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Charles Stewart III^a
R. Michael Alvarez^b
Stephen S. Pettigrew^c
Cameron Wimp^d

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^aThe Massachusetts Institute of Technology

^bThe California Institute of Technology

^cUniversity of Pennsylvania

^dArkansas State University

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Abstract

Objective: We analyze the significant increase in the residual vote rate in the 2016 presidential election. The residual vote rate, which is the percentage of ballots cast in a presidential election that contain no vote for president, rose nationwide from 0.99% to 1.41% between 2012 and 2016.

Method: We use election return data and public opinion data to examine why the residual vote rate increased in 2016.

Results: The primary explanation for this rise is an increase in abstentions, which we argue results primarily from disaffected Republican voters, rather than alienated Democratic voters. In addition, other factors related to election administration and electoral competition explain variation in the residual vote rates across states, particularly the use of mail/absentee ballots and the lack of competition at the top of the ticket in non-battleground states. However, we note that the rise in the residual vote rate was not due to changes in voting technologies.

Conclusion: Our research has implications for the use of the residual vote as a metric for studying election administration and voting technologies.

^aThe Massachusetts Institute of Technology

^bThe California Institute of Technology

^cUniversity of Pennsylvania

^dArkansas State University

What does it signify when a voter fails to cast a vote for president? Before 2000, it was generally assumed to signify a choice made by the voter to abstain. The Florida recount in 2000, with its tales of hanging chads and butterfly ballots, demonstrated how the lack of a vote for president might instead indicate voter confusion or voting-machine malfunction.

The 2016 election draws attention back to abstention, owing to an increase in the residual vote rate — the percentage of ballots that contained no vote for president — to 1.41%, from 0.99% in 2012 and 1.05% over the three previous presidential elections.¹ As we show, this spike is most likely due to a surge in abstentions, mostly Republicans unwilling to vote for Donald Trump, rather than the sudden failure of voting machines.

The residual vote rate was originally employed to measure the degree to which voting machines may contribute to “lost votes” (Alvarez et al. 2004; Alvarez, Ansolabehere, and Stewart 2005). We suggest that the residual vote rate may also be a tool for measuring the degree of abstention in presidential elections, and may provide a better estimate of presidential abstentions than asking survey respondents whether they intentionally abstained.

This is the first examination of the dynamics of abstention in the 2016 presidential election. Using the canonical theories about behavior and voting machine performance, we examine the increase in the residual vote in 2016. The evidence we offer points to a significant role played by voter abstention, due to alienation from the candidates, particularly among Republicans.

The Residual Vote

The residual vote rate is a measure of voting machine accuracy that was initially championed by the Caltech/MIT Voting Technology Project in 2001, and has been used subsequently in many

¹ To calculate the residual vote rate, a state must report the number of voters who cast a ballot, rather than just the number of votes cast for particular candidates. MS, MO, OK, PA, and TX did not report this information in 2016.

studies of voting technology and election administration.² From the beginning, scholars recognized that variation in the residual vote rate is a function of multiple factors. Among these are abstention, machine deficiencies, poor ballot designs (Niemi and Herrnson, 2003; Kimball and Kropf, 2005), and administrative practices (Stewart, 2004).

The residual vote rate is closely related to ballot roll-off, although the two measures are distinguishable, both conceptually and in practice. Burnham (1965, p. 9) defined ballot roll-off as “the tendency of the electorate to vote for ‘prestige’ offices but not for lower offices on the same ballot.” It is measured by subtracting the number of votes cast for down-ballot races from the number of votes cast for the top-of-the-ticket race. One benefit of roll-off as a measure is that it only requires knowing the total number of votes cast for a particular set of offices, rather than the total number of ballots cast (including blank or partially blank ballots), which prior to 2000 many states did not report. However, roll-off is useless in conducting aggregate-level studies that focus on the *top* of the ticket. Despite some continued use of the measure (e.g., Reilly and Richey 2011), the residual vote has largely replaced roll-off, even when the focus of study has been down-ballot races (e.g., Alvarez, Beckett and Stewart, 2013).

Abstention in presidential elections

We are interested in what happens when a voter has decided to cast a ballot, but does not vote for president. Past research has tended to frame the issue of abstention-conditional-on-turnout in terms of the probabilistic spatial model, where two spatial dynamics determine abstention, *abstention due to alienation* and *abstention due to indifference*. In the former, a voter is more

² See Ansolabehere (2002), Leib and Dittmer (2002), Knack and Kropf (2003) Brady (2004), Buchler, Jarvis, and McNulty (2004), Ansolabehere and Reeves (2004), Hanmer and Traugott (2004), Sinclair and Alvarez (2004), Bullock and Hood (2005), Herron and Sekhon (2005), Stewart (2006), Warf (2006), Everett, et al (2008), Allers and Kooreman (2009) Campbell and Byrne (2009), Hanmer, Park, and Traugott (2010), McDonald (2011), Alvarez, Beckett and Stewart (2013), Damschroder (2013), and Kropf and Kimball (2013).

likely to abstain if the candidates are viewed as ideologically distant from the voter. In the latter, the voter is more likely to abstain if the candidates are seen as interchangeable. Public opinion studies have found evidence of both paths to abstention in presidential (Adams, Dow, and Merrill 2006) and U.S. Senate elections (Plane and Gershtenson 2004).

Popular accounts of the 2016 November election provide reasons to believe that some voters who turned out also abstained in the presidential contest, either due to alienation or indifference, at higher rates than in the typical presidential election. This is on top of voters who may have failed to turn out altogether, because they were either not mobilized by the campaigns, or because they were less enthusiastic about the candidates (Fraga 2018).

Abstention-due-to-alienation and indifference are important concepts in the comparative literature on protest voting. The presence of blank, null, or spoiled (BNS) ballots has been notable in countries with compulsory voting. In many of these countries, rates of BNS ballots, what we call the residual vote rate, are often quite high, and BNS ballots are often interpreted as protest votes or abstentions-due-to-alienation (Schwartzman 1973; Alves 1985; Kinzo 1988; Lamounier 1989; Power and Roberts 1995). However, research has also observed that compulsory voting systems tend to have higher residual vote rates in down-ballot contests, which is also consistent with abstention-due-to-indifference even in these countries. While BNS ballots have been used to study protest voting in nations with compulsory voting, they have also been used to identify “BNS protest voting,” in particular, evidence for voter disapproval of the choices on the ballot (Alvarez, Kiewiet, Nunez, 2018). This literature has infiltrated scholarship on American elections only slightly (Weinberg, Linderman, and Kavar 1982; Brown 2011; Damore, Waters and Bowler 2012).

The 2016 Residual Vote Rate and Abstentions in Context

The residual vote rate for president is defined as

$$100 \times \left(1 - \frac{\text{Total votes for presidential candidates}}{\text{Total ballots cast}} \right).$$

The national residual vote rate time series that runs from 1980 to 2016 (Figure 1) shows a clear break after 2000, which can be attributed to a combination of new voting machines and other post-2000 administrative changes. Before and including 2000, the residual vote rate hovered around 2%. It was cut in half immediately after 2000, but spiked in 2016.

[Figure 1]

The average residual vote rate from 2004 to 2012 was 1.07%; the rate in 2016 was 1.41%. The difference, 0.34 percentage points, is a good starting point for quantifying the *increase* in abstentions in 2016, beyond the abstention rate in recent prior elections. Because the baseline abstention rate in prior elections has been estimated to be around 0.5% (Stewart, 2014; Knack and Kropf, 2008), this would put the 2016 presidential abstention rate at around 0.8% nationwide. This implied abstention rate is significantly greater than the 0.11% of CCES respondents who reported abstaining in 2016, which we discuss in more detail in the paper's Supplementary Materials.

Figure 2 presents scatterplots that compare the residual vote rates in 2016 and 2012 at the county and state levels (Figures 2a and 2b, respectively). To aid in legibility, cube roots have been taken of the percentages in the county graph. Overall, there are small-to-moderate correlations across time at both levels of aggregation: $r = .29$ for counties and $r = .68$ for states.³ These correlations suggest that slow-changing legal, administrative, and cultural practices underlie the residual vote rate in any given jurisdiction.

³ The correlations are calculated weighting by turnout in 2016.

[Figure 2]

Inspection of the graphs in Figure 2 reveals that the residual vote rate went up in 2016 in most counties (1,629 of 2,586) and states (35 of 45). This suggests that the residual vote rate spike in 2016 had a common nationwide cause. However, the increase was greater in some states and counties, which also suggests that variations in short-term political factors that affected some parts of the country more than others also were in play.⁴

Partisanship, Ballot Access Laws, and the Residual Vote Rate in 2016

In this section, we turn our attention to the cross-sectional variation of the residual vote rate in 2016, both at the state and county levels. We focus on determining whether administrative, technological, or behavioral factors might explain variation in the 2016 residual vote rate.

Maps describing the geographic distribution of the residual vote rate in 2016, at both the county and state levels, are provided in Figure SM3 of the supplementary materials. Five states (Mississippi, Missouri, Oklahoma, Pennsylvania, and Texas) did not reliably report turnout rates statewide, so are shaded gray in both maps. While Alaska reported turnout, its election returns were reported by state senate district, which hinders allocating the residual vote rate into that state's county equivalents. See the paper's Supplementary Materials for details about our estimation of the residual vote rate.

An examination of the geographic distribution of residual vote rates reveals, first, that the residual vote variation *within* most states was much less pronounced than variation *between* states.⁵ This suggests that any explanations for the residual vote rate variation must account for legal and administrative factors that are often determined by state legislatures or directives from

⁴ In the Supplementary Materials we discuss Nevada, which since the 1970s, has allowed its voters to vote for "none of these candidates" (NOTC) in the presidential race.

⁵ A simple quantitative measure of this point is the R^2 (.54) of a regression that only contains state dummy variables to explain county residual vote rates.

the state's chief election authority. The highest residual vote rates in 2016 tended to be in the western states; residual vote rates were lower in the southeast. While this pattern is somewhat correlated with strength shown in the primaries by Trump, it is also correlated with the use of vote-by-mail, which has previously been shown to be correlated with higher residual vote rates (Alvarez, Beckett, and Stewart 2005). We address these issues below.

Voting technology and the residual vote in 2016

Early research on voting technology and the residual vote found that older technologies, especially punch-card machines, had significantly higher residual vote rates than newer technologies. By 2012, all of the antiquated machines that had been used in 2000 were retired from federal elections. Prior research has generally found little difference in residual vote rates when comparing electronic voting machines (DREs) and optically scanned paper ballots (Ansolabehere and Stewart 2005). Because virtually all votes are now cast on one of these two technologies, it is unlikely that cross-county variation in the 2016 residual vote rate would be strongly related to voting technology.

In a simple bivariate test, the residual vote rate in 2016 *was* slightly greater in counties that used optical scanners (1.46%) than in counties that used DREs (1.26%).⁶ A simple *t*-test rejects the null hypothesis that these percentages are equal (*p* value of < 0.0005). However, this difference in the residual vote rate across the two major types of voting machines may be an artifact of the types of machines used in different states. If we conduct this simple statistical test in the context of a (state-level) fixed-effects regression, DREs have a *higher* average residual

⁶ There were 1,704 and 733 counties that used optical scanners and DREs, respectively. In addition, the average residual vote rate for the 43 counties that used hand-counted paper was 2.20%; the average residual vote rate for the 80 counties that used a mix of technologies was 1.67%. Averages here, and elsewhere in the paper, are calculated after weighting by turnout.

vote rate than optical scanners, by 0.14 percentage points.⁷ The fact that the estimated effect of using optical scanners rather than DREs can flip signs is consistent with past work that has found that the effects of voting technologies on the residual vote rate can be sensitive to specification in cross-sectional analysis (Ansolabehere and Stewart 2004).

Voter abstention in the 2016 presidential election: the role of party faction, election law, and voter strategy

We focus on four major factors regarding voter abstention: one behavioral, two legal, and one strategic. The first factor, which we classify as behavioral, is (1) the relative distaste partisans felt for the major-party nominees, especially the nominees of their own party. The second and third factors, which we classify as legal, are (2) the ability of voters to write in presidential candidates if they wish and (3) the extent of mail-ballot use in a state. The fourth factor, which we classify as strategic, is (4) the partisan balance in a state, which might make voters more or less likely to mark their ballot in an expressive, rather than narrowly instrumental, way.

If some voters abstained because of their distaste for the candidates, then we should see more abstentions where support for those candidates is weakest. Applied to 2016, if some fraction of Republicans found voting for Trump unpalatable, and if those same Republicans could not bring themselves to vote for Clinton or any of the other candidates, then we would expect abstentions to be higher in counties where Trump's support among Republicans was weakest. A similar argument could be made about "Sanders Democrats." We operationalized strength of support for the party nominees by using the county-level vote shares received by Trump and Sanders in the Republican and Democratic primaries, respectively.

⁷ The t -statistic testing the difference in residual vote rates between DREs and optical scanners in the fixed-effects regression is 2.54, $p = .011$.

Because support for Trump and Sanders in the primaries was likely correlated with overall partisan strength within a county, we control for partisan strength by taking the average of the vote received by Republican candidates in each county from 2000 to 2012. To allow for the possibility that more staunchly partisan areas may be more likely to stand by their party's candidate, we also included the square of the Republican-strength variable.

We employ fixed-effects regression to help account for unmeasured legal, administrative, and cultural factors that had a common influence on the residual vote rate in 2016 beyond the behavioral factors we explore here. These state-level fixed effects also help to account for different mixes of candidates who were on the primary ballot in each states and the different time of the year when the primaries were held. This also allows us to include states that held caucuses rather than primaries. For these states, support for Trump and Sanders is set to zero for each county. These states' observations do not contribute to the analysis about the correlation between the residual vote rate and support for Trump/Sanders, but they do contribute to the analysis about the correlation between the residual vote rate and historical partisan voting patterns.

Table 1 reports the results of the analysis. The strongest effect is related to partisan strength. The combination of the two Republican-strength variables indicates a symmetrical curvilinear relationship, with the highest residual vote rates coming in counties with evenly split partisanship.⁸ Interestingly, counties that gave Trump his highest vote totals in the primary were no more or less likely to cast blank ballots in the general election. Just as interestingly, counties that gave Sanders their greatest support in the primaries were *less* likely to cast residual votes in November. Thus, we see little support for an association between party factionalism and general election abstention.

⁸ Taking first derivatives and setting them to zero, the maximum of the Republican strength effect occurs when average Republican vote share is 54.7%.

[Table 1]

Abstention may not be the only option available to disaffected partisans: they could vote for minor-party candidates or could write in another candidate. In either case, the ability to vote for a minor-party candidate or write in a candidate depends on ballot access laws in the voter's state.

In 2016, 6.04% of voters voted for a these minor-party candidate, well over the 3.75% of the vote that went to minor-party candidates in 2012.⁹ (See Figure SM4 in the supplementary materials.) While these percentages are nowhere close to years like 1968, 1992, and 1996, they approached the 8.24% level for the minor-party vote in 1980, when John Anderson received 6.6% of the vote against Ronald Reagan and Jimmy Carter. Among major minor-party candidates in 2016 on the right, Gary Johnson received 3.27% of the nationwide popular vote, while Evan McMullin received 0.53%, and the Constitution-Party candidate Darrell Castle received 0.15%. The only significant minor-party presence on the left was the Greens' Jill Stein, at 1.06% of the vote. Even if we apportion all the remaining minor-party candidates to the left, that leaves 4.01% of the nationwide popular vote going to right-wing minor-party candidates and 2.03% going to left-wing minor-party candidates. In short, if abstention was disproportionately a Republican behavior in 2016, so was voting for minor-party candidates.

In addition to voting for minor-party candidates, voters can often write in a candidate. In 2016, only nine states¹⁰ prohibited write-in candidates.¹¹ The remaining states allowed write-ins,

⁹ These election return statistics are taken from David Leip's Atlas of U.S. Presidential Elections, <https://uselectionatlas.org>.

¹⁰ AR, HI, LA, MS, NV, NM, OK, SC, and SD.

¹¹ We developed these categories through triangulating among a number of sources, including *Ballotpedia* and state election Websites.

with 33 having some form of registration in order for the votes to be reported separately, and nine (including D.C.) allowing write-ins without registration.¹²

Although most states allow write-in votes for president, write-in votes can be hard to count, since they typically require hand tabulation. Because of this extra effort and the unlikelihood that write-in votes will be cast for the winner, they often go uncounted by precinct workers even when the state allows for write-ins (Ansolabehere et al. 2018). Also, even when states favor registered write-in candidates, they often have choices about how to report votes for unregistered candidates — they can record each unregistered candidate receiving votes by name, group the unregistered candidates into a “scattering” category, or ignore them as if the ballot was unmarked. If the last choice is made, then legally cast votes will be ignored in the counting and appear as residual votes.¹³

Based on the tendency of poll workers to undercount write-in votes, either because some do not want to count them or are instructed not to, it is easy to see how liberal write-in laws could perversely increase the high residual-vote rate. When an increased number of disaffected voters come to the polls and write in a minor-party candidate, the residual vote rate will go up if poll workers are not diligent in counting those write-in votes. At the very least, whether an uptick in write-in votes increases or decreases residual votes is an empirical question.

In the case of 2016, it appears that easy access to the write-in option ended up *increasing* the residual vote rate. When we divide states into the three categories based on write-in laws discussed above, states that disallowed write-ins had average residual vote rates of 0.95%,

¹² These nine states were AL, DC, IA, NH, NJ, OR, PA, RI, and VT.

¹³ One of the co-authors spoke to a senior election official from a state with a high residual vote rate about the counting of write-ins. He stated that he regarded votes for non-registered write-in candidates as all akin to “voting for Donald Duck,” and not worth the time of poll workers to count, despite the fact that a write-in line appears on the ballot and all votes appearing on the line are legal votes in that state.

compared to 1.33% in states that allowed write-ins without pre-registering and 1.44% in states that required pre-filing of write-in candidates. These differences between states, of course, may be due to spurious correlation. Still, at first look, it is not obvious that liberal write-in laws made it more likely that write-in votes would actually be counted.

With our focus on the role of abstention in producing the 2016 spike in the residual vote rate, there is a danger we might ignore other changes in the electoral landscape that may also be increasing the residual vote rate over time. One important factor is the increased use of the mail to deliver and return ballots in recent years. This increase is due to the confluence of a number of factors, the most important being the demise of “for-excuse” absentee ballot laws, the rise of permanent absentee ballot lists, and the increase in the number of states that deliver all their ballots by mail. Based on responses to the Census Bureau’s Current Population Survey Voting and Registration Supplement, we estimate that the percentage of voters using the mails to return ballots doubled from 2000 to 2016, from 10.2% of voters to 21.1%.

Previous research leads us to expect that the increase in voting by mail would cause the residual vote rate to increase independent of changes in abstention rates. Alvarez, Beckett and Stewart (2013) found that the rise of vote-by-mail in California over a two-decade period led to a significant rise in the residual vote rate in that state — a rise that counteracted the reduction in the residual vote rate caused by the retirement of punch-card and mechanical lever machines. Those who cast their ballot by mail or at a drop-off location cannot take advantage of Help America Vote Act (HAVA) mandated technologies that scan the ballot for over- or under-votes. Thus, there is a direct mechanism that links an increase in the use of the mail ballots to the rise of the residual vote rate.

Because state law determines whether mail ballots will be widely used, it makes sense to explore the relationship between mail-ballot use and residual votes at the state level. In 2016, the correlation between the residual vote rate and the fraction of ballots cast by mail was moderate ($r = .59$). This correlation was much weaker in 2012 ($r = .29$) and non-existent between 2000 and 2008. (Scatterplots illustrating these effects, along with associated linear regressions, appear in Figure SM5 and Table SM1 in the supplementary materials.). These results suggest that the increase in the residual vote in 2016 might be due to the coincident rise in voting-by-mail, in addition to abstention-due-to-alienation.

Finally, going to the polls and abstaining in the presidential race, or voting for a minor-party candidate, is likely to be influenced by the competitive environment of the state in which a voter lives. Despite the unlikelihood that any individual vote will be determinative in a race, many voters act as if their one vote will determine the outcome of an election, especially when it is perceived to be close (Alvarez, Boehmke, and Nagler 2006). If abstention is one of the available choices among those who come to the polls, and if at least some voters see a trade-off between their vote being expressive and their vote determining the outcome of the election, then we could imagine that there would be less abstention in highly competitive states`.

The simplest way to test this notion in the 2016 election is to examine the correlation between the residual vote rate and the Trump-Clinton electoral margin across the states. The results, provided in Figure SM6 in the supplementary materials, are consistent with the idea that voters take into account the strategic circumstances when they decide whether to abstain. Examining 2016 alone, the correlation between the residual vote rate and the percentage margin-of-victory by the prevailing candidate in a state is moderate ($r = .42$) and the t -score of the best-

fit line through the scatter is 1.96, using robust standard errors.¹⁴ Measurements of association improve when we remove D.C., which is a clear outlier.¹⁵ In addition, 2016 appears to be the only year in recent history in which there has been a statistically significant association between the residual vote rate and the two-party margin of victory.¹⁶

All told, then, it appears that the tendency to abstain in 2016 was tempered by the competitive environment. In more competitive, battleground states, abstaining or voting for a minor-party candidate could more likely lead to an even-more-disliked electoral outcome.

The Residual Vote Rate in Recent History

The major story in the residual vote rate over the past twenty years has been its dramatic decline after the 2000 presidential election, in the wake of the wave of new voting machines and administrative practices that swept over election administration after the Florida recount fiasco. A new chapter in the residual vote rate was written in 2016, when it increased from 2012, and approached the level of 2000. The question this raises is, had there not been a wave of new voting machines adopted by local jurisdictions after 2000, would the residual vote rate have been even higher in 2016 than what we observed? The answer is “yes,” as the following analysis demonstrates.

Here, we estimate the residual vote rate in a fixed-effects framework (Ansolabehere and Stewart, 2004; Stewart, 2006). To focus on the effects of changing voting technologies, there are two types of variables: (1) a series of dummy variables to indicate the election year and (2) a

¹⁴ More precisely, the best-fit line's equation is $y = 0.99 (0.16) + 0.024 (0.012) x$, with $R^2 = .18$ and $n = 46$. (Standard errors of coefficient are in parentheses.) Observations are weighted by turnout in 2016. The model was estimated using robust standard errors.

¹⁵ With DC excluded, the best-fit line's equation is $y = 0.93 (0.16) + 0.028 (0.023) x$, with $R^2 = .23$ and $n = 45$.

¹⁶ As explored further in the supplementary materials (Table SM2 and Figure SM7), 2016 is the only year since 2000 in which the residual vote rate has been lower in low margin-of-victory (“battleground”) states than in high margin-of-victory states. As with 2016, the substantive results of the analysis do not change for previous years if we exclude D.C. from the analysis.

series of dummy variables to indicate the type of voting technology used by a county in year t . Rather than explicitly control for other demographic and administrative practices that might lead to inter-county variation in residual vote rates, these factors are accounted for by using county fixed effects.¹⁷ The focus here is on the role of technology and national factors that are common to all states and counties.

We performed the analysis on a county-level dataset that included observations from every presidential election from 1988 to 2016. Because the number of states reporting turnout has grown over the years, the number of counties reflected in each year's analysis also increases, from 1,354 in 1988 to 2,597 in 2016. The results are reported in Table 2. In the first column, we include only the year dummy variables, showing only year-to-year fluctuations in the residual vote rate before considering changing voting technologies. Here we see a pattern of coefficients that is broadly consistent with the graph in Figure 1.

[Table 2]

Because the omitted year is 2000, the analysis of the year dummies revolves around the pre- and post-HAVA periods. Before the HAVA-era reforms, there are two positive coefficients, and one of the year coefficients that is statistically no different from zero. This indicates that in the late 1980s and 1990s, the residual vote rate nationwide was sometimes greater than in 2000, controlling for voting technology use. The four year-specific coefficients after 2000 are negative, which reflects the fact that residual vote rates fell after 2000 beyond what we would have predicted from changing voting technologies alone. Finally, the coefficient associated with 2016 in the first column of Table 2 is also negative, but it is roughly half the absolute value of the coefficients associated with the period 2004–2012.

¹⁷ Because we include county-level fixed effects many of the state-level factors we explored previously are outside the scope of analysis,

The second column adds dummy variables reflecting different voting technologies that were used during this period. This analysis reveals that across this entire period, punch card voting machines and DREs had residual vote rates that were higher than optical scanners. The residual vote rates of hand-counted paper — which is rarely used nowadays — had lower residual vote rates. Because the voting technologies are not uniformly distributed across the period covered in the regression — punch cards and mechanical lever machines are no longer used, hand-counted paper is virtually extinct, optical scanners have become steadily more common, while the use of DREs has waxed and waned — their presence in the regression shifts the size of the year-specific dummy variables. Most notably, the 2016 dummy variable flips signs once we account for changes to voting technologies. The size of the coefficient suggests that if there had not been a modernization of voting machines in the 2000s, the residual vote rate in 2016 would have exceeded 2000 by about 0.25 percentage points.

Discussion and Conclusions

The residual vote rate for president in 2016 was a half-point higher in 2016 than in 2012 or in any of the post-2000 presidential elections, for that matter. We have presented evidence that this was due to an increase in under-votes, driven by abstentions in the presidential race. At the same time, this increase also shows signs of interacting with factors related to election administration, namely, the rise in voting by mail and the counting of write-in votes. That said, abstention is a topic that is rarely taken up by academic students of American elections. For that reason, the infrastructure of electoral studies is poorly situated for studying this phenomenon. Thus, we focus on four implications of this study for future research.

First, our results open up the issue of protest voting in the U.S. to further study. Even if protest voting has been uncommon historically in the U.S., the current political climate may be

ripe for it to become more frequent. For instance, protest voting was in evidence in the 2017 U.S. Senate Special Election in Alabama, in which Democrat Douglas Jones narrowly defeated Republican Roy Moore by 21,924 votes out of 1,348,720 cast.¹⁸ Moore was seen by many Alabama Republicans as a flawed candidate, presenting a dilemma to loyal Republicans who could not crossover and support Jones. In this case, the preferred action was not leaving the ballot blank,¹⁹ but rather, casting a write-in vote. In that race, 22,852 write-in votes were cast, enough potentially to have swung the results of the election. The prevalence of write-in votes was the greatest in both the most staunchly Republican counties of the state and in the counties that most supported Moore's opponent in the Republican primary, Luther Strange.²⁰ Thus, the write-in vote in Alabama appears to be a consequential protest vote.

A second implication of our findings is that public opinion surveys under-estimate the prevalence of intentional abstentions in top-of-the-ballot races. As we note above, the abstention rate in the 2016 presidential election, according to answers to the CCES vote-choice question, was an order-of-magnitude less than what the analysis of aggregate election returns suggest. There are many reasons why this might be, ranging from the nature of survey respondents, who may be less likely to abstain at the top of the ticket, to social-desirability bias that favors naming

¹⁸ State of Alabama, "Canvass of Results for the Special General Election held on December 12, 2017," <https://www.sos.alabama.gov/sites/default/files/voter-pdfs/2017%20Official%20General%20Election%20Results%20without%20Write-In%20Appendix%20-%202017-12-28.pdf>.

¹⁹ There were only 1,763 residual votes reported in the unofficial election night results, or 0.13% of votes cast. There appears to be no correlation between the residual vote rate and support for Moore or Republican candidates more generally. The only factor explaining especially high residual vote rates in the Senate contest in a few outlying counties (Baldwin, Geneva, Lamar, Lowndes, Madison, Marengo, Tallapoosa, and Washington) was that these counties also had tax-rate questions on the county ballot, and apparently several hundred voters showed up to vote on these questions while abstaining from the question of U.S. senator.

²⁰ The correlation between the percentage of write-in votes in the special election and the vote for Strange in the primary was .30, while the correlation between the write-in vote and Trump's share of the presidential vote in 2016 was .31. Because support for Strange and support for Trump in the general election are negatively correlated, the fact that both are positively correlated with write-in votes indicates that each is tapping into the two important factors that drove the write-in vote: Republican Party loyalty and opposition to Moore.

a candidate over admitting abstention. Perhaps scholars can find some way to alter the vote-choice question to elicit more “abstention” responses, assuming the problem is social desirability. However, efforts to overcome the well-known problem of over-reporting turnout (Traugott and Katosh, 1979) by altering question wording or adopting other techniques have met with mixed success (Abelson, Loftus, and Greenwald, 1992; Presser, 1990; Holbrook and Krosnick, 2010). Thus while additional improvements in survey question design is imperative, we are agnostic that such research will increase the revelation of abstention. Thus, we argue that until progress is made in eliciting more accurate reports of abstentions in surveys, research on protest voting in the U.S. will need to rely heavily on aggregate analysis.

A third implication is that residual vote rates can vary, longitudinally and cross-sectionally, for reasons related to election administration that go beyond the performance of voting technologies. One of those reasons is the rise of mail ballots, which are prone to higher residual vote rates than ballots cast in person (Alvarez, Beckett and Stewart, 2013). Another reason is variation in the implementation of liberal write-in-ballot laws, which can, ironically enough, create inflated residual vote rates by encouraging write-in votes that are uncounted.

The final implication of our results goes back to the most common recent use of the residual vote rate to assess the accuracy of voting technologies. Here, we show why the residual vote rate should be used cautiously to assess the accuracy of voting machines, and especially its use in comparing across jurisdictions. One example of the use of the residual vote in important analysis of the administration and technologies in recent American elections is the Elections Performance Index (EPI). The use of the residual vote rate is justified in the EPI based on academic research demonstrating its success in quantifying the relative performance of voting

technologies. The analysis here suggests that efforts such as the EPI should normalize for abstentions, perhaps using the simple dummy-variable methodology presented in Table 2.

Citations

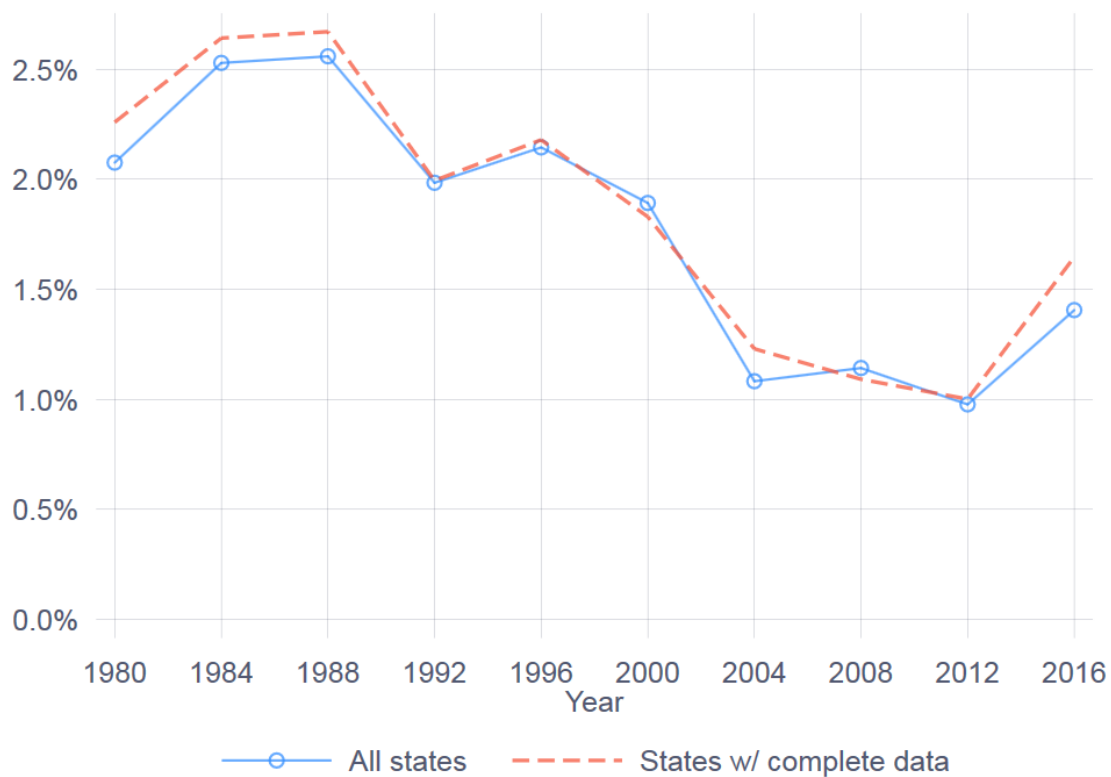
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Figure 1. Residual vote rate nationwide in presidential elections, 1980–2016.

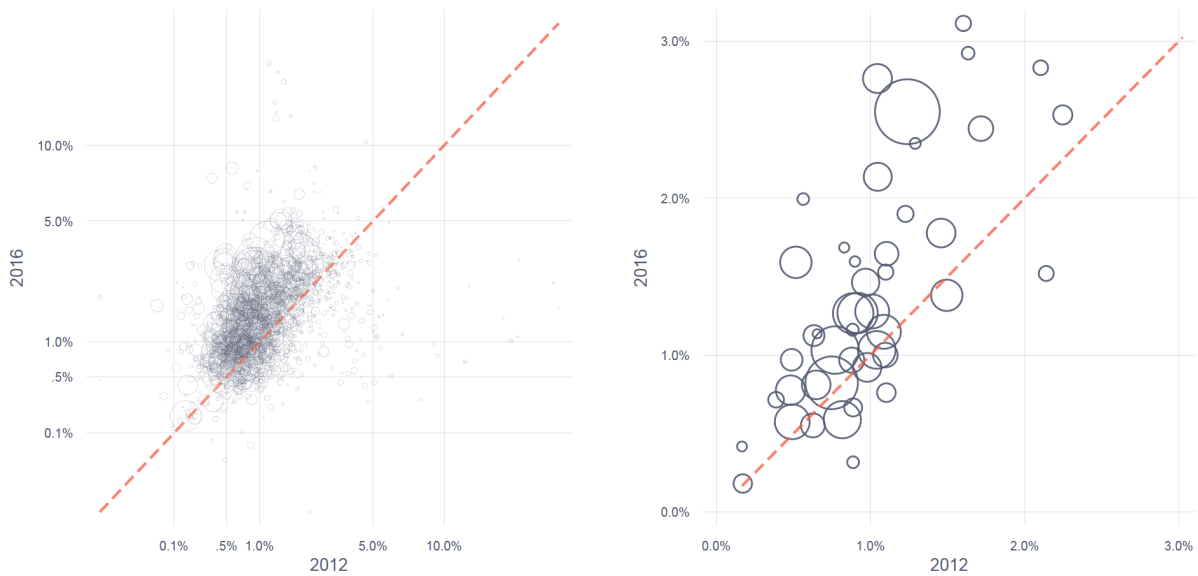


Source: United States Election Project (1980–1984); Election Data Services (1988–2000); the authors (2004–2016).

Note: The solid blue line reports the residual vote rate using all the data available for each year. The dashed red line report the residual vote rate using data from states for which we could calculate the residual vote rate *each year* from 1980 to 2016.

Figure 2. Comparison of residual vote rate, 2016 vs. 2012.

a. Counties (data transformed by taking cube-roots) b. States



Source: Data gathered by the authors

Table 1. Regression predicting residual vote rate as a function of Republican strength in a county and vote for Trump and Sanders in nominating primaries. State fixed effects.

Variables	Coeff. (s.e.)
Trump primary share	-0.0021 (0.0022)
Sanders primary share	-0.0093** (0.0027)
Republican strength	0.039*** (0.006)
Republican strength ²	-0.036*** (0.007)
Constant	0.0088*** (0.0019)
N	1,746
R ²	.54

* $p < .05$, ** $p < .01$, *** $p < .001$

Source: Data gathered by the authors.

Table 2. Residual vote rates, 1988–2016, with machine effects included. County fixed effects.

Variables	Coeff. (s.e.)	Coeff. (s.e.)
<u>Year</u>		
1988	0.0059*** (0.0004)	0.0057*** (0.0004)
1992	-0.0000 (0.0004)	-0.0003 (0.0004)
1996	0.0020*** (0.0004)	0.0018*** (0.0004)
2000	Excluded	Excluded
2004	-0.0083*** (0.0003)	-0.0068*** (0.0004)
2008	-0.0083*** (0.0003)	-0.0062*** (0.0004)
2012	-0.0092*** (0.0003)	-0.0074*** (0.0004)
2016	-0.0046*** (0.0003)	0.0024*** (0.0004)
<u>Voting technology (opscan excluded)</u>		
-Punch card	—	0.0057*** (0.0004)
-Mechanical lever	—	-0.0004 (0.0005)
-Paper	—	-0.0033** (0.0012)
-DRE	—	0.0030*** (0.0003)
-Mixed	—	-0.0011 (0.0006)
Intercept	0.019*** (0.0003)	0.016*** (0.0003)
County fixed effects	Yes	Yes
N	17,312	17,312
R ²	.42	.44

* $p < .05$, ** $p < .01$, *** $p < .001$

Source: Data gathered by the authors

Abstention, Protest, and Residual Votes in the 2016 Election
Supplementary Materials for Online Publication

Residual Votes Data and Analysis

Many states, particularly those in New England and the upper Midwest, administer elections at the municipality, not county level. We have aggregated to the county level for these states. The only major statistical effect of doing so is to reduce the number of observations, and thus increase standard errors, rather than introduce bias. Indeed, disaggregating to the municipality level — or even precinct level — in analysis like this can introduce a degree of false precision. See Alvarez, Ansolabehere, and Stewart (2005).

A number of states (Mississippi, Missouri, Oklahoma, Pennsylvania, and Texas) did not record the number of voters who cast a ballot in the 2016 election as a part of the election canvassing process, which is needed to perform the type of statistical analysis that follows. It is possible to approximate turnout levels using other sources that are not tied directly to the canvass, such as the U.S. Election Assistance Commission's Election Administration and Voting Survey. However, because these alternative methods are not as rigorous as those calculated during the post-election canvass, we chose to omit these states. This is the same choice made in research going back the original article by Ansolabehere and Stewart (2005).

Research following the 2000 election found large differences across *types* of voting machines — DREs, optical scanners, etc. — and smaller differences between specific implementations of these machines, such as between full-face and page-by-page DREs. In the nearly twenty years since then, variation in machine interfaces has declined significantly within voting technology type, as greater attention has been paid to human factor considerations. For instance, scanned paper ballots have converged on “complete the oval,” moving away from “complete the arrow.” Full-face DREs are less common. One difference that has remained among optical scanners is that some jurisdictions scan the ballots in the precinct, while other collect the ballots at the end of Election Day and scan them centrally. We did not have sufficient information about how the optical scanners were used in the counties in our study, across the entire time period of the study, to include this information in the analysis.

Individual-level Analysis using CCES data

Evidence that Republican voters may have been alienated from voting for Trump shows up in two ways in public opinion data. We illustrate this using the 2016 Cooperative Congressional Election Study (CCES). We define abstention as those who reported that they voted in the 2016 election, but then answered that “I didn’t vote in this election” in response to the vote-recall question in the post-election CCES survey (“For whom did you vote for President of the United States?”) First, Republicans who supported candidates other than Trump in the primaries or caucuses were more likely to report abstaining in the general election. (See Table 1a.)²¹ Among the 5,937 Republican CCES respondents who reported they supported Trump in the primaries, none reported abstaining in November; Republican abstentions came entirely from non-Trump primary supporters. Second, ideologically moderate Republicans were more likely to report they did not cast a ballot for president, despite having turned out to vote, than far right Republicans (Table 1b). Leaving aside the small number of liberal Republicans in the survey, Republican abstentions were more prevalent on the middle-of-the-road/moderate-conservative side of the party.

[Table 1]

The Democratic Party also had a disruptive candidate, although the nature of the disruption was different. Bernie Sanders offered a platform that was coherent, if ideologically extreme, in contrast with Trump’s mix of policy positions. Sanders also fought against the party establishment. These efforts generated animosity between his supporters and those of the eventual nominee, Hillary Clinton. This animosity might have primed Democrats for their own form of abstention-due-to-alienation in the general election, with Sanders supporters finding it impossible to vote for Clinton.

However, evidence from the CCES provides little support for the hypothesis that Democratic abstention in the general election simply mirrored that of the Republicans. First, Sanders’s primary voters reported abstaining at essentially the same rate as Clinton’s supporters once November rolled around (Table 2a). Thus, despite lingering animosity between the Clinton and Sanders camps after the nomination was decided, there is little evidence that this animosity carried over into the November balloting. Furthermore, because Sanders clearly positioned himself on the far left of the Democratic Party, an abstention-through-alienation pattern in the general election among Democrats would have to show that *leftist* Democrats abstained in the general election at higher rates than moderates did. In fact, the opposite is true; if anything, *centrist* Democrats disproportionately abstained (Table 2b). Still, this pattern is less pronounced than among Republicans.²²

[Table 2]

Turning to the issue of abstention due to indifference, this phenomenon should manifest itself in the general election among voters who reported seeing no ideological difference between Trump and Clinton. This is easy to test, by examining the abstention rate as a function of perceived ideological difference on the standard 7-point ideological scale (Table 3). Among those who saw no ideological difference between the candidates, the abstention rate was much higher than if even a slight difference was perceived. In addition, there is an order-of-magnitude

²¹ In Table 1 we have included responses from Republican identifiers who reported voting for a Democrat in the primaries for the sake of completeness. Because such a small fraction of Republican identifiers voted for a Democrat in the primaries, we do not analyze those responses here.

²² Figure SM1 in the supplementary materials provides a visual summary of Tables 1b and 2b.

difference between those who saw only a minor ideological difference between the candidates (3 points or fewer) and those who saw a major difference (4 points or greater).

[Table 3]

Of course, this is an overly simple test of abstention-due-to-indifference. First, the flow of causality is ambiguous — a respondent might just as easily rationalize abstention by stating she saw no ideological difference between the two candidates as be drawn to abstain because she saw no difference. Second, failure to see big ideological differences between Trump and Clinton may be a proxy for inattention to politics which, itself, is a likely cause of abstention.

We conclude this section by placing the preceding discussion about abstention in the 2016 presidential election in a multivariate statistical context. Here, the dependent variable is the “abstention” indicator and the independent variables are (1) indicators for primary/caucus support, (2) self-reported ideology, and (3) perceived ideological differences between the candidates. To simplify interpretation, we exclude respondents whose party identification does not match their ideology. (That is, we exclude all self-reported liberal Republicans and conservative Democrats.) We also exclude self-identified independents and minor-party identifiers. We estimate the model using a rare-events logit procedure suggested by Firth (1993) and Heinze and Schemper (2002), and report the results in Table 4.²³ Three effects consistently stand out: (1) Republicans were more likely to abstain than Democrats, (2) Republican primary supporters of Trump were less likely to abstain than Republican supporters of other candidates, and (3) respondents who saw big ideological differences between Trump and Clinton were less likely to abstain.

[Table 4]

There is one important detail in the analysis summarized in Table 4 that gives us pause: the lack of variability in the dependent variable. Only 0.11% of respondents (52 weighted and 81 unweighted observations, out of 45,242 observations overall in the dataset) self-reported abstaining. Thus, individual-level analysis can give us clues about where we might find higher residual vote rates (i.e. in strong Republican areas and areas that supported Trump’s opponents in the primaries), but beyond that, further insight from public opinion data is limited. Not only is this a small number of observations to hang the individual-level analysis on, it is an especially low number of abstainers, given the patterns in the aggregate election returns.²⁴

²³ This technique utilizes a penalized maximum likelihood scoring technique in order to reduce bias in rare-event models. It also helps to overcome the problem of “separation” in limited dependent variables models, which is when an independent variable perfectly predicts an observed outcome on the dependent variable.

²⁴ It is unclear whether the under-reporting of abstention on public opinion surveys in the 2016 presidential election is confined to the CCES. For instance, the sequence of questions in the ANES about vote choice does not allow the respondent to report abstaining in the presidential race.

Table 1. Reported abstention in the 2016 general election among Republicans, given primary/caucus support and ideology.

a. Primary/caucus support

Candidate support	Abstention pct.	N
Donald Trump	0.00%	5,675
Ted Cruz	0.19%	2,867
John Kasich	0.29%	1,017
Marco Rubio	0.26%	1,138
Another Republican	0.25%	619
Neither Dem. or Rep.	0.70%	105
Any Democrat	0.07%	592
Total	0.11%	12,013

b. Ideology

Respondent ideology	Abstention pct.	N
Very liberal, Liberal, or Somewhat liberal	0.00%	469
Middle of the road	0.18%	2,630
Somewhat conservative	0.26%	3,323
Conservative	0.10%	6,232
Very conservative	0.06%	3,480
Not sure	0.00%	200
Total	0.14%	16,334

Note: Independent Republican leaners are included as Republicans. All three “liberal” responses are collapsed into one category.

Source: 2016 CCES, Common Content

Table 2. Reported abstention in the 2016 general election among Democrats given primary/caucus support.

a. Primary support

Candidate support	Abstention pct.	N
Hillary Clinton	0.05%	9,213
Bernie Sanders	0.07%	6,024
Another Democrat	0.31%	99
Neither Dem. or Rep.	0.00%	103
Any Republican	0.03%	811
Total	0.05%	16,250

b. Ideology

Respondent ideology	Abstention pct.	N
Very liberal	0.04%	4,066
Liberal	0.01%	6,092
Somewhat liberal	0.12%	3,879
Middle of the road	0.11%	5,245
Somewhat conservative, Conservative, or Very conservative	0.01%	2,229
Not sure	0.00%	484
Total	0.06%	21,995

Note: Independent Democratic leaners are included as Democrats. All three “conservative” responses are collapsed into one category.

Source: 2016 CCES, Common Content

Table 3. Reported abstention in the 2016 general election as a function of perceived ideological distance between Donald Trump and Hillary Clinton.

Absolute difference on 7-point scale	Abstention pct.	N
0	0.35%	1,577
1	0.18%	2,947
2	0.21%	5,169
3	0.15%	8,482
4	0.04%	9,217
5	0.04%	6,159
6	0.06%	2,023
Total	0.11%	35,574

Source: 2016 CCES, Common Content

Table 4. Probability of respondents reporting they abstained in the 2016 presidential election.

	Rare-events logit	Effect
Republican (Democrat excluded category)	5.75*** (1.46)	.0109†
Republican voted for Trump in primary	-3.32* (1.43)	-.0012†
Democrat voted for Sanders in primary	0.42 (0.60)	.0004†
Republican ideology (positive = conservative)	-0.37* (0.18)	-.0014‡
Democratic ideology (positive = conservative)	0.73* (0.31)	.0184‡
Perceived ideological difference b/t Trump & Clinton	-0.41*** (0.11)	-.0049‡
Intercept	-8.11*** (1.14)	
N	28,418	
Llf	-281	

* $p < .05$, ** $p < .01$, *** $p < .001$

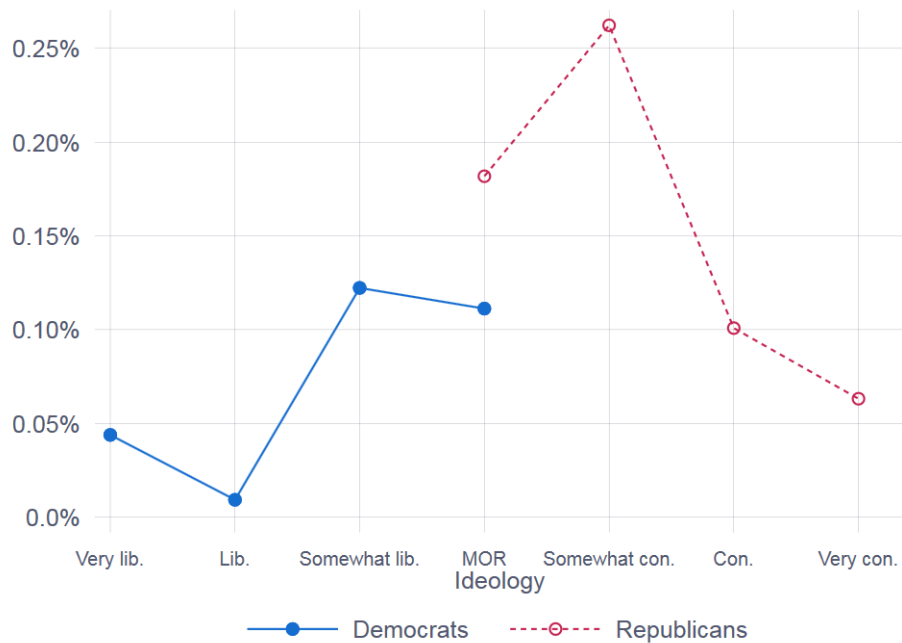
†Effect calculated by setting other variables at their means and evaluating the difference in predicted probabilities at $x = 0$ and $x = 1$.

‡Effect calculated by setting other variables at their means and evaluating the difference in predicted probabilities at $x = \min(x)$ and $x = \max(x)$.

Source: 2016 CCES, Common Content

A visual summary of Tables 1b and 2b

Figure SM1. Reported abstention in the 2016 election by Democratic and Republican identifiers, by ideology.



Source: CCES 2016, Common content

A side note about Nevada

Nevada is an interesting case in studying the residual vote and abstentions because in the 1970s it began providing a ballot mechanism that allows voters to register an abstention in the presidential race, by offering the choice of “none of these candidates” (NOTC). Presumably, voters making this choice would have abstained if they had voted in any other states.²⁵ Therefore a comparison of Nevada’s residual vote rate over time alongside its “none of these candidates” rate (we will call this the “NOTC rate”) is instructive.²⁶

Figure SM2 shows the relevant Nevada time series going back to 1964. The NOTC option was first offered in presidential elections in 1976, so the NOTC rate is shown starting then. Interestingly, the onset of the NOTC option in 1976 did not obviously depress the residual vote rate in that year, which suggests that in years prior to that, most voters who would have abstained in the presidential contest just stayed home instead. From 1976 to 2012, both the residual vote rate and the NOTC rate gradually declined, to the point that in 2012, the residual vote rate in Nevada was 0.17% and the NOTC rate was 0.57%, totaling 0.74%. In 2016, the residual vote rate declined to a miniscule 0.004%, but the NOTC rate spiked to 2.56%, for an increase of nearly 2 percentage points.

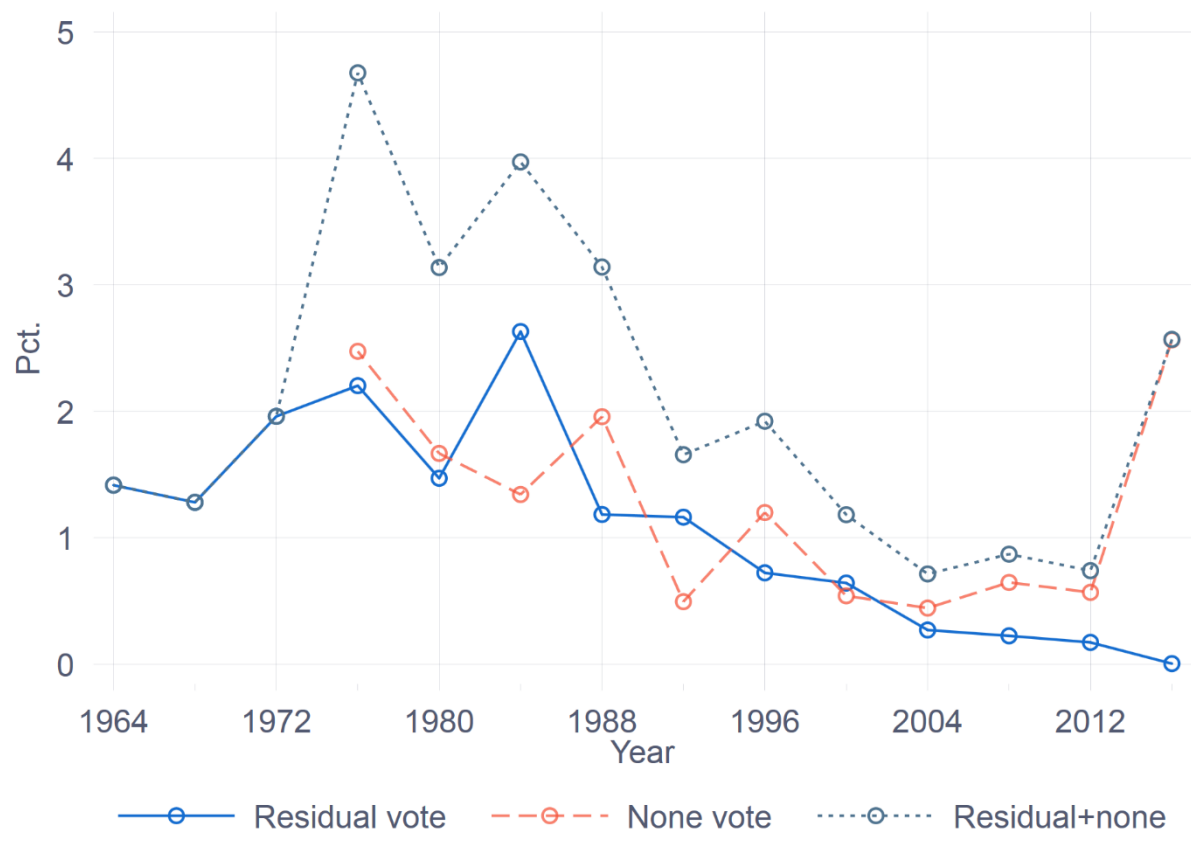
[Figure SM2 about here]

It is instructive to speculate about what would have happened if Nevada did not have the NOTC option in the 2016 election. Presumably, some of the voters who chose NOTC for president in 2016 would have stayed home if it had not been offered as a choice. However, others would have shown up, either out of civic duty or interest in down-ballot races, and would have presumably abstained in the presidential contest. Distinguishing between these two actions is a tricky methodological question, and one in principle that has implications for how we think about abstentions in all states.

²⁵ It is also likely that at least some of the Nevada voters who vote for “none of these candidates” would have failed to turnout in another state that did not offer the choice.

²⁶ For research into Nevada’s NOTC option, see Damore, Waters and Bowler (2012).

Figure SM2. Residual vote and none-of-these-candidates vote in Nevada presidential elections, 1964–2016.

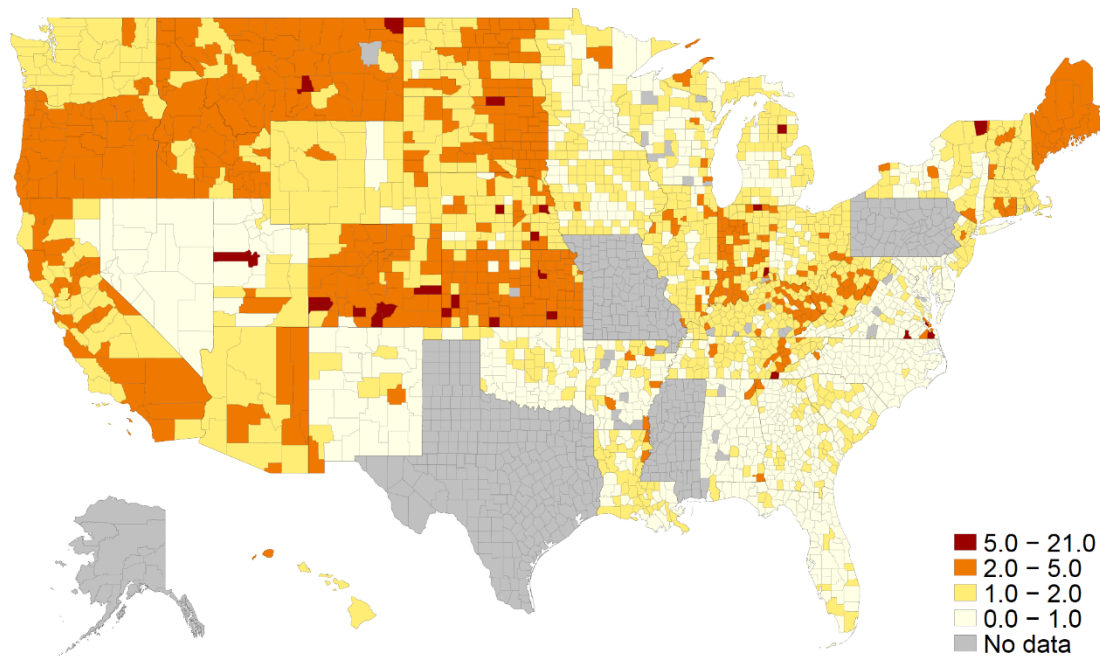


Source: Nevada Secretary of State.

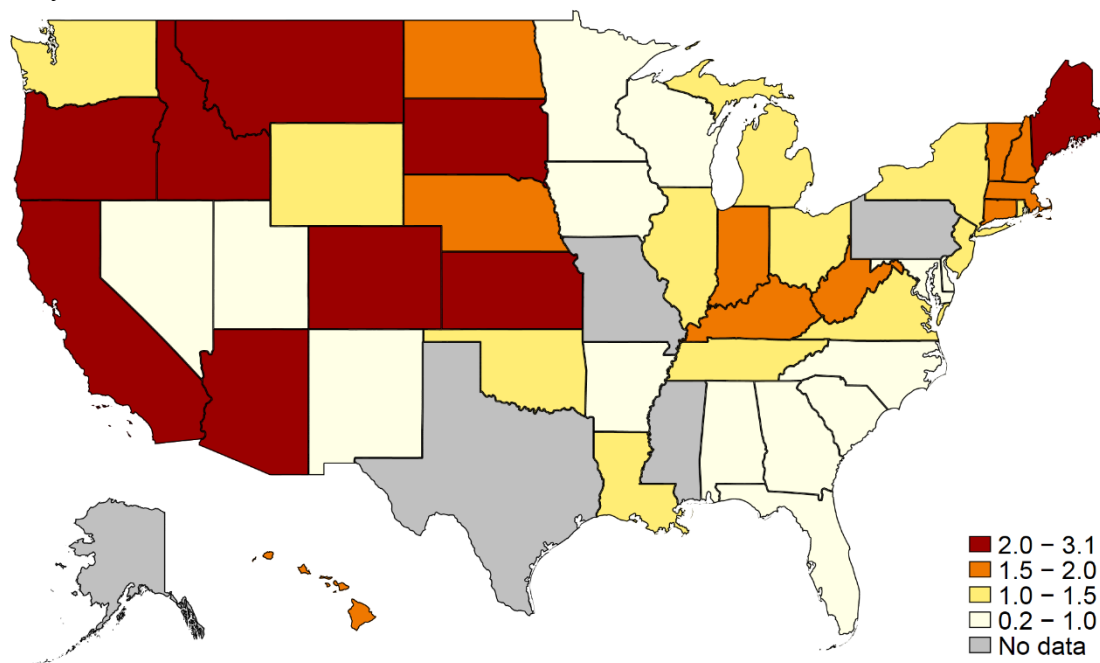
Geographical variation of the residual vote rate in 2016

Figure SM3. Residual vote rate in 2016.

a. By county

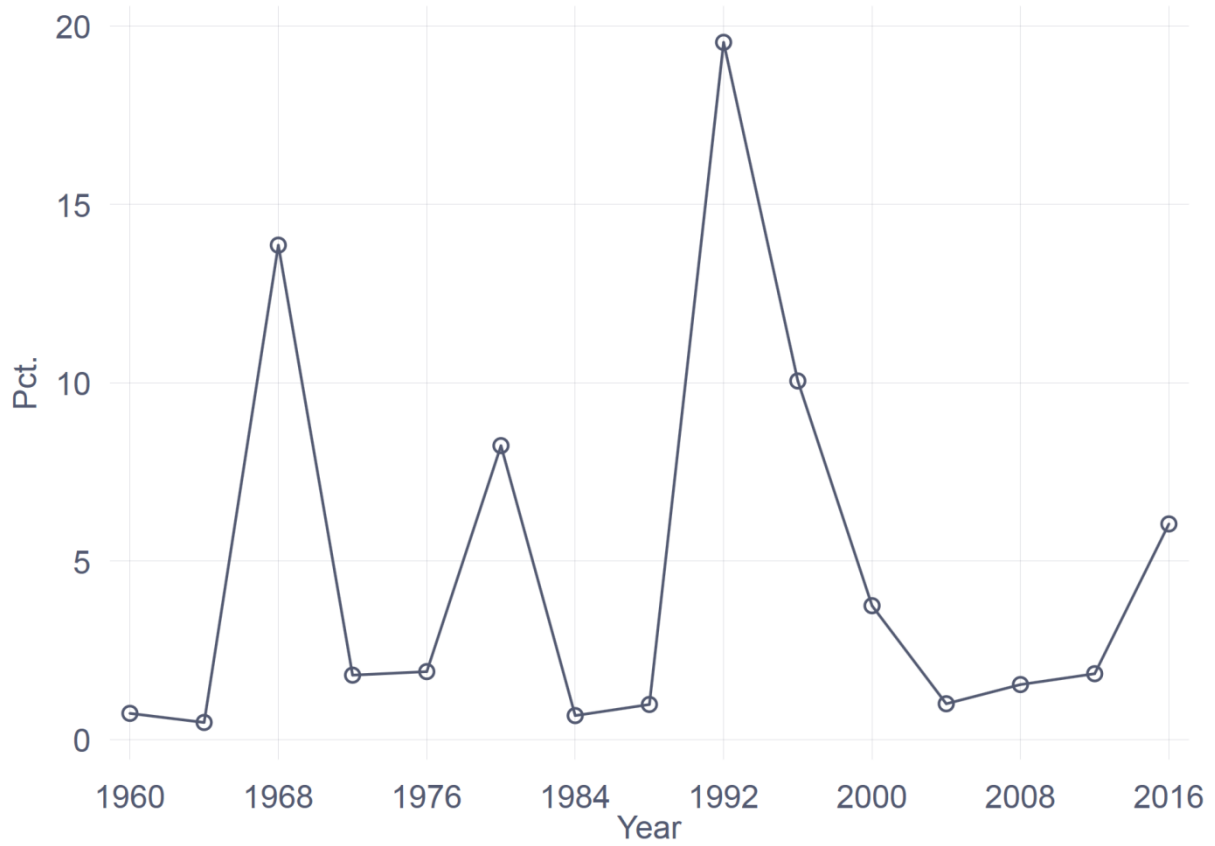


b. By state



Time series of minor-party vote shares

Figure SM4. Percent of the national presidential vote received by non-major-party candidates, 1960–2016.

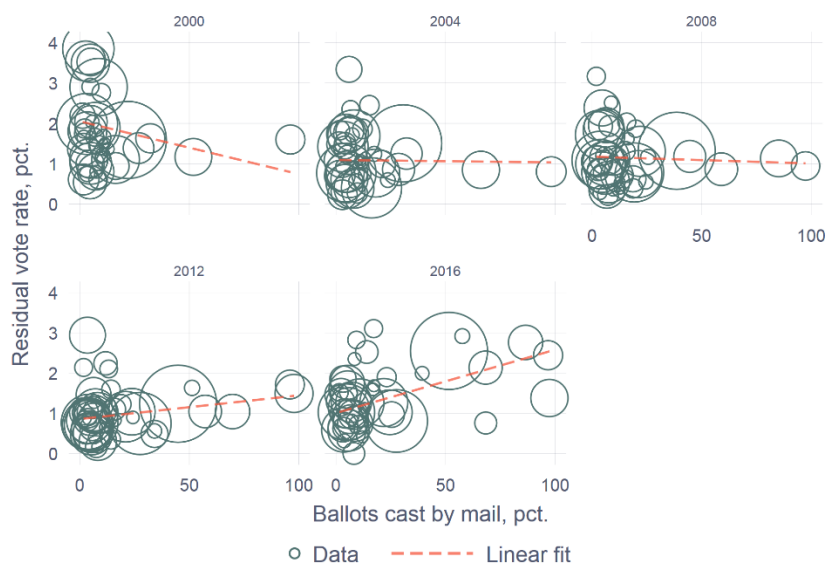


Source: Dave Leip's Presidential Atlas

Relationship between residual vote rate at the state level and the fraction of votes cast by mail.

Note that in the graphs and regressions below, there is a significant right skew to the variable measuring the use of mail ballots. However, transforming this variable --- for instance, by taking logarithms --- does not change the substance of the analysis.

Figure SM5. Relationship between residual vote rate and fraction of votes cast by mail, 2000–2016.



Source: U.S. Census Bureau, Current Population Survey, Voting and Registration Supplement, various years; Election data gathered by authors

Table SM1. Regression of residual vote rate on fraction of ballots cast by mail at the state level, 2000–2016. (Robust standard errors)

	Year				
	2000	2004	2008	2012	2016
Ballots cast by mail	-0.013 (0.008)	-0.001 (0.004)	-0.002 (0.003)	0.0059** (0.0021)	0.016** (0.005)
Intercept	2.05*** (0.25)	1.09*** (0.13)	1.17 (0.11)	0.86*** (0.10)	1.01*** (0.11)
R ²	.05	.00	.01	.09	.35
N	41	42	45	48	46

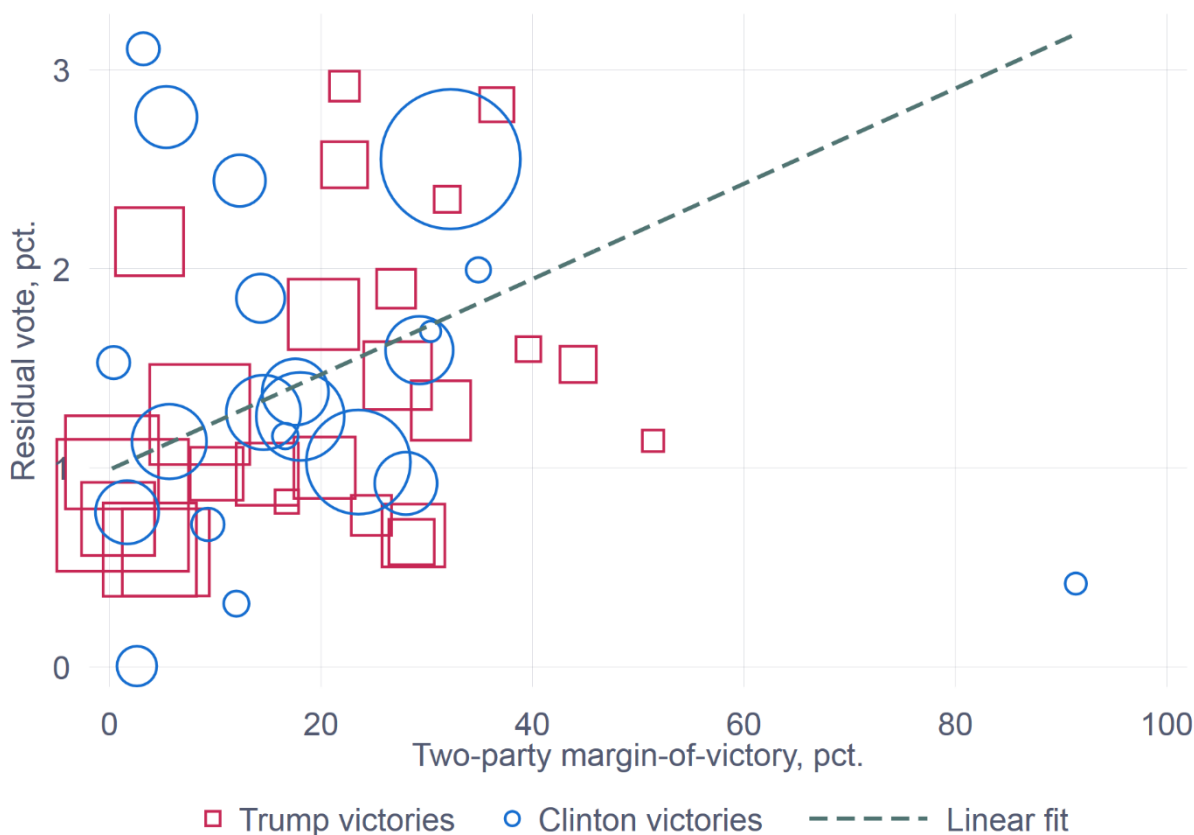
* $p < .05$, ** $p < .01$, *** $p < .001$

Source: U.S. Census Bureau, Current Population Survey, Voting and Registration Supplement, various years; Election data gathered by authors

Relationship between partisan competitiveness of states and the residual vote rate.

Here, we have plotted the residual vote rate of each state in 2016 against the percentage margin-of-victory enjoyed by Trump (red squares) and Clinton (blue circles). (The sizes of the data tokens are proportional to the number of voters.) While there is considerable variation around the best-fit line, the correlation is moderately high ($r = .43$) and the t -score of the line's slope is 1.96, using robust standard errors.²⁷ The District of Columbia is the obvious outlier in the graph, but its small relative turnout means that removing it from the analysis barely changes the results, and if anything, strengthens them.²⁸

Figure SM6. Correlation between the residual vote rate and two-party margin-of-victory in each state, 2016.

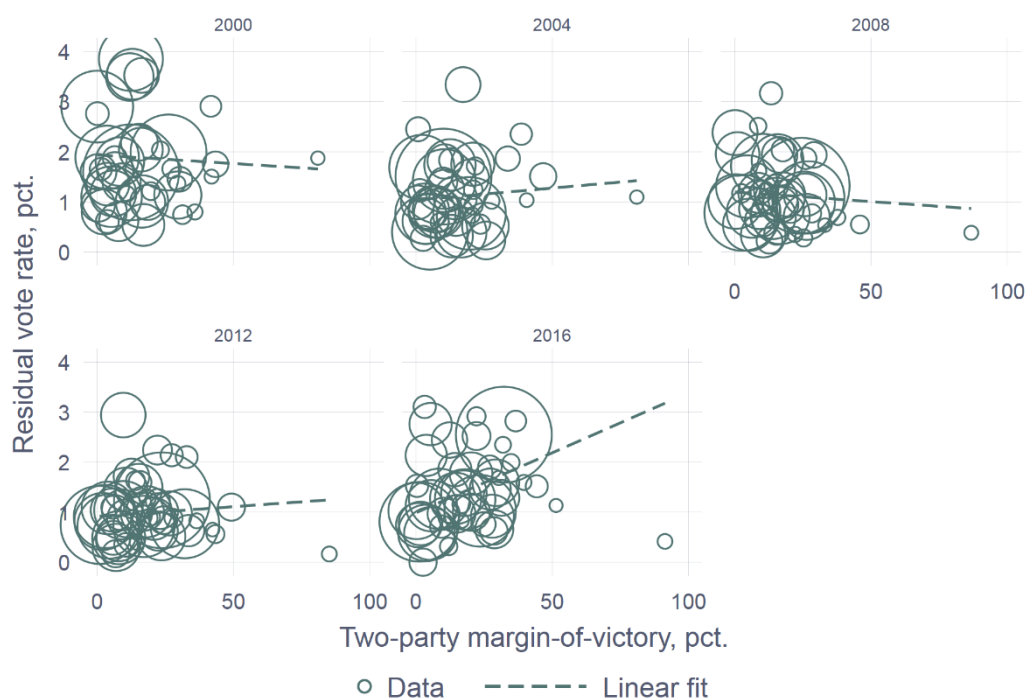


Sources: Data gathered by the authors and Dave Leip's Atlas of U.S. Presidential Elections.

²⁷ More precisely, the best-fit line's equation is $y = 0.99 (0.16) + 0.024 (0.012) x$, with $R^2 = .18$ and $n = 46$. (Standard errors of coefficient are in parentheses.) Observations are weighted by turnout in 2016. Robust standard errors.

²⁸ With DC excluded, the best-fit line's equation is $y = 0.93 (0.16) + 0.028 (0.023) x$, with $R^2 = .23$ and $n = 45$.

Figure SM7. Correlation between the residual vote rate and two-party margin-of-victory in each state, 2000–2016.



Sources: Data gathered by the authors and Dave Leip's Atlas of U.S. Presidential Elections.

Table SM2. Regression of residual vote rate on two-party margin of victory at the state level, 2000–2016. Robust standard errors.

	Year				
	2000	2004	2008	2012	2016
Margin-of-victory	-0.003 (0.012)	0.005 (0.010)	-0.004 (0.008)	0.004 (0.005)	0.024* (0.012)
Intercept	1.93*** (0.28)	1.03*** (0.18)	1.20*** (0.18)	0.92*** (0.12)	0.99*** (0.16)
R ²	.00	.01	.01	.01	.18
N	41	42	45	48	46

* $p < .05$, ** $p < .01$, *** $p < .001$

Source: Data gathered by the authors and Dave Leip's Atlas of U.S. Presidential Elections.