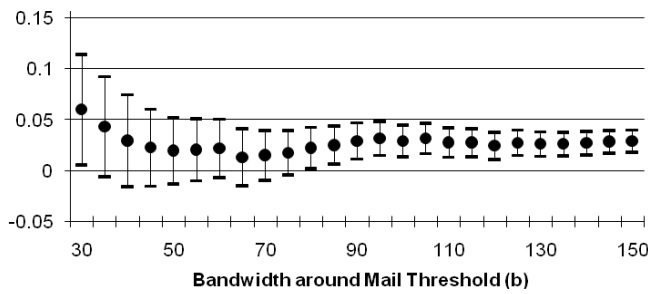


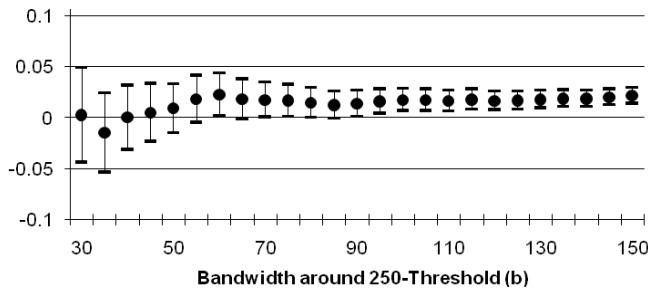
Figure 6: Effects of VBM on Support for Withdrawn Candidates
 Circles indicate point estimates, bars indicate 95% confidence interval



(a) Effect of VBM on Edwards' vote share

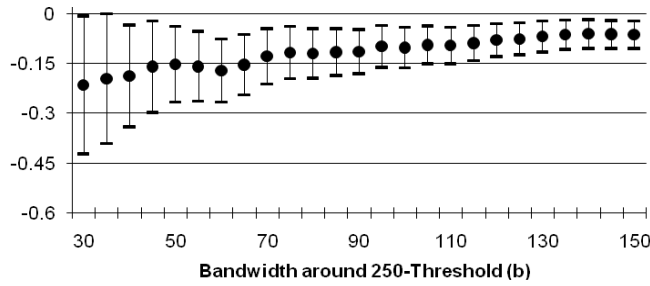


(b) Effect of VBM on Giuliani's vote share

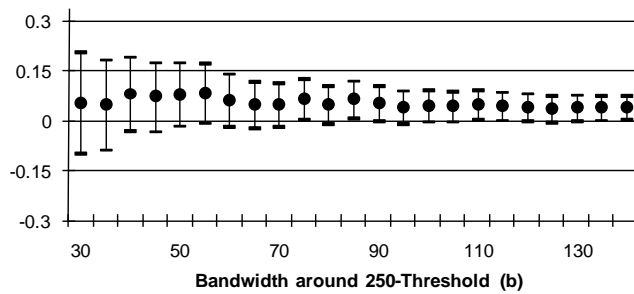


(c) Effect of VBM on Thompson's vote share

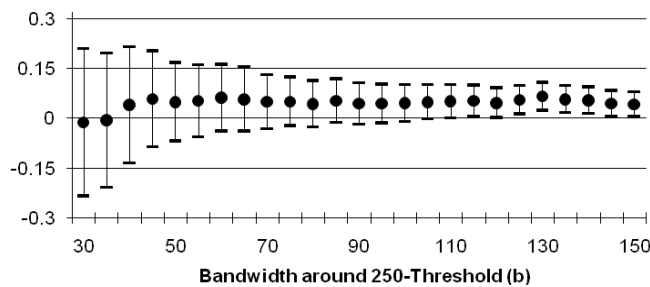
Figure 7: Effects of VBM on Support for Remaining Candidates
 Circles indicate point estimates, bars indicate 95% confidence interval



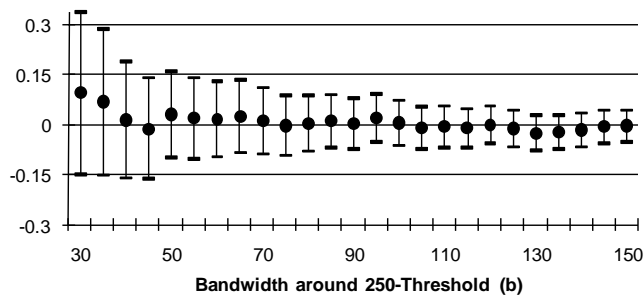
(a) Effect of VBM on Obama's minus Clinton's vote share



(b) Effect of VBM on Huckabee's minus McCain's vote share



(c) Effect of VBM on Huckabee's minus Romney's vote share



(d) Effect of VBM of Romney's – McCain's vote share

Table 1: Balance Tests for Matching Estimator

Values show percentage point difference in VBM-only relative to traditional precincts.

Standard errors in parenthesis. Bold indicates a significant difference at 95% level.

	(1) Full Sample	(2) Matched	(3) Caliper Matched
Observations	16,859	5,014	1,528
Mail Precincts	2,507	2,507	764
Traditional Precincts	14,352	2,237	630
% Rural	0.294 (0.012)	0.055 (0.021)	0.014 (0.022)
% White	0.036 (0.004)	-0.005 (0.006)	-0.004 (0.009)
% Black	-0.012 (0.001)	0.001 (0.002)	-0.001 (0.003)
% Asian	-0.027 (0.002)	-0.002 (0.003)	-0.002 (0.005)
% Hispanic	0.004 (0.003)	0.006 (0.004)	0.006 (0.006)
% Age 18 - 29	-0.015 (0.002)	-0.001 (0.003)	-0.001 (0.003)
% Age 30 - 44	-0.030 (0.002)	-0.008 (0.003)	-0.005 (0.004)
% Age 45 - 64	0.024 (0.002)	0.002 (0.003)	0.001 (0.004)
% Age 65+	0.020 (0.004)	0.007 (0.005)	0.004 (0.006)
% Democratic	-0.028 (0.003)	0.000 (0.005)	0.000 (0.006)
% Republican	0.039 (0.003)	0.003 (0.006)	0.003 (0.007)
% Decline to State	-0.013 (0.002)	-0.003 (0.002)	-0.003 (0.002)
% Minor Party	0.002 (0.001)	0.000 (0.001)	0.000 (0.001)
% Male	0.003 (0.001)	0.000 (0.001)	0.000 (0.002)
% Female	-0.009 (0.001)	-0.002 (0.001)	-0.003 (0.002)
% Unknown Gender	0.006 (0.002)	0.002 (0.002)	0.003 (0.002)
% Late Registrants	0.001 (0.001)	0.002 (0.001)	0.000 (0.001)
% Absentee (Santa Clara Only)	0.011 (0.004)	0.008 (0.006)	0.004 (0.008)

Table 2: Balance Tests for Differences-in-Difference Estimator

Standard errors in parenthesis. Bold indicates a significant difference at 95% level.

	(1)	(2)	(3)
Bandwidth (b)	50	75	100
251- b ≤ Forcing ≤ 250	16,208	4,808	1,480
251- b ≤ Forcing ≤ 250	2,404	2,404	740
250 + b < Forcing	13,804	1,502	608
% Rural	0.047 (0.026)	0.025 (0.023)	0.024 (0.021)
% White	-0.005 (0.013)	0.003 (0.010)	0.000 (0.008)
% Black	0.000 (0.004)	-0.003 (0.003)	-0.002 (0.003)
% Asian	-0.011 (0.008)	-0.010 (0.006)	-0.009 (0.005)
% Hispanic	0.012 (0.007)	0.004 (0.006)	0.007 (0.005)
% Age 18 - 29	0.003 (0.009)	-0.001 (0.007)	-0.002 (0.006)
% Age 30 - 44	-0.020 (0.009)	-0.013 (0.007)	-0.012 (0.006)
% Age 45 - 64	-0.004 (0.009)	0.011 (0.008)	0.012 (0.006)
% Age 65+	0.022 (0.014)	0.004 (0.013)	0.002 (0.011)
% Democratic	-0.001 (0.008)	0.000 (0.006)	-0.002 (0.006)
% Republican	0.010 (0.010)	0.008 (0.008)	0.008 (0.007)
% Decline to State	-0.010 (0.005)	-0.009 (0.004)	-0.007 (0.003)
% Minor Party	0.001 (0.002)	0.001 (0.002)	0.001 (0.001)
% Male	-0.001 (0.004)	0.001 (0.004)	0.002 (0.003)
% Female	-0.005 (0.005)	-0.007 (0.004)	-0.007 (0.003)
% Unknown Gender	0.005 (0.006)	0.006 (0.005)	0.005 (0.004)
% Late Registrants	0.000 (0.004)	-0.001 (0.003)	-0.002 (0.003)
% Absentee (Santa Clara Only)	0.026 (0.022)	0.016 (0.017)	0.016 (0.015)

Table 3: Estimates of Vote-by-Mail on Vote Shares in the Democratic Primary (standard errors in parenthesis)

	Matching Estimator				Differences-in-Differences Estimator				
	(1)	(2)	(3)	(4)		(5)	(6)	(7)	
Sample:	<u>Full (OLS)</u>	<u>Full (IV)</u>	<u>Matched</u>	<u>Caliper</u> <u>Matched</u>	Bandwidth (b):	<u>50</u>	<u>75</u>	<u>100</u>	
Observations	16,724	16,724	4,744	1528	251– b ≤ Registrants ≤ 250	271	456	633	
Mail Precincts	—	2,372	2,372	764	251– b ≤ Registrants ≤ 250	155	260	369	
Traditional Precincts	—	14,352	1,526	630	250 + b < Registrants	1013	1477	1863	
<u>First Stage</u>					<u>First Stage</u>				
% Mail Ballots	—	0.523 (0.003)	0.511 (0.005)	0.502 (0.006)	% Mail Ballots	0.317 (0.026)	0.358 (0.019)	0.390 (0.016)	
<u>Second Stage</u>					<u>Second Stage</u>				
% Edwards	0.082 (0.002)	0.048 (0.003)	0.040 (0.003)	0.041 (0.004)	% Edwards	0.037 (0.010)	0.037 (0.007)	0.044 (0.006)	
% Obama – % Clinton	-0.096 (0.019)	-0.086 (0.014)	-0.100 (0.017)	-0.086 (0.024)	% Obama – % Clinton	-0.153 (0.058)	-0.117 (0.040)	-0.102 (0.031)	

Table 4: Estimates of Vote-by-Mail on Vote Shares in the Republican Primary (standard errors in parenthesis)

	Matching Estimator				Differences-in-Differences Estimator			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Sample:	<u>Full (OLS)</u>	<u>Full (IV)</u>	<u>Matched</u>	<u>Caliper Matched</u>	Bandwidth (b):	<u>50</u>	<u>75</u>	<u>100</u>
Observations	16,693	16,693	4,688	1,520	251 – b ≤ Registrants ≤ 250	271	456	633
Mail Precincts	—	2,344	2,344	760	251 ≤ Registrants ≤ 250 + b	155	260	369
Traditional Precincts	—	14,349	1,497	626	251 + b < Registrants	1013	1477	1863
<u>First Stage</u>					<u>First Stage</u>			
% Mail Ballots	—	0.444 (0.003)	0.434 (0.005)	0.427 (0.006)	% Mail Ballots	0.232 (0.022)	0.275 (0.018)	0.313 (0.015)
<u>Second Stage</u>					<u>Second Stage</u>			
% Giuliani	0.047 (0.002)	0.034 (0.003)	0.035 (0.003)	0.031 (0.004)	% Giuliani	0.020 (0.017)	0.018 (0.011)	0.029 (0.008)
% Thompson	0.017 (0.001)	0.026 (0.002)	0.025 (0.003)	0.026 (0.004)	% Thompson	0.009 (0.012)	0.017 (0.008)	0.018 (0.006)
% Huckabee – % McCain	-0.124 (0.007)	0.028 (0.009)	0.027 (0.012)	0.032 (0.015)	% Huckabee - % McCain	0.080 (0.058)	0.049 (0.037)	0.052 (0.027)
% Huckabee – % Romney	-0.068 (0.007)	0.042 (0.009)	0.059 (0.012)	0.055 (0.016)	% Huckabee - % Romney	0.050 (0.060)	0.051 (0.038)	0.046 (0.029)
% Romney – % McCain	-0.055 (0.009)	-0.015 (0.011)	-0.032 (0.015)	-0.023 (0.019)	% Romney - % McCain	0.031 (0.066)	-0.002 (0.045)	0.005 (0.034)

Figure A1: Balance Tests for Differences-in-Differences Estimator

Circles indicate point estimates, bars indicate 95% confidence interval

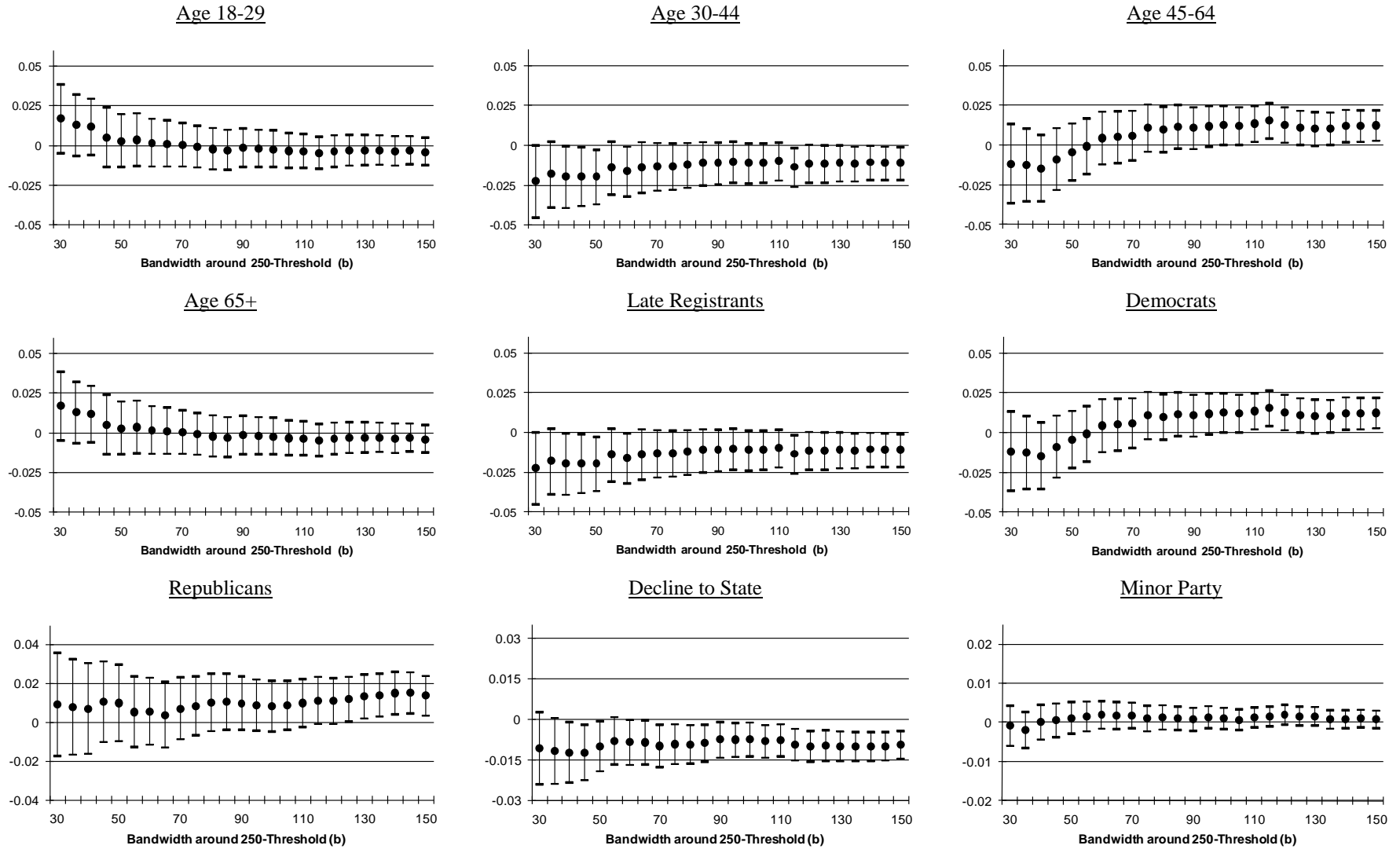


Figure A1: Balance Tests for Differences-in-Differences Estimator (Continued)

Circles indicate point estimates, bars indicate 95% confidence interval

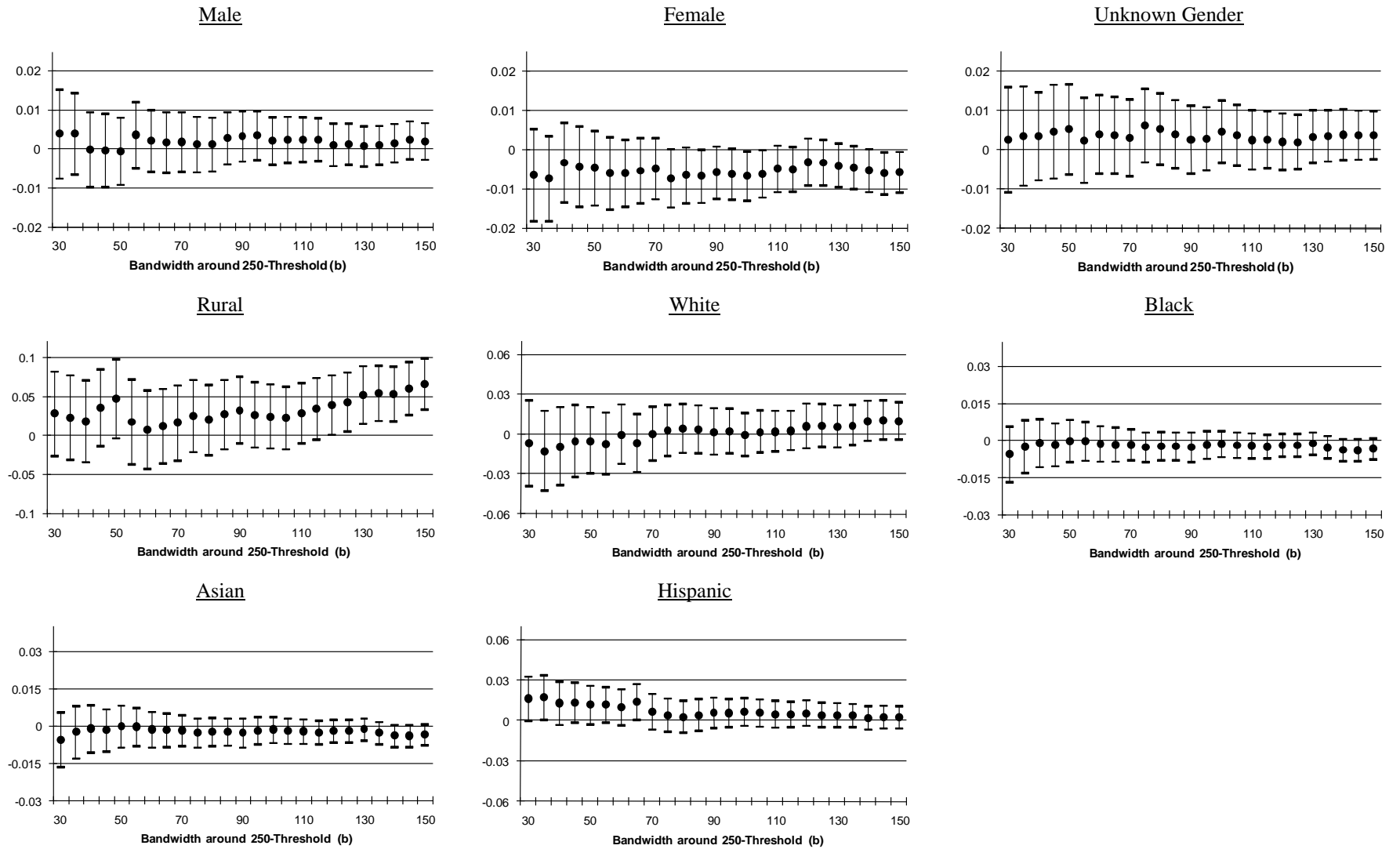


Table A1: Excluded Counties

<u>County</u>	<u>Reason for Exclusion</u>
Alpine	Only mail-only precincts
Amador	Single mail-only precinct
Butte	Could not provide full documentation of excluded registrants
Calaveras	Only traditional precincts
Del Norte	Only traditional precincts
El Dorado	Could not provide full documentation of excluded registrants
Inyo	Unable to observe the treatment assignment variable
Merced	Could not provide full documentation of excluded registrants
Monterey	Results and discontinuity at different levels of aggregation
Napa	Could not provide full documentation of excluded registrants
Nevada	Unable to observe the treatment assignment variable
Riverside	Could not provide full documentation of excluded registrants
San Diego	Unable to observe the treatment assignment variable
San Luis Obispo	Unable to observe the treatment assignment variable
Sierra	Only mail-only precincts
Sutter	Unable to observe the treatment assignment variable
Trinity	Unable to obtain precinct-level data
Tulare	Unable to observe the treatment assignment variable

Table A2: Within County Difference-in-Means Estimates

Standard errors in parenthesis. Bold indicates a significant difference at 95% level.

Balance Tests				Democratic Primary			
Bandwidth (b):	<u>50</u>	<u>75</u>	<u>100</u>	Bandwidth (b):	<u>50</u>	<u>75</u>	<u>100</u>
251- b ≤ Forcing ≤ 250	297	500	704	251- b ≤ Forcing ≤ 250	297	500	704
251 ≤ Forcing ≤ 250 + b	168	290	418	251 ≤ Forcing ≤ 250 + b	168	290	418
% Rural	0.099	0.087	0.103	First Stage			
	(0.034)	(0.030)	(0.025)	% Mail Ballots	0.328	0.377	0.416
% White	0.034	0.036	0.033		(0.025)	(0.019)	(0.015)
	(0.020)	(0.016)	(0.013)	Second Stage			
% Black	-0.006	-0.008	-0.003	% Edwards	0.045	0.039	0.050
	(0.006)	(0.005)	(0.005)		(0.014)	(0.009)	(0.007)
% Asian	-0.010	-0.018	-0.018	% Obama - % Clinton	-0.031	-0.064	-0.038
	(0.011)	(0.009)	(0.007)		(0.074)	(0.050)	(0.039)
				Republican Primary			
				Bandwidth (b):	<u>50</u>	<u>75</u>	<u>100</u>
				251- b ≤ Forcing ≤ 250	297	500	704
				251 ≤ Forcing ≤ 250 + b	167	289	416
				First Stage			
% Hispanic	-0.020	-0.014	-0.014	% Mail Ballots	0.317	0.358	0.390
	(0.013)	(0.010)	(0.009)		(0.026)	(0.019)	(0.016)
% Age 18 - 29	-0.006	-0.014	-0.016	Second Stage			
	(0.009)	(0.009)	(0.007)	% Thompson	0.018	0.019	0.024
% Age 30 - 44	-0.020	-0.013	-0.012		(0.012)	(0.008)	(0.007)
	(0.009)	(0.007)	(0.006)	% Giuliani	0.035	0.029	0.038
% Age 45 - 64	0.012	0.019	0.025		(0.019)	(0.013)	(0.011)
	(0.010)	(0.008)	(0.007)	% Huckabee - % McCain	0.053	0.037	0.058
% Age 65 +	0.015	0.008	0.004		(0.072)	(0.045)	(0.033)
	(0.013)	(0.010)	(0.009)	% Huckabee - % Romney	0.056	0.040	0.026
% Democrat	-0.027	-0.020	-0.021		(0.060)	(0.037)	(0.030)
	(0.012)	(0.009)	(0.008)	% Romney - % McCain	-0.003	-0.003	0.032
% Republican	0.037	0.032	0.031		(0.076)	(0.049)	(0.039)
	(0.013)	(0.010)	(0.008)				
% Decline to State	-0.010	-0.011	-0.011				
	(0.005)	(0.004)	(0.003)				
% Minor Party	0.000	0.000	0.001				
	(0.002)	(0.002)	(0.001)				
% Male	0.002	0.001	0.001				
	(0.005)	(0.004)	(0.003)				
% Female	-0.004	-0.006	-0.007				
	(0.005)	(0.004)	(0.003)				
% Unknown Gender	0.001	0.005	0.006				
	(0.006)	(0.005)	(0.004)				
% Late Registrants	0.001	-0.003	-0.004				
	(0.003)	(0.003)	(0.002)				
% Late Registrants	0.001	-0.003	-0.004				
	(0.003)	(0.003)	(0.002)				