Abstention, Protest, and Residual Votes in the 2016 Election

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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 percent 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 nonbattleground 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.

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 percent, from 0.99 percent in 2012 and 1.05 percent 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,

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[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.

SOCIAL SCIENCE QUARTERLY, Volume 101, Number 2, March 2020

DOI: 10.1111/ssqu.12757

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 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 (1965:9) 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

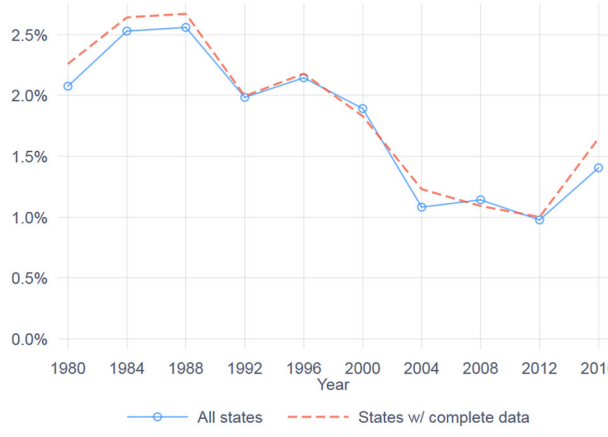
We are interested in what happens when a voter has decided to cast a ballot, but does not vote for president. Past research has tended to frame the issue of abstention conditional on turnout in terms of the probabilistic spatial model, where two spatial dynamics determine abstention, *abstention due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

[2]See Ansolabehere (2002), Leib and Dittmer (2002), Knack and Kropf (2003), Brady (2004), Buchler, Jarvis, and McNulty (2004), Ansolabehere and Reeves (2012), 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).

FIGURE 1

Residual Vote Rate Nationwide in Presidential Elections, 1980–2016



NOTE: The solid blue line reports the residual vote rate using all the data available for each year. The dashed red line reports the residual vote rate using data from states for which we could calculate the residual vote rate *each year* from 1980 to 2016.
SOURCE: U.S. Election Project (1980–1984); Election Data Services (1988–2000); the authors (2004–2016).

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 Timmons 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, and Nunez, 2018). This literature has infiltrated scholarship on American elections only slightly (Weinberg, Linderman, and Kawar, 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:

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

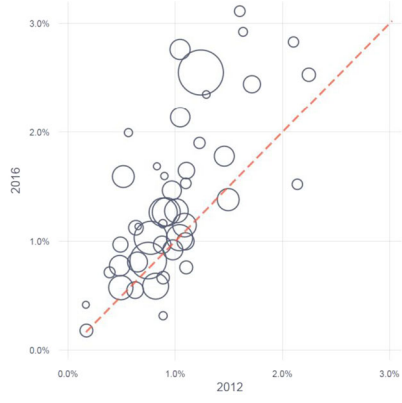
The national residual vote rate time series that runs from 1980 to 2016 (Figure 1) shows a clear break after 2000, which can be attributed to a combination of new voting machines and other post-2000 administrative changes. Before and including 2000, the residual vote

FIGURE 2

Comparison of Residual Vote Rate, 2016 Versus 2012

a. Counties (data transformed by taking cube roots)

b. States



SOURCE: Data gathered by the authors.

rate hovered around 2 percent. It was cut in half immediately after 2000 but spiked in 2016.

The average residual vote rate from 2004 to 2012 was 1.07 percent; the rate in 2016 was 1.41 percent. 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 percent (Stewart, 2014; Knack and Kropf, 2008), this would put the 2016 presidential abstention rate at around 0.8 percent nationwide. This implied abstention rate is significantly greater than the 0.11 percent of CCES respondents who reported abstaining in 2016, which we discuss in more detail in the article's Supplementary Materials.

Figure 2 presents scatterplots that compare the residual vote rates in 2016 and 2012 at the county and state levels (Figure 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: $r = 0.29$ for counties and $r = 0.68$ for states.[3] These correlations suggest that slow-changing legal, administrative, and cultural practices underlie the residual vote rate in any given jurisdiction.

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]

[3]The correlations are calculated weighting by turnout in 2016.

[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.

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 county and state levels, are provided in supplementary Figure SM3. 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 article'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 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, Ansolabehere, 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 percent) than in counties that used DREs (1.26 percent).[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 vote rate than optical scanners, by 0.14

[5]A simple quantitative measure of this point is the R^2 (0.54) of a regression that only contains state dummy variables to explain county residual vote rates.

[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 percent; the average residual vote rate for the 80 counties that used a mix of technologies was 1.67 percent. Averages here, and elsewhere in the article, are calculated after weighting by turnout.

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, 2005).

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.

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

[7]The *t*-statistic testing the difference in residual vote rates between DREs and optical scanners in the fixed effects regression is 2.54, $p = 0.011$.

[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 percent.

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	Coefficient (*SE*)
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	0.54

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
SOURCE: Data gathered by the authors.

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.

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 percent of voters voted for a minor-party candidate; well over the 3.75 percent of the vote went to minor-party candidates in 2012[9] (see supplementary Figure SM4). While these percentages are nowhere close to years such as 1968, 1992, and 1996, they approached the 8.24 percent level for the minor-party vote in 1980, when John Anderson received 6.6 percent of the vote against Ronald Reagan and Jimmy Carter. Among major minor-party candidates in 2016 on the right, Gary Johnson received 3.27 percent of the nationwide popular vote, while Evan McMullin received 0.53 percent and the Constitution Party candidate, Darrell Castle, received 0.15 percent. The only significant minor-party presence on the left was the Greens' Jill Stein, at 1.06 percent of the vote. Even if we apportion all the remaining minor-party candidates to the left, it leaves 4.01 percent of the nationwide popular vote going to right-wing minor-party candidates and 2.03 percent 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 states[10] prohibited write-in candidates.[11] The remaining states allowed

[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.

write-ins, with 33 having some form of registration in order for the votes to be reported separately, and nine (including DC) 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., 2017). 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 percent compared to 1.33 percent in states that allowed write-ins without preregistering and 1.44 percent in states that required prefiling 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 percent of voters to 21.1 percent.

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

[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 nonregistered 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.

for over- or undervotes. 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 ($r = 0.59$). This correlation was much weaker in 2012 ($r = 0.29$) and nonexistent between 2000 and 2008. (Scatterplots illustrating these effects, along with associate linear regressions, appear in supplementary Figure SM5 and Table SM1.) 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 tradeoff 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 supplementary Figure SM6, 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 ($r = 0.42$) 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 DC, 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 20 years has been its dramatic decline after the 2000 presidential election, in the wake of the wave of new voting machines

[14]More precisely, the best-fit line's equation is $y = 0.99\ (0.16) + 0.024\ (0.012)\ x$, with $R^2 = 0.18$ 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 $R^2 = 0.23$ and $n = 45$.

[16]As explored further in supplementary 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 DC from the analysis.

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, 2005; 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 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 intercounty 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 data set 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.

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 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.

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.

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

TABLE 2

Residual Vote Rates, 1988–2016, with Machine Effects Included: County Fixed Effects

Variables	Coefficient (*SE*)	Coefficient (*SE*)
Year		
1988	0.0059***	0.0057***
	(0.0004)	(0.0004)
1992	−0.0000	−0.0003
	(0.0004)	(0.0004)
1996	0.0020***	0.0018***
	(0.0004)	(0.0004)
2000	Excluded	Excluded
2004	−0.0083***	−0.0068***
	(0.0003)	(0.0004)
2008	−0.0083***	−0.0062***
	(0.0003)	(0.0004)
2012	−0.0092***	−0.0074***
	(0.0003)	(0.0004)
2016	−0.0046***	0.0024***
	(0.0003)	(0.0004)
Voting technology (opscan excluded)		
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***	0.016***
	(0.0003)	(0.0003)
County fixed effects	Yes	Yes
N	17,312	17,312
R^2	0.42	0.44

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
SOURCE: Data gathered by the authors.

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 undervotes, 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 United States to further study. Even if protest voting has been uncommon historically in the United States, 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 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 cross over 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.

The second implication of our findings is that public opinion surveys underestimate 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 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 *overreporting* 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 are 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 United States will need to rely heavily on aggregate analysis.

The 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

[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 percent 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 0.30, while the correlation between the write-in vote and Trump's share of the presidential vote in 2016 was 0.31. 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.

vote in an 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.

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Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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