Information and Wasted Votes: A Study of U.S. Primary Elections

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Abstract

We study whether information leads voters and donors to "waste" fewer votes and donations on candidates who do not finish in first or second place. Examining U.S. primary elections featuring more than two candidates, we compare voting and contribution behavior across offices with varying levels of information. We find that voters and donors are more likely to support the top two candidates, and less likely to waste votes or donations on lesser candidates, when information levels are higher. In addition, we find that donors consistently act more "strategically"—i.e., waste fewer donations on lesser candidates—than voters. To supplement these analyses, we isolate the causal effect of information by leveraging adjacent U.S. counties that differ in their access to politically relevant information from the media. We again find that information helps voters avoid wasting votes on candidates who are unlikely to win. The results are relevant for understanding the behavior of voters and contributors, for understanding the role of information in elections, and for the evaluation of policies like runoff primaries designed to facilitate strategic voting outcomes.

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1 Introduction

Unlike general elections in the U.S., in which each party typically fields one candidate, primary elections often consist of three or more candidates vying for a single nomination. Some of these races—like those for president or for the U.S. senate—receive a large amount of media coverage and often feature detailed polling data. Many races, however, concern down-ballot state or local offices that receive little to no coverage or polling—offices such as state representative, state comptroller, treasurer, railroad commissioner, and many more. In these latter races, voters often face the difficult task of distinguishing among three or more candidates with little information about who the favored candidates are. In such situations, voters may split their support over a set of relatively equally preferred candidates and may "accidentally" nominate a less-preferred candidate. With more information about the expected outcome of the race, voters might be able to coordinate their votes and avoid "wasting" votes on other candidates. These wasted votes add noise, and in some cases inefficiency, to the electoral process.

More precisely, consider a plurality-rule election for a single office in which three or more candidates, A, B, and C, compete. If a voter learns from a poll that C is very likely to receive the fewest votes, then—assuming she votes at all—she should cast her ballot either for A or B, even if C is her first choice. To vote for C would be to "waste" her ballot (Duverger 1954), since the contest is really between A and B.[1] Voting for her preferred choice among A and B, rather than "wasting" her vote, is often called strategic, or tactical, voting. A number of decision-theoretic and game-theoretic models formalize this logic.[2] On the other hand, if the voter does not receive any polling information, then she will not know

[1] Droop (1869, cited in Riker, 1982) stated the argument clearly: "Each elector has practically only a choice between two candidates or sets of candidates. As success depends upon obtaining a majority of the aggregate voters of all the electors, an election is usually reduced to a contest between the two most popular candidates or sets of candidates. Even if other candidates go to the poll, the electors usually find out that their votes will be thrown away, unless given in favour of one or other of the parties between whom the election really lies."

[2] See McKelvey and Ordeshook (1972), Black (1978), Hoffman (1982), Palfrey (1989), Gutowski and Georges (1993), Myerson and Weber (1993), Cox (1994), and Fey (1997).

whether C really is expected to place third, and thus will not know whether a vote for C is a "wasted" vote.

How widespread is strategic voting in actual elections? The estimates in the empirical literature, which differ in context, estimation approach, and in how they define strategic voting, range from 3 percent to over 80 percent.[3] For example, Alvarez and Nagler (2000) estimate that in the 1987 elections for the House of Commons in Britain, only about 7 percent of voters engaged in strategic voting. On the other hand, Kawai and Watanabe (2013) estimate that in the 2005 elections for the House of Representatives in Japan, 63-84 percent of voters were strategic.[4]

The wide range of estimates in the empirical literature suggests that the amount of strategic voting varies across contexts. In addition to the fact that different studies employ different methodologies, data, and definitions, one reason the estimated amount of strategic voting might vary is that the information available to voters is different in different elections.[5] In many cases there may be too little polling data for voters to accurately determine the two most preferred candidates. As Myatt (2007) shows, if the information voters receive is noisy, and they know this and act accordingly—and assume that other voters are doing the same—then some voters may vote strategically and some may not.

[3]The more recent literature includes Alvarez and Nagler (2000), Blais et al. (2001), Blais (2002), Chhibber and Kollman (2004), Blais, Young, and Turcotte (2005), Hillygus (2007), Fujiwara et al. (2011), Kawai and Watanabe (2013), Spenkuch (2014), and Anagol and Fujiwara (N.d.). See Alvarez and Nagler (2000) for a summary of the earlier literature.

[4]Comparing estimates across papers can be difficult due to definitional differences. As Kawai and Watanabe (2013) makes clear, many previous papers actually estimate only the amount of *misaligned* voting. This quantity is generally lower than the amount of *strategic* voters since some voters will be voting strategically when voting for a top-ranked candidate whom they genuinely prefer. Consider the Alvarez and Nagler (2000) estimate that 7% of voters exhibit misaligned voting. We know that supporters of the 3rd-ranked candidate can comprise no more than $\sim$33% of the population. A crude transformation of their estimate into the proportion voting strategically is thus $\frac{7}{33} \approx 21\%$. Even this estimate is far lower than that estimated in Kawai and Watanabe (2013). We thank the editors for pointing out this discrepancy in the previous literature, which prevents straightforward comparisons of estimates.

[5]Also, many voters might vote non-strategically because they have other reasons for turning out and voting—e.g., intrinsic benefits that do not depend on the outcome—and this might vary across elections.

Thus far, the literature has not directly addressed the role of information in accounting for the amount of strategic voting that occurs. This paper represents a first step in that direction.

Why should we care about the role of information? First, understanding the role of the information environment helps us understand the limits of strategic voting—where we can expect strategic voting to occur and where we might expect it not to occur. Insufficient levels of strategic voting—construed in this instance as a surplus of "wasted" votes—may lead to inefficient electoral selection, in which high quality candidates can be at risk of losing to lower quality candidates because of vote splitting. Information, if it prevents vote wasting, might help address this inefficiency. Understanding the role of information is also important in considering the design of electoral institutions. For example, runoff primaries, or institutions that give a larger role to party elites—e.g., pre-primary endorsing conventions, "challenge" primaries (in which candidates must exceed a given threshold in a pre-primary convention to be placed on the primary ballot), or minimum thresholds for winning with post-primary conventions to choose nominees when no candidate exceeds the threshold—are particularly desirable in low-information environments. Runoffs often yield the same outcomes as strategic voting, where no votes are wasted, even when voters lack the information necessary to vote strategically. At a minimum, runoffs help prevent the worst types of candidates from winning.[6]

In addition, showing that the information environment matters provides a rationale for the provision of polling data. Critics of the media often complain about the tendency for media outlets to focus on "horserace" coverage of elections (who is ahead and who is behind and by how much), but this type of coverage may be beneficial if it facilitates strategic voting. Finally, studying variation in the information environment can increase confidence in our measures of strategic voting. We expect to observe more strategic voting in high-information elections than in low-information elections, so if a particular measure of strategic

[6]Related electoral institutions, such as ballots with first and second choices, might also be considered.

voting does *not* exhibit this pattern then we might question whether it actually measures strategic voting.

To attack this issue, we study U.S. primary elections involving three or more candidates—those with the potential for strategic voting or vote wasting. In this setting, we exploit three sources of variation in information levels. The first source of variation is the salience of the office sought. We compare voter behavior in high-information races (e.g., primary elections for governor or U.S. senator) to voter behavior in low-information races (e.g., primary elections for state auditor, state treasurer, or secretary of state). The second source of variation is the type of actor. We compare the behavior of high-information actors, specifically, campaign donors, with the behavior of low-information actors, namely, ordinary voters. In addition, we compare those donors who are probably the most informed (interest groups) with donors who are probably less informed (individuals).[7] The third source of variation involves media market structure. We compare the behavior of voters in relatively high-information areas—those living in television markets that lie entirely or predominantly inside the state—with the behavior of voters in relatively low-information media markets—those living in television markets that lie predominantly outside the state.

Overall, we find consistent evidence that the degree of vote wasting depends on the information available. While 80% of votes go to the top two candidates in lower office elections, more than 91% goes to the top two candidates in races for governor or U.S. senator. For any given level of office, group donors consistently heap their support on the top two candidates more than do voters and individual donors. Even for low offices, almost 95% of group donations go to the top two candidates. We also find that the degree to which votes are wasted is strongly and negatively related to the degree of competition among the top two candidates in races for governor or U.S. senator, but not in races for lower offices. Finally, we show that counties with access to in-state media, which covers relevant

[7]This second source of variation is a mix of information and "sophistication" since campaign donors—especially interest groups—not only have more information but might be better at using this information strategically.

elections, systematically waste fewer votes on primary candidates outside the top two than do neighboring counties in out-of-state media markets.

The remainder of the paper is organized as follows. First, we describe the data we use in our analyses. Next, we compare the frequency of strategic voting across offices and actors with lower or higher degrees of information. Subsequently, we investigate differences in the relationship between the competitiveness of elections and the degree of strategic voting across offices. In the final analysis, we use adjacent counties in different media markets to isolate the causal effect of information on strategic voting. Finally, we conclude by discussing the implications of our findings.

2 Strategic Voting and Giving Across Offices

In this section we examine patterns of voting and donation behavior in U.S. primary elections. We quantify the level of strategic voting and giving, and we examine how that behavior changes across two dimensions of information: across actors with more or less information about the expected outcome, and across offices where more or less polling, campaigning, and other sources of information are present.

2.1 Data

We study primary elections for statewide executive offices, the U.S. Senate, and the U.S. House of Representatives over the period 1990-2010. We rely on three datasets. The first is a dataset on election returns for primary elections for a range of offices.[8] The main offices are: Governor, Lieutenant Governor, Attorney General, Auditor (sometimes called Controller or Comptroller), Secretary of State, Treasurer, Agriculture Commissioner, and Education

[8]See Ansolabehere et al. (2010) for more details.

Commissioner (sometimes called Superintendent of Education or Public Schools), as well as U.S. Senator, and U.S. Representative.[9]

The second dataset is on contributions to state political office. The source is the "Follow the Money" website of the National Institute on Money in State Politics, which contains information on all contributions made in state elections.[10] To ensure that we only include contributions made for the primary election, we drop all contributions made on or after the date of the primary election, using a dataset of primary election dates compiled from the Federal Elections Commission (FEC) and various state election reports.[11]

The third dataset, compiled from FEC data, provides the contribution data for federal offices. Unlike the state contribution data, the FEC data explicitly codes contributions as intended for the primary or general, so we are able to isolate primary election contributions directly. We merge all three datasets and compile candidate vote, individual donation, and group donation totals by race. For each donation record, the Follow the Money and FEC datasets identify whether the donor is an individual or a group based on federal and state disclosure requirements.

We keep all elections in which we have both the vote totals and contribution data, and in which there are *at least* three primary election candidates. Because not all elections receive appreciable amounts of contributions, the final merged dataset for which both election and donation data exists covers many but not all of the offices for which we have election data. Specifically, the final merged offices, with sample sizes in parentheses, are: Adjutant (1); Agriculture Commissioner (11); Attorney General (32); Auditor (16); Comptroller (12); Corporate Commissioner (2); Court of Criminal Appeals (3); Education Commissioner (19); Finance Commissioner (1); Governor (155); U.S. House (1,337); Insurance Commissioner (7);

[9]For the sake of completeness, we also include a small number of observations on other offices for which scattered election returns exist. These include: Land Commissioner, Insurance Commissioner, Adjutant, and fewer than 10 observations on idiosyncratic, state-specific elected offices (e.g., Railroad Commissioner in Texas).

[10]See `http://www.followthemoney.org`.

[11]The FEC data is from `http://www.fec.gov/pubrec/fe2010/2010pdates.pdf`, `http://www.fec.gov/pubrec/fe2012/2012pdates.pdf` and related documents.

Justice (7); Labor Commissioner (5); Lands Commissioner (4); Lieutenant Governor (66); Public Service Commissioner (6); Railroad Commissioner (2); U.S. Senate (234); Secretary of State (31); and State Treasurer (25).[12,13]

2.2 Variation in the Information Available Across Offices

Although it may be obvious to some readers, we begin by providing evidence that more information is available in races for higher' offices (state governor and U.S. Senator) than in races for lower offices (down-ballot statewide offices), with races for the U.S. House in between. Specifically, we show that campaign spending and media coverage are both higher in races for higher offices.

Consider all races with three or more candidates. For each candidate we compute the total amount of dollars contributed, using the FEC data described above for federal elections and the Follow the Money data, also described above, for state-level elections. We then calculate race totals as the sum of the candidate-level totals. To approximate per-constituent contributions, we divide the race contribution totals by state population and, for the U.S. House, by the approximate number of constituents per district, calculated as the state's population in a given year divided by the number of districts in the state.[14]

For each of the top three candidates we also searched the Newslibrary.com archive for articles mentioning the candidate.[15] We searched in all sources located in the candidate's state during the three months leading up to the primary election, and counted the number

[12]We limit attention to 1990–2010 because this is the period covered by the Follow the Money data. The dataset on election returns covers a large range of years, including the entire post-WWII period, and the FEC datasets cover the period 1980-2012.

[13]For full analyses when we do not merge with the campaign contribution data, the offices, with sample sizes in parentheses, are: Adjutant (2); Agriculture Commissioner (19); Appeals Court (1); Attorney General (60); Auditor (31); Court of Civil Appeals (2); Comptroller (17); Corporate Commissioner (9); Court of Criminal Appeals (22); Education Commissioner (24); Finance Commissioner (1); Governor (262); U.S. House (1,386); Insurance Commissioner (21); Justice (10); Labor Commissioner (12); Lands Commissioner (10); Lieutenant Governor (108); Public Service Commissioner (15); Railroad Commissioner (4); U.S. Senate (236); Secretary of State (54); State Treasurer (43).

[14]Data on state population by year is from the U.S. Census.

[15]The vast majority of media sources in Newslibrary.com are newspapers, although for recent years the archive also covers many local television news stations.

Table 1 – Information Levels By Office Type

	Newspaper Hits Per 100,000 People		Campaign Contributions Per Constituent ($)	
	Mean	N	Mean	N
Lower Offices	2.57	245	0.12	250
U.S. House	6.01	846	0.49	1337
Higher Offices	9.69	301	0.61	389

Sources: NewsLibrary, FEC, Follow the Money. Sample sizes differ based on data availability.

of articles that contained the candidate's name, the name of the office he or she was seeking, and the word "election." We then summed the counts across the three candidates to make a total for each race, and we again converted these to "per constituent" totals using population data and the number of House districts.

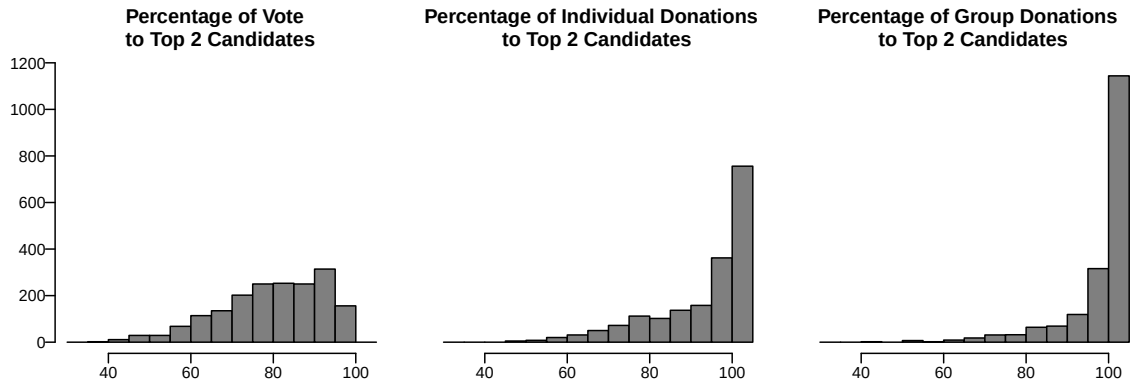
Table 1 shows the results. Both in terms of newspaper coverage and in terms of campaign contributions, races for higher offices—Governor and Senator races—rank the highest, with the U.S. House somewhat below and lower statewide offices a clear third. This is consistent with the evidence presented in Hirano et al. (N.d.), which shows that voters learn about ideology during campaigns for higher offices but not for lower statewide offices.

2.3 Information, Strategic Voting and Strategic Giving

We now turn to the study of strategic voting, or "vote wasting," and strategic campaign donations.

Figure 1 presents histograms of the distribution of the total votes or donations that the top two candidates in a race receive as a share of all votes or donations in the race. Consider the left panel. This panel shows that, in the vast majority of contested primary elections with at least three candidates, the top two candidates receive at least 50%, and often much more, of all votes. However, they often receive far less than *all* votes, as would be predicted by a model of pure strategic voting.

Figure 1 – Vote and Donation Percentages to Top Two Candidates, All Offices. Each histogram presents the distribution of the share of votes or donations that go to the top two candidates in primary races with three or more candidates. Across all races, donors and especially group donors are much more likely to give all their support to the top two candidates. They are thus less likely than voters to waste support on candidates outside of the top two.



The second two panels contrast sharply with the first. In a large proportion of all contested primary elections with at least three candidates, *all* individual contributions and *all* group contributions flow to the top two candidates. This behavior is especially marked among group donors, who we might expect have more information, and are more strategic, than individual donors. It is also possible, based on this evidence, that the behavior of donors induces even sincere (non-strategic) voters to heap their votes. Perhaps there would be even less voter heaping, for example, if donors did not give funds disproportionately to the top two candidates, who can then use those funds to induce voter support. While this is a possible channel by which donors can help voters avoid wasting votes, it is interesting to see that, at the end of the day, donors still appear more strategic than voters. Likewise, it could be that voters are strategic but donors care only about supporting winners, in which case voter heaping could produce donor heaping. The fact that we find so much more donor heaping than voter heaping suggests this is a less important mechanism, though we cannot rule out its existence.

Though telling, the histograms pool over office types and number of candidates. Inevitably primary elections with more candidates will have more votes going to candidates other than the top two, unless strategic voting is perfect. To account for this, we now focus on the percentage of votes and contributions going to the lesser candidates—candidates 3 through k where k is the number of candidates in the race, and we investigate relationships across the number of candidates.

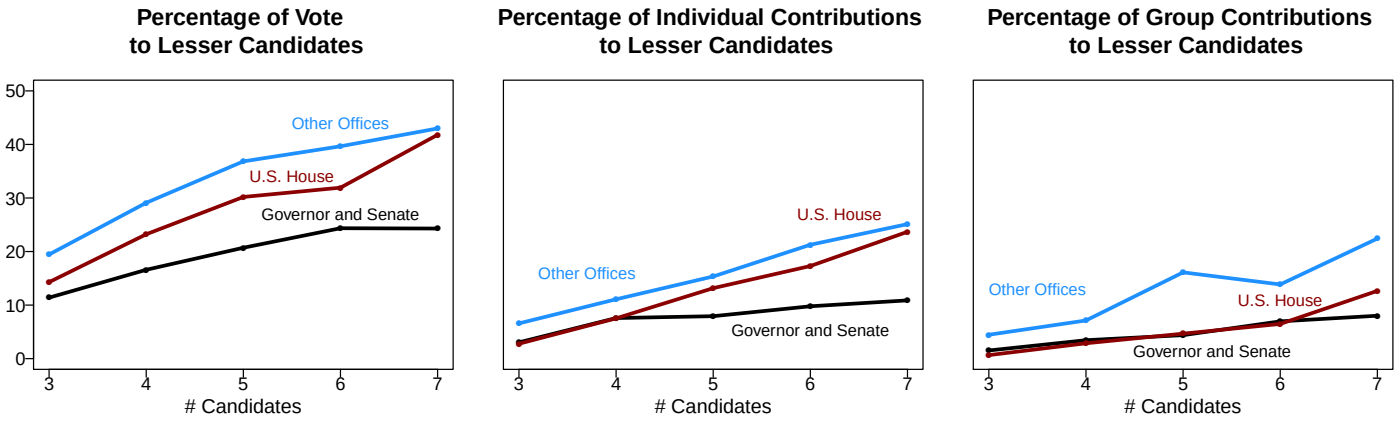
If information plays a role in strategic voting, then we should expect to see more strategic voting—and thus a smaller percentage of votes to the lesser candidates—in higher offices.[16] In particular, we should expect the U.S. House to exhibit a smaller percentage of votes going to lesser candidates than the other offices, i.e., lower state offices, and we should expect Governor and Senate primary races to exhibit a smaller percentage than the U.S. House.

Figure 2 examines this prediction, plotting the percentage of the primary vote to lesser candidates (those not in the top two) across the number of candidates separately for each of the three sets of offices. Consider the left panel. We see as expected that a higher percentage of votes go to the lesser candidates as the number of total candidates increases (the horizontal axis). We also see the expected pattern across offices. Other offices—lesser state offices like Attorney General and Secretary of State—exhibit consistently higher vote percentages flowing to candidates outside of the top two. U.S. House primary races display less of these "wasted" votes, and Governor and Senate races display the least.

The next two panels examine these same relationships for individual and group donors. The levels of the lines in the panels fall as we look across the panels; this represents the increasingly strategic behavior we see across these actors. Group donors, as before, appear to be the most strategic, "wasting" almost none of their contributions, especially in races for higher offices.

[16] In many down-ballot races there is a fairly large amount of "roll-off." The voters who abstain in these races are probably not well informed. It is likely that if they had voted they would have voted somewhat randomly, probably exhibiting a larger fraction of "wasted" votes than those who actually voted. So, roll-off may lead us to under-estimate the value of information in facilitating strategic voting.

Figure 2 – Vote and Donation Percentages to Lesser Candidates Across Offices and Number of Candidates. Plots the votes or contributions flowing to lesser candidates (those not in the top two in the race) as a share of all votes or contributions in the race. More votes and contributions are "wasted," i.e., flow to lesser candidates, in lower salience settings. In addition, more strategic and more informed actors—especially group donors—waste fewer contributions.



We also examine these relationships more formally using simple dummy-variable regressions to estimate conditional means. We estimate equations of the form

$$Y_i^{[12]} = \beta_0 + \beta_{House} House_i + \beta_{High} High_i + \sum_{j=3}^{N} 1\{\#Candidates_i = j\} + \epsilon_i \quad (1)$$

where $Y_i^{[12]}$ is the share of either votes or money flowing to the top two primary election candidates in race i. The variable $House_i$ is a dummy variable indicating whether race i is a U.S. House election or not, and $High_i$ indicates a "higher office" election, either a Governor or U.S. Senate race. The omitted category is therefore lower offices, i.e., Attorney General, Secretary of State, etc. Finally, the summation represents dummies for each possible number of candidates, starting with 3 since we only include primary elections with at least three candidates.

Table 2 presents the results. In the first column, we include all elections and summarize the percent of votes going to the top two candidates. In the next three columns, we include

Table 2 – Percent of Votes and Donations to Top 2 Candidates Across Offices, 1990-2010. Higher offices, where more information is avaiable, exhbit fewer wasted votes and donations than lower offices. Across all offices, donors act more strategically than voters.

	All Races	Races with Donation Data		
	Vote (%)	Vote (%)	Individual Donations (%)	Group Donations (%)
Constant (Other Offices)	79.76 [0.41]	80.07 [0.57]	93.44 [0.71]	94.29 [0.66]
U.S. House	5.42 [0.47]	5.91 [0.62]	3.15 [0.76]	5.05 [0.71]
High Offices	11.79 [0.63]	12.16 [0.78]	5.66 [0.89]	5.10 [0.78]
# Candidates FE	Yes	Yes	Yes	Yes
N	2349	1813	1813	1813

Regression coefficients from Equation 1. Lesser offices are omitted category for estimated coefficients. Robust standard errors in brackets.

only the merged dataset of elections where we have both electoral returns and contribution data. The rows reflect the estimates for β_0, β_{House} and β_{High} from Equation 1. Thus, the first row indicates the average percentage of votes or donations flowing to the top two candidates in races for lesser offices (e.g., Attorney General, Secretary of State, etc.) Consistent with the figures, we see that individual and especially group donors "waste" fewer donations on other candidates than do voters in lesser offices. Group donors are estimated to contribute almost 95% of all donations to the top two candidates, even in lesser office races.

However, as we look across more salient offices in which voters receive more information about candidates, the share of votes flowing to the top two candidates rises precipitously. In "high" offices—Governor and Senator—voters heap almost 92% of their votes on the top two candidates according to the first column (79.76 + 11.79 = 91.55%). Individual and group donors' patterns rise in the same way across the offices, though their increases are not as dramatic since, presumably, they possess more information than do voters even in races for lower offices.

Other factors besides information may help explain the pattern of evidence we have uncovered in this analysis, although the differences in salience across the contexts is difficult to dismiss. One possibility is that higher offices may be more likely to have skewed distributions of candidate quality in primary elections—in particularly, they might be more likely to have an incumbent in a multi-candidate primary, in which case we might see more heaping of votes on the top two candidates.[17] To ensure that this is not driving our results, Table A.1 in the Appendix replicates the analysis using only open primaries. We continue to find the same relationship between office type and strategic voting. In addition, the subsequent analyses represent attempts to ensure that information, and not other unobserved factors besides incumbency, helps explain the behavior we observe.

2.4 Competition, Information, and Strategic Voting

Intuitively, fewer voters should "waste" their votes when the race between the top two candidates is especially competitive. If it appears from polls that the first-place candidate is far ahead of the second-place candidate, so the probability of a tie is extremely low, voters might decide that there is no point in being highly strategic with their vote if some other motive—e.g. voting simply to express their preference, or to "send a message" on some issue position, or to protest against corruption by the incumbent—is present. On the other hand, if it appears from the polls that the race between the top two candidates is tight, then more voters might decide that casting a strategic vote is worthwhile.

While it is intuitive that voters have more incentive to avoid "wasting" their votes in close elections, recent theoretical work shows that the situation is more complicated (Myatt 2007). Suppose for example, that there are three candidates, A, B, and C, with expected vote shares $v_A > v_B > v_C$. If v_B increases and v_C falls with v_A fixed, then A's expected margin over B falls, *and* B's expected margin over C increases. This increases the incentives

[17] Another possibility is that there are unobserved differences across states correlated with the number of lower-office elections the state has and linked to the heaping behavior. To rule this out, in the Appendix we re-estimate the main analyses including state fixed effects. Coefficients are nearly unchanged.

for a voter whose favorite candidate is C to vote strategically for either A or B. On the other hand, if v_A falls and v_C increases with v_B fixed, then although A's expected margin over B falls, B's expected margin over C also falls. In this case the incentives for a voter whose favorite candidate is C to vote strategically might decrease. It is not as obvious that the vote for C will be "wasted," because with uncertainty about the vote shares C might really be in second place rather than B.

Alternatively, consider the following argument involving the probabilities of a tied election. Suppose now that we make the gap between A and B smaller by lowering v_A and dividing that extra vote share evenly between v_B and v_C (so that the vote shares still sum to 1), then a tie between A and B becomes more likely, but so does a tie between A and C. The absolute probability that A and B tie has therefore increased, but the relative probability of being pivotal in a choice between A and B vs. in a choice between A and C has not. Thus, from a theoretical point of view it is not clear how strong the relationship between competitiveness and wasted votes should be. Rather, it depends on how much voters pay attention to "relative" vs. "absolute" probabilities of various pivotal events.

By investigating the link between competitiveness and strategic voting empirically, we may be able to shed some light on these possibilities. If we find a positive link between the two, it might suggest that voters do care about competitiveness and focus on absolute probabilities of being pivotal (i.e., when they see A and B become closer in the polls, they become more likely to move their vote to either A or B). On the other hand, if we find no link between competitiveness and strategic voting, then we may not be able to distinguish between whether (a) voters simply do not react to increases in competitiveness, or (b) voters do care about competitiveness but focus on relative probabilities of being pivotal, which may remain unchanged in our empirical specifications. We therefore proceed with our analysis aware of this possible ambiguity. As it turns out, we find evidence that competition is associated with strategic voting, but only in higher-information settings.

To investigate the relationship between wasted votes and competition, we study a slightly different dependent variable than in the previous section. We do this because there is a strong and negative "mechanical" relationship between the vote for the top two candidates (the variable studied in the previous section) and competitiveness. The reason is as follows: Consider a situation where candidate A is in the lead and candidate B is in second place. If candidate A is extremely popular and receives a large share of the votes, then (i) the share of the total votes for A and B combined will increase (because of the votes for A), and (ii) candidate A's margin of victory over B will also increase—i.e., the race between A and B will be less competitive. Evidently there are many such cases in our data, e.g., many of the cases where candidate A is an incumbent.

Thus, in this section we drop the first-place candidate and study the votes for the second place candidate as a fraction of the total votes for all candidates except the first-place candidate. We ask the question, How many voters whose favorite candidate is neither A nor B (i.e., not among the top two), but who prefer candidate B over candidate A, vote strategically for candidate B rather than their favorite candidate? More importantly for us, is it the case that more voters vote strategically in this way when the race between candidates A and B is close, especially for higher offices? We therefore estimate the following equation:

$$\begin{aligned} Y_i^{[2]} = \beta_0 + \beta_{House} House_i + \beta_{High} High_i + \gamma_0 Competition_i + \gamma_{House} House_i \times Competition_i \\ + \gamma_{High} High_i \times Competition_i + \sum_{j=3}^{N} 1\{\#Candidates_i = j\} + \epsilon_i \end{aligned} \tag{2}$$

where $Y_i^{[2]}$ is the votes for the second-place candidate as a fraction of the total votes for all candidates except the first-place candidate, $House_i$ and $High_i$ are as above, and $Competition_i$ is 1 minus the first-place candidate's share of the total votes for the top two candidates (equivalently, the second-place candidate's share of the total votes for the top two candidates). We de-mean $Competition_i$ so that the estimates of β_{House} and β_{High} are easier to interpret.[18]

[18] These coefficients then measure the effects of $House_i$ and $High_i$, respectively, holding $Competition_i$ fixed at its mean value.

Table 3 – Percent of Votes Not Cast For Winning Candidate That Go to Second-Place Candidates Across Offices, 1990-2010.

	Percent to Candidate 2	Percent to Candidate 2
Constant (Lower Offices)	61.30 [0.53]	61.54 [0.60]
U.S. House	3.97 [0.59]	4.12 [0.65]
High	9.01 [0.85]	10.64 [0.93]
Competition (Lower Offices)	–	0.02 [0.06]
U.S. House × Competition	–	0.11 [0.06]
High × Competition	–	0.32 [0.07]
# Candidates FE	Yes	Yes
N	2349	2349

Regression coefficients from Equation 1. Lesser offices are omitted category. Robust standard errors in brackets.

The main coefficients of interest are γ_{High} and γ_{House}. For example, γ_{High} measures the relationship between the degree of competition among the top two candidates and the degree of strategic voting in races for governor and U.S. senator, compared to the relationship in races for lower statewide offices. If more voters are informed about whether or not the race between the top two candidates is close, and if more voters vote strategically when the race between the top two is close, then γ_{High} should be positive.

Even after dropping the first-place candidate there may be a "mechanical" relationship between $Y_i^{[2]}$ and $Competition_i$. Both of these variables should tend to increase as the vote for the second-place candidates increases. This mechanical effect appears to be weak in our data, however, since as we show below the relationship between $Y_i^{[2]}$ and $Competition_i$ is essentially flat for lower statewide offices. More importantly, there is no obvious reason to expect that this mechanical effect is larger in races for governor and U.S. senator than in races for the U.S. House or lower statewide offices.

Table 3 shows the results. In the first column, we include only dummies for U.S. House races and higher office races, along with dummies for the number of candidates, to show how the means of the new dependent variable look. Like in the previous analysis, we see that both U.S. House primary voters and primary voters in higher office elections waste fewer votes—illustrated here by the fact that the coefficients on House and High in the first column are positive, indicating that a larger share of all votes not cast for the winning candidate go to the runner-up and not to any of the lesser candidates.

The second column estimates equation 2 from above. We do not find a significant relationship between competition and strategic voting in lower offices. In the U.S. House, on the other hand, a one percentage-point increase in competition is associated with a .13 percentage point increase (0.02 + 0.11) in the share of votes not cast for the winning candidate that go to the second-place candidate—a large increase in the amount of strategic voting. We can marginally reject the null that this relationship is the same as that in lower houses ($p = 0.088$). In higher offices this difference is more pronounced.[19] Here a one percentage-point increase in competition is associated with a .34 percentage-point increase in strategic voting, and we can reject the null that this relationship is the same as in lower offices.[20]

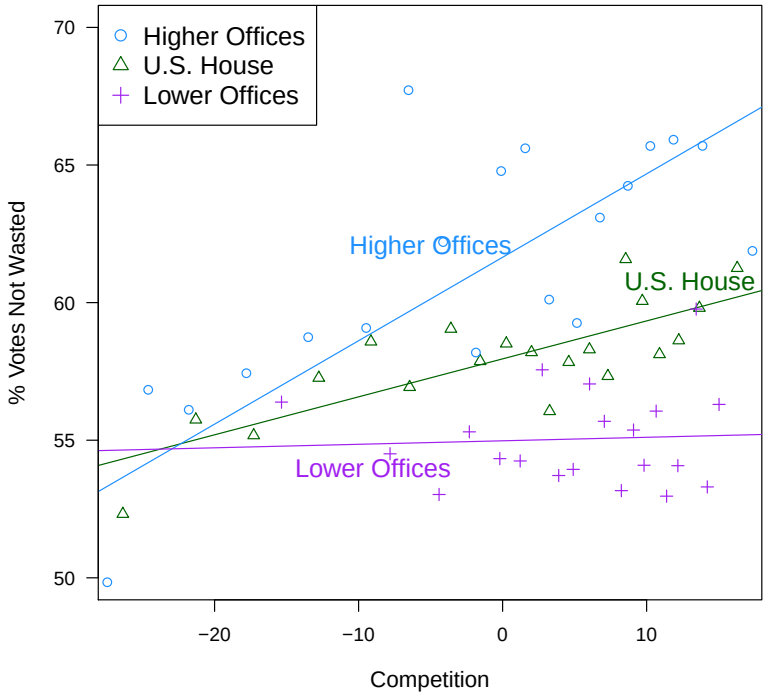
To illustrate the varying relationship between competition and strategic voting across electoral contexts with differing levels of information, Figure 3 plots the equivalent information from the regression. The graph presents averages of the strategic voting measure in equal-sample-sized bins of the competition variable, with the data residualized by the control variables from equation 2—namely, the fixed effects for the number of candidates.[21] The figure is therefore the graphical equivalent of the regression from before. As the plot shows, the relationship between competition and strategic voting grows across electoral contexts with more information.

[19] In Appendix Table A.2 we replicate this analysis excluding primaries where an incumbent is present. We continue to find the same pattern of evidence.

[20] We also reject the null that the relationship is the same for the House and higher offices ($F = 20.97; p < 0.0001$).

[21] The plot was generated using the `binscatter` command in Stata.

Figure 3 – Competition and Strategic Voting Across Offices. Competition leads to fewer wasted votes in higher offices but not in lower offices.



Note: "% Votes Not Wasted" is measured as the percent of all votes not cast for the winning candidate that go to the runner-up candidate. "Competition" is measured as the percent of all votes going to the top two candidates that the winner receives, de-meaned so that it has mean 0. Points are averages in equal-sample-sized bins of the competition variable.

3 Isolating Information Effects Using Media Markets

In the preceding analyses, we showed how two dimensions of variation suggest the presence of a significant amount of strategic behavior in U.S. elections. First, political actors with more information about expected electoral outcomes, i.e., individual and especially group donors, support the top two candidates in primary races with 3 or more candidates at a higher rate than actors with less information, i.e., voters. And second, all three groups of actors increase their support for the top two candidates in races for higher offices, elections in which there is more campaigning, more polling, and thus generally more information about expected outcomes.

These are relevant dimensions of variation, and the large sample sizes offer statistical power. However, pooled comparisons run the risk of confusing other, unobserved differences between races and between political actors with differences caused by the varying levels of information. To isolate the effect of information more cleanly, in this subsection we take advantage of variance in information that results from county-level exposure to information from the media.

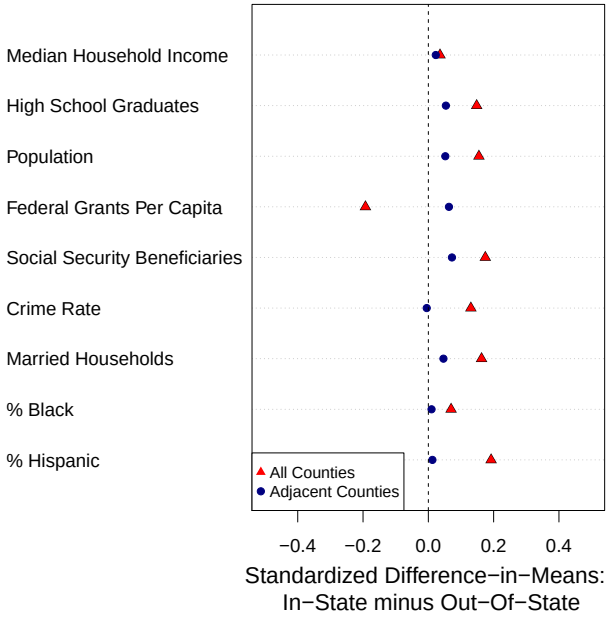
We pursue an identification strategy similar to that in Ansolabehere, Snowberg, and Snyder (2006) and Snyder and Stromberg (2010). We identify adjacent counties that, while similar in other ways, are situated in different media markets according to the media data from Snyder and Stromberg (2010). One set of counties resides in a media market that delivers residents news about their elected officials, while the other set resides in an out-of-state media market that instead delivers residents news about elected officials in the other state, not the state in which they vote. Snyder and Stromberg (2010) document the consequences this arrangement has on the information levels of voters and on the resulting behavior of elected officials.[22]

Comparing voting behavior in counties with in-state media markets to those in out-of-state media markets directly might still not identify the causal effect of information since these counties differ from each other in many ways. Accordingly, we use *adjacent* counties—pairs of counties sharing a physical border but differing in whether they are in an in-state or out-of-state media market.

Figure 4 presents balance tests on a variety of covariates that shows how much more similar these adjacent counties are to each other, compared to the raw comparison of all in-state

[22]How much more information do in-state counties get about local politics as compared to out-of-state counties? Ansolabehere, Snowberg, and Snyder (2006) reports that in-state TV news shows air roughly 10 times as many stories about the in-state's governor than about other governors, so the information effects are likely to be large. Of course, we cannot say for certain the size these information effects will be for our study, since we study a variety offices (including but not limited to the governor), and we do not know the size of the "first-stage" effects of news stories on voter information for our sample. We should note that Ansolabehere, Snowberg, and Snyder (2006) documents considerable effects on voter information, however. For example, the paper reports that survey respondents were 20 percentage-points more likely to report seeing a senate candidate on TV if they lived in an in-state media market county.

Figure 4 – Balance On Covariates, All Counties vs. Adjacent Counties. Focusing the analysis on comparisons of adjacent counties that differ in their access to in-state media improves balance on a variety of pre-treatment covariates.



and out-of-state media market counties regardless of location.[23] The red triangles represent these raw comparisons and the blue dots represent the comparisons on the "matched" sample of adjacent counties. Though on average across all counties, in-state media market counties receive fewer federal grants, have higher crime rates, and are more populous, among other things, adjacent counties are highly comparable on all observed dimensions.

Figure 5 provides a map of the continental U.S., with the adjacent counties colored. The figure shows that many states and all regions of the U.S. are represented.

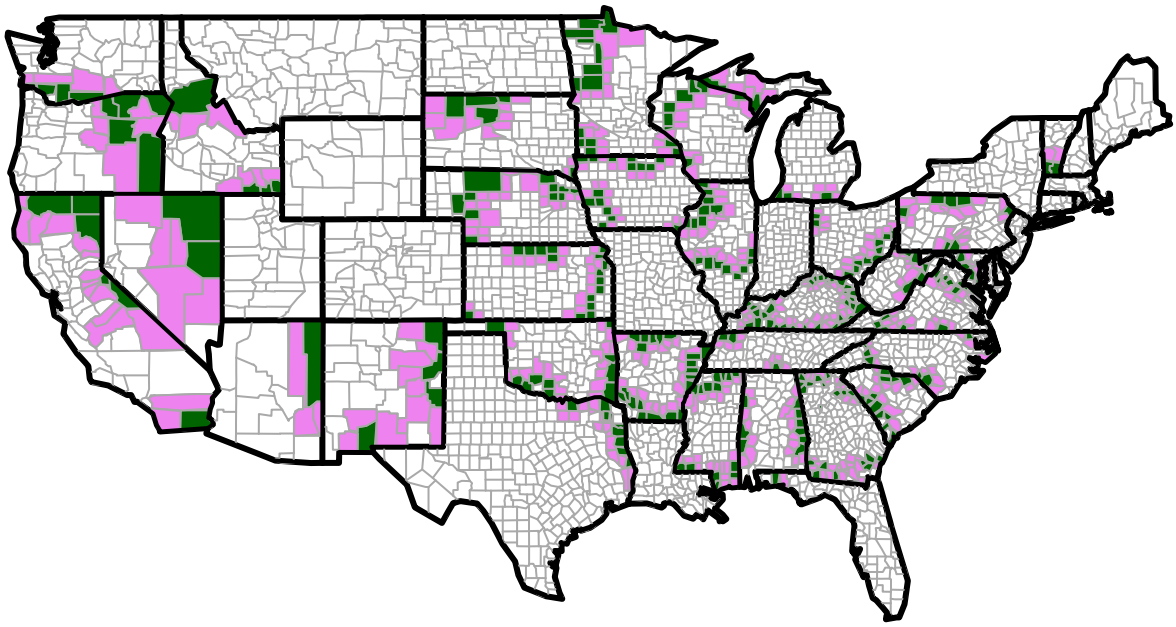
Having validated the identification strategy, we now apply it. We estimate equations of the form

$$Y_{ic} = \beta_0 + \beta_1 In\ State\ Media\ Market_c + \gamma_i + \epsilon_{ic} \tag{3}$$

where the variable Y_{ic} represents the share of votes going to the top two candidates in race i in county c. The variable $In\ State\ Media\ Market_{ic}$ is a dummy indicating whether county c

[23]Data on the demographics of counties comes from the 2000 U.S. Census.

Figure 5 – Counties Included in Adjacent Counties Analysis



Note: Counties in green (or dark gray if graph is black and white) are those in out-of-state media markets. Counties in pink (or light gray) are adjacent in-state media market counties.

is in its own state's media market or not. The quantity of interest is the coefficient on this dummy, β_1, indicating the difference in the average percentage of votes going to the top two candidates between in-state and out-of-state media market counties. Finally, γ_i represents the inclusion of fixed effects for each race. These fixed effects mean that we are relying only on *within*-race comparisons between two sets of voters—those in the state media market and those outside of it.

Table 4 presents the results both using all counties (first two columns) and using the adjacent counties. As the latter two columns show, the additional information from being an in-state media market causes a discernible increase in the percentage of votes going to the top two candidates. Among all races in adjacent counties (third column), being in the in-state media market is estimated to cause a 1.58 percentage-point increase in the percentage of the vote flowing to the top two candidates.

Although we believe that the within-race variance in media market provides exogenous leverage on information, this information could affect vote aggregation through a variety of channels. One channel, the one we are interested in, is by informing voters about the expected outcome and thus signaling voters about which candidate to support and which to abandon strategically. Another possible channel could be that the increase in information better informs voters about which candidates are of high quality. If the distribution of quality is, for some reason, such that the top one or two candidates have the lion's share of the quality, then information could cause the observed increase in vote percentage to the top two without the effect indicating the presence of strategic voting.

We think this is unlikely for two reasons. First, there is no clear reason why primary races with three or more candidates would systematically involve a skewed quality distribution in which the top one or two candidates possess a disproportionately large share of the quality. Second, in the second and fourth columns of Table 4, we subset the analysis to only races in which no candidates have previous office-holder experience, a commonly used measure of candidate quality (Jacobson 1989). To calculate this measure for our samples, we track candidates by name and state, and we record any previous offices they have held. The effects remain quite similar even in this subset of races in which the information revelation is less likely to concern candidate quality. Finally, we also replicate the analysis excluding races with an incumbent. Table A.3 in the Appendix presents the results, which lead to the same conclusions as those presented here.

These effects are precise if not extremely large, though they represent a somewhat larger change in behavior on the part of non-strategic voters. For example, from β_0 in the third column we see that 75.62% of votes go to the top two candidates in counties in the out-of-state media market. Thus 24.38% of votes (100-75.62) are "wasted" on the other candidates in the race. In the in-state media markets, though, 22.8% of votes are wasted (100-(75.62+1.58))—a decrease of 6.5 percentage points in the percentage of non-strategic voters.

Table 4 – County-Level Analysis. Counties in in-state media markets, which receive more information about elections, exhibit less vote wasting than counties in out-of-state media markets.

	All Counties		Adjacent Counties	
	Vote Pct, Top 2	Vote Pct, Top 2	Vote Pct, Top 2	Vote Pct, Top 2
In-State Media Market (β_1)	2.36	2.16	1.58	1.33
	(0.37)	(0.66)	(0.24)	(0.67)
Out-of-State Media Market (β_0)	75.28	70.34	75.62	71.06
	(0.29)	(0.53)	(0.14)	(0.39)
N	26,508	3,941	8,213	1,166
Race Fixed Effects	Yes	Yes	Yes	Yes
Races Included	All	No Experience	All	No Experience

Robust standard errors clustered by race in parentheses. Out-of-State Media Markets are the omitted category (β_0).

When elections occur in higher information contexts, primary voters heap more of their votes on the top two candidates. In this section, we take account of the possible unobserved differences between offices, other than their differences in information, by comparing how voters heap their votes within the same race in different counties. These counties differ from each other in their exposure to media content about the race, but are plausibly similar in other respects. In this alternate comparison, we again see that information leads to a higher aggregation of votes on the top two candidates. Likewise, we also see that donors, who are likely to possess more information than voters and have more incentives to act strategically, consistently aggregate more of their contributions to the top two candidates.

4 Conclusion

We have shown that there appears to be a non-trivial amount of strategic voting in U.S. primary elections, and we have demonstrated that it varies with the information environment. Although many votes are "wasted"—i.e., cast for candidates that wind up in third place

or lower—significantly fewer votes are wasted in contexts where voters have more information, including in more salient elections. In addition, fewer votes are wasted in elections in counties with greater access to media coverage of state politics. Finally, across all contexts, campaign donors, especially interest group donors, "waste" very little of their money on candidates other than the top two. This evidence is supportive of theoretical predictions that information about expected vote outcomes plays an important role in facilitating strategic voting. In low information environments, a proliferation of candidates leads to increasing numbers of "wasted" votes.

The findings point to the value of media coverage—even the sometimes breathless "horse race" coverage—for helping voters coordinate on viable candidates. The findings also have implications for the design of electoral institutions. "Wasting" votes in primary elections with many candidates is not merely an indicator of whether voters follow the dry, abstract models of strategic voting that political science and economics has proposed. It also reflects the degree to which voters' preferences are efficiently aggregated in the electoral process. When information about the candidates is scarce, more voters support candidates who cannot win the race, which can lead to "mistakes" in which less-preferred candidates win. This suggests that runoff primaries—which give voters the chance to update and choose among the top two candidates from the first round—may be particularly valuable for selecting nominees for down-ballot offices and in other low-information settings. Alternatively, we might consider institutions that give party elites a larger role, such as pre-primary endorsing conventions, "challenge" primaries, or minimum thresholds for winning with post-primary conventions to choose nominees when no candidate exceeds the threshold. These might be preferred if the party elites help coordinate candidate and/or voter behavior in ways that mimic strategic voting.

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Appendix

Intended for online publication only.

First, we replicate the three main analyses from the paper excluding primary elections in which any incumbents are present. As the tables show, all results are robust to the exclusion of these races. This suggests that the findings are not driven by differences in the frequency of incumbent presence across contexts.

Second, we replicate Tables 2 and 3 from the paper with the inclusion of state fixed effects. Again, we continue to find extremely similar point estimates.

Table A.1 – Percent of Votes and Donations to Top 2 Candidates Across Offices, No Incumbents in Race, 1990-2010.

	All Races	Races with Donation Data		
	Vote (%)	Vote (%)	Individual Donations (%)	Group Donations (%)
Constant (Other Offices)	79.29 [0.43]	79.72 [0.58]	93.35 [0.75]	94.17 [0.68]
U.S. House	3.46 [0.50]	3.48 [0.65]	2.24 [0.81]	4.79 [0.76]
High Offices	10.46 [0.70]	10.64 [0.85]	4.68 [0.99]	4.89 [0.86]
# Candidates FE	Yes	Yes	Yes	Yes
N	1869	1394	1394	1394

Regression coefficients from Equation 1. Lesser offices are omitted category for estimated coefficients. Robust standard errors in brackets.

Table A.2 – Percent of Votes Not Cast For Winning Candidate That Go to Second-Place Candidates Across Offices, No Incumbents, 1990-2010.

	Percent to Candidate 2	Percent to Candidate 2
Constant (Lower Offices)	61.23 [0.56]	61.21 [0.68]
U.S. House	2.82 [0.62]	2.59 [0.73]
High	9.66 [0.94]	10.20 [1.02]
Competition (Lower Offices)	–	0.04 [0.07]
U.S. House × Competition	–	0.13 [0.08]
High × Competition	–	0.23 [0.09]
# Candidates FE	Yes	Yes
N	1869	1869

Regression coefficients from Equation 1. Lesser offices are omitted category. Robust standard errors in brackets.

Table A.3 – County-Level Analysis, No Incumbents

	All Counties		Adjacent Counties	
	Vote Pct, Top 2	Vote Pct, Top 2	Vote Pct, Top 2	Vote Pct, Top 2
In-State Media Market (β_1)	2.39	2.16	1.71	1.33
	(0.38)	(0.66)	(0.27)	(0.67)
Out-of-State Media Market (β_0)	73.90	70.34	74.15	71.06
	(0.30)	(0.53)	(0.15)	(0.39)
N	22,063	3,941	6,916	1,166
Race Fixed Effects	Yes	Yes	Yes	Yes
Races Included	All	No Experience	All	No Experience

Robust standard errors clustered by race in parentheses. Out-of-State Media Markets are the omitted category (β_0).

Table A.4 – Percent of Votes and Donations to Top 2 Candidates Across Offices, 1990-2010. Higher offices, where more information is avaiable, exhbit fewer wasted votes and donations than lower offices. Across all offices, donors act more strategically than voters.

	All Races	Races with Donation Data		
	Vote (%)	Vote (%)	Individual Donations (%)	Group Donations (%)
Constant (Other Offices)	80.01 [0.43]	80.61 [0.59]	94.07 [0.70]	94.37 [0.65]
U.S. House	5.25 [0.50]	5.49 [0.65]	2.53 [0.77]	5.09 [0.71]
High Offices	11.52 [0.63]	11.50 [0.78]	5.37 [0.87]	5.14 [0.77]
# Candidates FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
N	2349	1813	1813	1813

Regression coefficients from Equation 1. Lesser offices are omitted category for estimated coefficients. Robust standard errors in brackets.

Table A.5 – Percent of Votes Not Cast For Winning Candidate That Go to Second-Place Candidates Across Offices, 1990-2010.

	Percent to Candidate 2	Percent to Candidate 2
Constant (Lower Offices)	61.33 [0.57]	61.57 [0.65]
U.S. House	4.02 [0.65]	4.26 [0.72]
High	8.54 [0.89]	10.40 [0.96]
Competition (Lower Offices)	–	0.05 [0.06]
U.S. House × Competition	–	0.11 [0.07]
High × Competition	–	0.31 [0.07]
# Candidates FE	Yes	Yes
State FE	Yes	Yes
N	2349	2349

Regression coefficients from Equation 1. Lesser offices are omitted category. Robust standard errors in brackets.

Figure A.1 presents the distribution of the number of candidates across the office types. As we see, the distributions are roughly similar, with a larger share of primaries for higher offices having a larger number of candidates.

Figure A.1 – Distribution of the number of candidates in primaries across office types.