When, Where, and How We Vote: Does it Matter?*

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Objectives. In this article, we explore the different ways Americans exercise their right to vote on Election Day and how these alternatives shape the voter's experience. *Methods.* Our study draws on data collected from exit polls with Election Day voters in the 2008 Colorado presidential election. Colorado is unique among the 50 states in that it affords it voters the widest array of voting options, both before and on Election Day, and thus provides an ideal setting for testing our hypotheses. *Results.* We find voting places that are more accessible and open (i.e., voters can vote at more than one location on Election Day) significantly enhance voter performance and evaluation. In several instances, this finding is attenuated for infrequent voters. *Conclusions.* There are valuable lessons regarding the centralization and location of polling places that could be applied to precinct voting models. Counties might concentrate more attention on adequately equipping polling locations, particularly having a sufficient number of quality poll workers to assist voters with check-in and the voting system.

Where, when, and how American voters cast their ballots has become highly variable. We do not all vote on the same day, we vote at a host of different places, and we use a cornucopia of different types of voting equipment ranging from paper ballots to sophisticated electronic voting machines. Does this matter? In this article, we explore the different ways Americans exercise their right to vote and how these alternatives shape the voter's experience. Our focus is on how the alternative ways we vote effect satisfaction with voting technology, the places at which we vote, the number of races voters ballot in, voter confidence that their ballot will be counted accurately, and the time voters spend waiting to vote. Our study draws on data collected from exit polls with Election Day voters in the 2008 Colorado presidential election.[1] Colorado is unique among

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[1]The focus of our study is how Election Day voting places and the persons who are responsible for their operation shape the voter's experience. We are unable to study voting place effects on the experience of mail-in voters since these voters presumably vote at home with unknown conditions and assistance from others. We are similarly constrained in comparing the experiences of in-person early voters with Election Day voters. In-person early voters choose

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the 50 states in that it affords voters the widest array of voting options, both before and on Election Day, and thus provides an ideal setting for testing our hypotheses.

The plan of the article is as follows. In the second section, we review the literature on the different ways individuals cast their ballot and how this variation might explain voter experiences and evaluations. In the third section, we offer a general explanation for how alternative institutional arrangements for conducting elections influence the voting experience. We offer several hypotheses about how alternative voting systems effect voter satisfaction and participation. The fourth section presents our hypotheses, a research design, and measures for testing our hypotheses. We provide the estimation results in the fifth section, drawing on an exit poll conducted on Election Day 2008 in Colorado. We conclude with a discussion of how our findings might be used by local election administrators.

Where and When We Vote

The overwhelming majority of Americans vote at a precinct voting place on Election Day. That is, all qualified voters residing in the same geography (i.e., precinct) can vote at only one voting place location on Election Day. Of course, voters in all states have a wide range of options when choosing when and where they vote. Voters have long had the opportunity to vote before Election Day by casting an absentee ballot, normally by mail (see Bensel, 2004). The proportion of votes cast before Election Day has increased over the last four decades. In the 1972 presidential election, 4 percent of the vote was cast before Election Day. In 2008, the proportion of vote cast before Election Day had increased to 30 percent (McDonald, 2009). In 2008, more than half of all votes cast in nine states (i.e., Colorado, Florida, Georgia, New Mexico, North Carolina, Oregon, Tennessee, Texas, and Washington) were cast before Election Day (McDonald, 2009). The significant rise in the number of votes cast before Election Day begins with the adoption of in-person early voting in Texas in 1988. As of 2008, more than half the states, 31, permitted in-person early voting (Cemenska et al., 2009).[2]

A recent election innovation adopted in Colorado, Indiana, and Texas and under consideration in several other states (e.g., Arizona) involves replacing

to vote before Election Day and choose when to vote (i.e., day of week) making comparisons with the experiences of Election Day voters problematic (e.g., different weather conditions, campaign activities, etc.). Moreover in-person early voters are known to be significantly different in terms partisanship and interest in and knowledge about politics (Stein, 1990; Gronke et al., 2007) further complicating a comparative analysis of voting place effects on the experiences of early and Election Day voters.

[2]In-person early voting comprises the larger proportion of votes cast before Election Day. Oregon has only vote by mail and several states, including Colorado, have permanent mail-in voting, which accounts for just over half of all votes cast in the 2008 Colorado presidential election.

traditional precinct-based voting places with Election Day vote centers (EDVC). Election Day vote centers are nonprecinct-based locations for voting on Election Day. The sites are fewer in number than precinct voting stations, centrally located to major population centers (rather than distributed among many residential locations), open to all voters in a county, and rely on county-wide voter registration databases accessed by electronic poll books (i.e., *Epollbooks*). Voters in the county are provided ballots appropriate to their specific voting jurisdiction. Of course this mode of balloting is what early voters are afforded before Election Day. Unlike in-person early voting and mail-in voting, vote centers replace traditional Election Day precincts.

The different opportunities to vote before and on Election Day are accompanied by with a wide variety of places at which we vote, ranging from local elementary schools to private homes and businesses including retail stores, bus stations, hotels, and supermarkets (Gronke, Rosenbaum, and Miller, 2007; Stein and Garcia, 1997; Stein, 1998; Stein and Vonnahme, 2011; Shambon and Abouchar, 2006). Moreover, the variety of these voting places is associated with significant variation in the infrastructure, accessibility, and layout of available locations in voting jurisdictions, conditions that can influence the individual voting experience.

Two aspects of voting are thought to have a positive effect on voter turnout and satisfaction with the voting experience: openness and centralization. Openness allows individuals to vote at any location throughout the county rather than be restricted to voting at only one location near the voter's residence. Openness is expected to increase turnout and voter satisfaction by lowering transportation and information costs as voters can go to any location that is most familiar and convenient for them or locations frequented in the course of their daily activities of working, shopping, and recreating.

Centralization refers to the accessibility of vote places to which voters not only reside, but where they work, shop, recreate, and travel. Centralization may have several positive effects on voter participation and satisfaction (Stein and Vonnahme, 2008). Larger and more visible sites can reduce informational costs that voters incur when attempting to find a polling location. A larger number of parking spaces, voting machines, and poll workers reduce voters' time to vote. With more staff at each polling location, poll workers are able to specialize in certain tasks such as checking in voters or assisting them with their ballots, which should lead to more efficient operations and improved service to voters. Claussen et al. (2008) make a similar argument about the voting experience and subsequent voter participation. They refer to voting as a "service experience" that can either positively or negatively reinforce future voting behavior. We share this view and believe that open and centralized voting systems enhance the voters "service experience" and future likelihood of voting.

Centralization may also be observed in Election Day precinct-based voting places, especially in counties that have consolidated their voting precincts presumably into a smaller number of larger voting places. One consequence

of consolidating voting precincts may be a more efficient distribution of voting places for both voters and election administrators, increasing voter participation and satisfaction (Brady and McNulty, 2011). For example, it is possible, and even likely, that the result of consolidating voting places requires that the new voting places be larger so as to accommodate the greater number of voters and required machines and poll workers. The availability of such facilities may be limited to locations outside of residential neighborhood, areas with facilities that can accommodate the need for larger floor space and parking.

The Impact of Where and When We Vote on Turnout and Voter Satisfaction

The efficacy of liberalized voting by mail (Berinsky, 2005; Berinsky, Burns, and Traugott, 2001) and in-person early voting (Stein and Garcia-Monet, 1997; Stein, 1998; Neeley and Richardson, 2001; Karp and Banducci, 2000; 2001; Gronke, Rosenbaum, and Miller, 2007; Kousser and Mullin, 2007) were found to have an insignificant or marginal effect on increasing the likelihood an individual will vote. Neeley and Richardson report "that early voting merely conveniences those who would have voted anyway" (2001:381). Stein (1998) reports that voter turnout among resource-poor voters does not benefit from the adoption of in-person early voting. More importantly, early voters are disproportionately likely to have voted in the past (Hanmer and Traugott, 2004; Southwell and Burchett, 1997, 2000). Richey (2008) offers a dissent from this view, finding that in Oregon, mail-in voting has increased voter turnout significantly since its adoption in 2000. Southwell and Burchett (1997, 2000) report high levels of voter satisfaction with early and mail-in voting. These findings are consistent with the view that early voting is used by likely voters.

It is thought that the use of voting centers on Election Day will increase voter turnout by reducing the cost and/or inconvenience associated with voting at traditional precinct locations for Election Day voters. Unlike those who vote early, Election Day voters are less partisan, less ideological, and less interested in politics. Consequently, they may be more susceptible to the convenience of Election Day vote centers. Stein and Vonnahme (2008) find some support for this hypothesis. Studying vote centers in one Colorado county during the 2006 mid-term election, the authors found that vote centers significantly increase voter turnout, especially among habitual nonvoters.[3]

[3]Americans vote a wide variety of places including schools, churches, public buildings, homes, shopping malls, school buses, and residences. There is compelling evidence to show that where we vote influences how we vote (Berger, Meredith, and Wheeler, 2002). Studying voting on school funding initiatives, the authors found that "people who were assigned to vote in schools were more likely to support a school funding initiative" (2008:8846). Moreover, this

How We Vote

The five voting technologies currently used in the United States are hand-counted paper ballots, mechanical lever machines, punch cards, optically scanned paper ballots, and electronic voting machines (i.e., direct-recording electronic (DRE) voting machines). The two most widely used technologies are optically scanned paper ballots and DREs (Verifiedvoting.org, 2012). Research has examined how each technology is related to several dependent conditions, including residual votes conventionally referred to as undervotes, voter satisfaction, voter confidence in the accuracy of the voting system, and the time it takes a voter to cast a ballot.

The residual vote is defined as the difference between the number of voters who come to the polls to vote and the number of votes cast in a given contest. When the number of votes cast for any one race is less than the total number of ballots cast, we observe residual votes, or undervotes. Overvotes occur when voters improperly mark or select more than one ballot choice for a single contest. These ballots are invariably voided with respect to the contest in question because voter intent cannot be readily determined.

The most obvious explanation of undervotes is the existence of weak and anemic candidate campaigns that fail to inform and mobilize voters, especially for low-level, obscure offices. Of greater relevance to election administration are undervotes that occur despite the voters' wish to register a choice for a given office. For example, new voting technologies, unfamiliar even to the most frequent voter, can lead voters to unintentionally fail to record their preferred vote choice. Overvotes are most often attributed to ballot design, voting technologies, and the interaction of these factors with voter attributes (e.g., education, age, and related physical acuity). Here, human factors interact with technology and ballot design to produce errors similar to those observed with the use and operation of consumer products (Greene, Byrne, and Everett, 2006; Everett, Byrne, and Greene, 2006; Laskowski et al., 2004; Roth, 1998).

Using different methodologies (experimental and aggregate studies), research settings (precincts, cities, and states), as well as a mix of different voting technologies, the extant research has found that paper ballots, both hand counted and optically scanned, are significantly superior to lever machines, DREs, and punched cards in reducing residual votes (White, 1960; Asher, 1982; Shocket, Heighberger, and Brown, 1992; Nichols and Strizek, 1995; Knack and Kropf, 2003; Kimball, Owens, and Keeney, 2004; Ansolabehere and Stewart, 2005). Other researchers (Stein et al., 2008; Alvarez and Hall, 2008), however, find that voter satisfaction and confidence was significantly

finding persisted when controlling for voters' political views, demographics, and unobservable characteristics of individuals living near schools. Berger, Meredith, and Wheeler (2002) explain the effect of voting place on vote choice as function of the "subtle power of situational context to shape important real-world decisions" (2008:8848). Voting at a school primes and activates an individual's affect about schools, for example, one should support education. This priming effect is found to be sufficiently salient to motivate a vote for a school spending initiative.

greater with electronic voting machines than with any other technology, including paper ballots, either optically scanned or hand counted.

These different and contrasting findings for voting technology's effect on the residual vote and voter evaluations may reflect the influence of the interaction between different voting technologies and local election administration. Moreover, the actual influence of voting technology on residual votes may be exaggerated. Voters "may intentionally abstain in a particular race" (Ansolabehere and Stewart, 2005:369) because of a lack of interest, information, or a preferred choice among the contesting candidates. These conditions cannot be attributed to any particular voting technology nor readily measured with aggregate/precinct-level designs. Similar results have been reported by Alvarez and Hall (2008) for voter satisfaction with their voting experience and voter confidence that their vote will be counted accurately. Moreover, these authors found some instances where electronic vote machines were rated as high as or higher than paper ballots.

Ansolabehere and Stewart (2005) offer an important note of caution about their own and the extant literature's conclusions about the effect of voting technology on residual votes. "[I]t appears that most of what influences whether votes get counted is due to population dependent factors that are distinct from the type of voting technology used" (2005:383). They conclude:

> The incidence of uncounted and spoiled ballots depends strongly and systematically on "county" in addition to equipment. . . . We conjecture that this county effect is substantially the result of local *institutions* of electoral administration, such as the administration of local polling places or advance instruction to voters. (2005:386)

We concur with this perspective. Moreover, we believe the technology voters use to cast their ballots is made more accessible, error free, and positively evaluated by voters with effective management and administration of the voting experience. The availability of experienced and knowledgeable poll workers who can assist voters with new and/or unfamiliar voting technologies enhances the voting experience and reduces voter errors such as under- or overcounts on their ballot. These conditions are thought to be more prominent at centralized and open voting places.

Research Hypotheses

The extant literature suggests that centralization and openness in the operation of voting systems has a significant and positive effect on voters' experience at the polling place. Allowing individuals to vote at any polling place throughout the voting jurisdiction (e.g., county) is mutually beneficial for voters and election administrators. For the voter, the added number of places at which to vote increases the likelihood that he or she can and will vote. For administrators, the opportunity to locate voting places beyond the confines of

neighborhoods and precincts increases the opportunities for the efficient and effective conduct of an election. The technical demands of conducting an election, both before and on Election Day require skilled personnel to maintain computer-based voting and registration databases and who are knowledgeable and conversant in election law. A larger number of relatively small voting places (i.e., precinct based/nonopen voting systems) work against the efficient and effective use of election personnel. Conversely, a smaller number of larger voting places enable local election officials to maximize the use of their scarce personnel and reduce operational costs, all to the benefit of voter.[4]

We suspect that the benefits from centralized and open voting systems disproportionately flow to infrequent voters and persons less interested in politics and therefore less likely to vote. Consider the experience of an infrequent voter. He or she is less likely to be familiar with the location of any voting place, the equipment on which to vote, and more easily deterred from voting when confronted with obstacles and impediments to voting such as long lines, scarce parking, and less accessible locations at which to vote. The search costs required of an infrequent voter to locate a voting place is reduced when the voting places are at locations that are familiar, frequented, and accessible to the general public (shopping malls, work places, and locations accessible from major roadways). The prior voting history of frequent voters makes them more knowledgeable about the location of voting places, the equipment on which they vote, and less likely to be deterred from voting because of long lines to vote, scarce parking, and less accessible locations at which to vote (Brady and McNulty, 2011).

We hypothesize that:

1. Voter satisfaction with the voting experience will be greater for voters balloting at open and centralized voting places.
2. Infrequent voters will experience greater satisfaction with their voting experience at open and centralized voting places.
3. Voter confidence that ballots will accurately be counted will be greater at open and centralized voting places.
4. Voters' evaluations of electronic voting machines will be more positive at open and centralized voting places.
5. Voters' waiting time to vote will be shorter at open and centralized voting places.
6. Voter undercounts will be lower at open and centralized voting places.

[4]Concerns are sometimes raised about the consequences of centralization on distance to polling locations. While this is an important concern about the implementation of EDVCs, we have found little evidence that vote centers substantially increase average residential distance and when combined with openness, we have found that a clear majority of voters do not minimize residential distance. Details of these analyses are available upon request from the authors.

Research Design and Measures

A test of our hypotheses requires a unique database and research setting in which we can observe voters balloting at several different types of voting places and on different types of voting equipment/systems in the same election. The Colorado 2008 presidential election provides us with such a setting. Colorado provides its citizens a wide variety of ways, places, and times that they can vote. Colorado voters can vote in person up to 12 days before Election Day at early voting places. Voters can request a permanent mail-in ballot that is sent to their residences one month before Election Day and can be returned at any time including on Election Day. In addition to in-person voting, on Election Day counties in Colorado can adopt Election Day vote centers. In 2008, 21 of Colorado's 64 counties conducted Election Day voting at vote centers rather than precinct-based voting places. Finally, Colorado counties have discretion in choosing the voting equipment on which their voters ballot. Colorado voters ballot on several different electronic voting machines as well as optically scanned paper ballots.

One concern with the research design is the possibility that only very high turnout counties adopted the innovation. We address this possible source of confounding in two ways. First, we compare mean turnout rates in the counties for the previous two elections to assess whether electorates in the EDVC counties are substantially more engaged than electorates in precinct counties regardless of the mode of voting. Second, we control for a number of key variables in the analyses below. Before 2006, only one county in Colorado used vote centers. After 2006, 18 additional counties adopted vote centers for Election Day voting. If only counties with highly engaged electorates adopted EDVCs, we would expect to observe a significant difference in mean turnout rates between EDVC and non-EDVC counties prior to the reform. However, this is not what we observe. In the previous election (2004), turnout as a percent of registered voters was slightly higher in the precinct (0.889) than EDVC counties (0.879), although this difference was not significant ($p = 0.441$, two-tailed). In the previous mid-term election (2002), turnout was again higher in precinct (0.583) than EDVC counties (0.507) and this difference was statistically significant ($p = 0.003$). Similarly, if adoption was motivated by a preference to reduce the costs of conducting and administering elections, we would expect to observe a significant difference in mean costs of conducting elections between EDVC and non-EDVC counties. A comparison of the total costs of in-person election administration (per vote cast) shows that EDVCs were associated with lower costs ($8) than precincts ($11) but this difference was not significant at conventional levels ($p = 0.214$).

To test our main hypotheses, we interviewed a sample of Election Day voters in the 2008 Colorado presidential election about their voting experiences. Interviews were conducted with 3,703 Election Day voters at 59 Election Day vote places in 25 of Colorado's 64 counties. Exit polls were conducted

in 12 counties that used Election Day vote centers and 13 counties that used precinct-based voting places.[5]

We constructed several measures of self-reported voter behavior and affect that might both define and explain the voting experience. These include:

- Evaluation of the voting system
- Evaluation of the polling place
- Self-reported time waiting to vote
- Voter confidence in the integrity of the voting system
- Self-reported number of races voted for (i.e., undercount).

In addition, we collected information on self-reported voting history, prior experience with type of voting technology used (paper and electronic voting systems), self-reported proximity of voting place to home, shopping, work, children's school, and major roadway, satisfaction with poll workers, and selected demographics including age, income, education, gender, and race/ethnicity. Finally, data were collected on the number of voting machines, parking spaces, and poll workers at each polling place by time of day. These data enable us to identify the physical and operational differences between Election Day voting places.

Measures

To measure the usability of different ballot systems, voters were asked whether they agreed or disagreed with the following statements about the voting technology they used on Election Day.

1. I thought the system was easy to use.
2. I think that I would like to use this system again.
3. I found the voting system unnecessarily complex.
4. I think that I would need the support of a technical person to use the system.
5. I felt very confident using the system.
6. I need to learn a lot of things before I could get going with the system.

Subjects could choose responses from strongly agree (5) to strongly disagree (1) for each of the items. Two factor scores were calculated from the six items

[5]Denver County used a consolidated or "super precinct" voting system. Super precincts are the product of consolidating a larger number of smaller voting places at a larger and more accessible location. Unlike Election Day vote centers, however, voters can ballot at only one designated super precinct. The assumed advantage of super precincts for voter participation is that their larger capacity (i.e., number of voting machines and poll workers) and location enhances the efficiency and convenience of voting for individual voters. Evidence for these effects is not found and Denver's super precincts are treated in our analysis as a precinct-based voting system.

using a rotated principal components analysis.[6] The first factor is comprised of items 1, 2, and 5 and measures the degree of difficulty the voter had in using the voting technology available at his or her voting place. The second factor, comprised of items 3, 4, and 6, measures the amount of assistance and time needed to learn how to use the voting technology.[7]

A similar set of questions were posed to voters about their polling place, including:

1. I did not have to go far out of my way to vote.
2. The poll workers were helpful.
3. This location was easy for me to find.
4. Parking was hard to find.

One factor score was computed for four items using an unrotated principal components analysis.[8]

Our measure of voter undercounts (i.e., the residual vote) is based on a voter's response to the question: "In about how many races did you vote today?" Voters could respond that they voted in all, more than half, half, or less than half of the races. Nearly two-thirds (64 percent) of 2008 Colorado voters reported voting in every race. We used these data to create a variable for undervoting that had a value of 0 for subjects who reported voting in every race and a value of 1 if the subject did not vote in every race.

Voter confidence in the voting system was assessed with the question: "I am confident that my vote will be counted accurately." Voters were asked if they agreed or disagreed with this statement using a five-point scale (1 = strongly disagree and 5 = strong agree). Not unexpectedly, an overwhelming majority of voters (78.05 percent) agreed with the statement. Finally, we asked voters: "How long did you wait in line to vote, if at all? No line, less than five minutes, 5–10 minutes, 10–20 minutes, more than 20 minutes?"

Findings

Summaries of the exit poll responses provide initial evidence in support of the main effects of EDVCs, specifically that they increase voter evaluations and voter confidence and reduce undervoting. Summaries (Table A2–A4) are

[6]Counties in Colorado have the option of conducting elections on either paper ballots or electronic voting machines. In our sample of Election Day voters, 64 percent used a paper ballot and 36 percent used an electronic voting machine.

[7]Previous research identified only one dimension of voting system usability with an exit poll conducted during the 2006 mid-term congressional election (see Stein et al., 2008; Stein and Vonnahme, 2009). The emergence of a second dimension might be due to the higher turnout obtained in a presidential election. Presidential elections turn out more and less experienced voters who might be unfamiliar with the voting technology they used. This lack of familiarity with the voting technology may account for the emergence of a second factor among presidential rather than mid-term election voters.

[8]A factor analysis of the four items produced one factor with an eigenvalue greater than 1.0.

included in the supporting information. An exception is hypothesis 5, which states that EDVCs will reduce time spent waiting in line. Self-reported wait times actually increased from a mean of 1.83 in precinct counties to 2.26 in EDVC counties ($p < 0.05$).[9] This difference, however, appears substantively trivial; a slightly greater proportion of respondents reported waiting 5–10 minutes to vote in EDVC counties than in precinct counties.

Rating of the Voting System

Table 2 reports the regression coefficients for a model of satisfaction with the voting system voters used on Election Day (columns 1 and 2). The dependent variable is the factor score for the rating of the voting system discussed above. The independent variables include the type of ballot used (1 = DRE, 0 = paper), prior experience with the ballot system (1 = yes, 0 = no), voter's rating of the voting place, the type of Election Day voting place (1 = EDVC, 0 = precinct), voting history (1 = some of the time or never, 0 = always or most of the time), time waiting to vote, and several demographic controls, including age, income, gender, and race/ethnicity (1 = non-Anglo, 0 = Anglo). To test our hypothesis that infrequent voters have a more positive voting experience at Election Day voters centers, we have included the interaction between self-reported voting history and voting place (1 = EDVC, 0 = precinct) in the second column of Table 1. As hypothesized, voters at Election Day vote centers were significantly more likely to positively rate their experience with their voting system than precinct voters. This effect is independent of the type of ballot used and the voter's rating of the voting place. Infrequent voters were more likely to positively rate the vote system used than voters with a more frequent history of voting. The coefficient for the interaction between voting history and voting at a vote center is positive but not statistically significant (Table 1, column 2). Contrary to our hypothesis, vote centers do not differentiate the voting experiences of frequent and infrequent voters.

Consistent with previous research (Stein et al., 2008), satisfaction with voting systems was significantly higher among those who balloted on an electronic voting machine than a paper ballot. Similarly, prior experience with the voting system produced more positive ratings for the voting system. The strongest determinant of voter satisfaction with the ballot system was voter's rating of the voting place. Accessible voting places with ample parking and helpful poll workers had a significant and positive effect on voters' rating of the type of ballot they used on Election Day. Among voter demographics, only income had a significant and expected positive effect on voters' experience with the voting system they used on Election Day.

[9]The responses for wait times were no line (1), less than five minutes (2), 5–10 minutes (3), 10–20 minutes (4), and more than 20 minutes (5).

TABLE 1

Regression Estimates and Standard Errors from the Exit Poll Responses

	Rate Voting System		Learning Vote System		Rate Polling Place		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ballot type (1 = DRE)	0.122***	0.123***	0.000	–0.078*	–0.090***	–0.247***	–0.090***
	(0.032)	(0.032)	(0.030)	(0.042)	(0.031)	(0.043)	(0.031)
Used ballot before	0.215***	0.216***	0.056*	0.062*	–0.145***	–0.131***	–0.143***
	(0.034)	(0.034)	(0.032)	(0.032)	(0.033)	(0.033)	(0.033)
Rate voting place	0.558***	0.557***	0.616***	0.612***	–	–	–
	(0.015)	(0.015)	(0.014)	(0.014)	–	–	–
Wait to vote	–0.037***	–0.038***	0.005	0.005	–0.070***	–0.071***	–0.071***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
EDVC	0.107***	0.037	0.021	0.015	0.162***	0.049	0.100*
	(0.030)	(0.057)	(0.029)	(0.057)	(0.030)	(0.037)	(0.056)
History of voting	0.045***	0.027	–0.038***	–0.024	–0.066***	–0.063***	–0.081***
	(0.015)	(0.020)	(0.014)	(0.018)	(0.015)	(0.015)	(0.019)
History × EDVC	–	0.038	–	–0.026	–	–	0.033
	–	(0.026)	–	(0.024)	–	–	(0.025)
EDVC × DRE	–	–	–	0.153***	–	0.310***	–
	–	–	–	(0.058)	–	(0.060)	–
Non-Anglo	–0.048	–0.048	–0.123***	–0.125***	–0.123***	–0.126***	–0.123***
	(0.036)	(0.036)	(0.034)	(0.034)	(0.035)	(0.035)	(0.035)

TABLE 1—continued

	Rate Voting System		Learning Vote System		Rate Polling Place		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Education	0.010	0.009	0.023	0.023	0.079***	0.078***	0.079***
	(0.017)	(0.017)	(0.016)	(0.016)	(0.017)	(0.017)	(0.017)
Age	–0.006	–0.006	0.002	0.003	–0.015**	–0.014*	–0.015**
	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Gender	–0.004	–0.004	0.019	0.022	0.048*	0.054*	0.047*
	(0.028)	(0.028)	(0.027)	(0.027)	(0.028)	(0.028)	(0.028)
Income	0.020**	0.020**	0.014	0.014	0.012	0.012	0.012
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Party ID	0.027	0.028	–0.001	0.000	–0.049***	–0.045***	–0.048***
	(0.018)	(0.018)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Rate voting system	–	–	–	–	0.537***	0.530***	0.536***
	–	–	–	–	(0.014)	(0.014)	(0.014)
Constant	–0.353***	–0.316***	–0.130	–0.148	0.060	0.073	0.092
	(0.110)	(0.113)	(0.104)	(0.107)	(0.108)	(0.108)	(0.111)
Observations	3,290	3,290	3,309	3,309	3,290	3,290	3,290
R^2	0.346	0.347	0.414	0.416	0.368	0.373	0.368

*$p < 0.1$, **$p < 0.05$, ***$p < 0.001$.

Time to Learn Voting System

Presidential elections produce a larger and less experienced population of voters. Many 2008 presidential voters had not voted since the 2004 presidential election. Consequently, infrequent voters may be less familiar with the location of their voting place and the proper use of the voting system. Infrequent voters are likely to require more time and assistance to vote compared to more frequent voters. This condition might be more pronounced in counties using electronic voting machines, a voting system that might not be familiar to infrequent voters. Election Day vote centers are thought to provide infrequent voters with multiple ways to "reacquaint" themselves with different voting technologies.

The third and fourth columns report models for the factor score measuring how easy it was to learn how to use the voting system. The third column tests the main effects of our hypothesized correlates of voter evaluations. The fourth column reports several tests of our explanations about how vote centers might enhance the ease with which voters acquire the necessary knowledge to operate different voting systems.

Contrary to expectations, we find no evidence that vote centers produce a significantly less effortless experience at mastering voting systems than precinct-based voting places. The specific ballot system used is unrelated to reported time and effort needed to learn how to the use the voting system. If electronic voting systems are easier to use, there is no evidence that the time and effort it takes to learn how to use an electronic voting system is the source of this preference. Prior experience with either electronic or paper ballots is associated with a significant and positive learning experience with the voting system used on Election Day. As hypothesized, however, voters balloting on electronic voting machines at vote centers reported an easier time learning how to use their respective electronic voting systems than voters balloting on DREs at precinct voting places (i.e., EDVC $\times$ DRE in the fourth column). As expected, infrequent voters reported more difficulty learning how to use their respective voting system than more frequent voters. The difficulty infrequent voters have mastering their respective voting systems is not, however, remedied by either voting at an Election Day vote center or on an electronic voting system. Consistent with Ansolabehere and Stewart's (2005) hypothesis, voters' rating of their voting place and its personnel has a significant and positive effect on the ease with which voters' mastered the voting system.

Rating of the Voting Place

Columns 5 and 6 report our estimates for the factor score of voters' rating of their voting place. Again, the table reports several models that include alternative interaction terms for testing our hypotheses. Voters rated their experience at vote centers significantly higher than voters at precincts. This effect remains

significant and strong when controlling for a host of rival explanations. As expected, a voter's rating of his or her experience with the voting system used strongly influences how the voter rated where he or she voted. Voters who balloted on electronic voting machines were significantly less likely to positively rate their voting place. We suspect this might reflect the effect of inexperienced voters who turnout for presidential elections and are less familiar with electronic voting machines. Infrequent voters, older voters, males, and less educated voters all reported less satisfactory ratings of their vote place.

Column 7 of Table 1 reports the test of our hypothesis that vote centers produced a more positive voting place experience for infrequent voters. The coefficient for the interaction between vote history and voting at a voter center (History × EDVC) is not statistically significant. Contrary to our hypothesis, infrequent voters are not more satisfied with their experience at vote centers over precinct-based voting places. Vote centers received a significantly higher rating from voters when they balloted on electronic voting machines. The coefficient for the interaction between vote centers and DREs (EDVC × DRE) in Table 1, column 6 is significant and positive. Moreover, the size of this coefficient ($b = 0.31$) is significantly larger than the effect for either vote centers or DREs have on voter satisfaction with their Election Day voting place.

How can we reconcile the finding that voters balloting on electronic machines prefer this voting system (columns 1 and 2 of Table 1), but generally rate their voting place experience more negatively than voters using paper ballots? As discussed earlier, we suspect that vote centers help voters facilitate their use of electronic voting machines, a voting technology that was relatively new to Colorado voters in 2008 and especially to intermittent voters. We test this expectation by asking whether voters who voted at a vote center on a DRE were more satisfied with their voting place than all other voters. The interaction between EDVC and DRE captures this effect. The coefficient for the EDVC variable in column 6 informs us about the vote place ratings for voters who balloted at a vote center on a paper ballot. The findings suggest strong support for our hypothesis; voters who voted at a vote center on a DRE had significantly higher ratings of their vote place than voters who balloted on paper ballots at vote centers.[10]

Voter Confidence Their Ballot Will be Accurately Counted

Voter confidence that their ballot will be accurately counted is almost exclusively a consequence of the voter's experience with the vote place and voting system (column 1, Table 2). Vote centers have a positive effect on voter confidence. Democrats are significantly more likely to believe their vote

[10]The number of voters voting at a vote center on a DRE is not a trivial proportion of the Colorado electorate in the 2008 presidential election. Approximately 21 percent of our sample ($N = 796$) voted on a DRE at an Election Day vote center.

TABLE 2 Regression Estimates and Standard Errors for Voter Confidence and Undercounts

	Confidence (1)	Undercount (2)
Ballot type (1 = DRE)	–0.021	–0.048
	(0.036)	(0.035)
Used ballot before	–0.013	–0.071*
	(0.038)	(0.037)
Rate vote place	0.311***	–0.059***
	(0.020)	(0.020)
Rate vote system	0.280***	–0.034*
	(0.020)	(0.019)
Wait to vote	–0.005	0.034***
	(0.013)	(0.013)
EDVC	0.058*	–0.150***
	(0.035)	(0.033)
History of voting	–0.022	0.178***
	(0.017)	(0.017)
Non-Anglo	–0.002	0.042
	(0.041)	(0.040)
Education	–0.023	–0.010
	(0.020)	(0.019)
Age	–0.005	–0.036***
	(0.009)	(0.008)
Gender	0.014	0.038
	(0.032)	(0.031)
Income	0.014	–0.038***
	(0.011)	(0.011)
Party ID	0.085***	0.013
	(0.020)	(0.019)
Constant	4.182***	1.540***
	(0.125)	(0.121)
Observations	3,286	3,254
R^2	0.256	0.111

*$p < 0.1$, **$p < 0.05$, ***$p < 0.001$.

will be accurately counted than either Republicans or independents. Voters who used a DRE in 2008 or earlier were no more skeptical about their vote being accurately counted than users of a paper ballot. Alternative ordered logit estimates are substantively similar.

Alvarez, Hall, and Llwellyn (2008) report significant differences in the confidence voters have that their ballot will be accurately counted by alternative modes of voting. Specifically, early voters, that is, persons voting by mail and in-person before Election Day, are significantly less confident that their ballot will be counted accurately than Election Day voters. Our estimates of voter confidence are obtained for only Election Day voters and anticipate those reported by Alvarez, Hall, and Llewellyn (2008). We suspect that the

diminished confidence early voters have that their ballot will be accurately counted is related to the "chain of custody" these voters perceive associated with their ballots. The ballots of early voters have more opportunities to be lost, mutilated, miscounted, or not counted at all. Mail-in ballots can be lost or marred in transit and in-person early voters may perceive the time between when they cast their ballot and when it is counted increases the likelihood of counting error, either intentional or unintentional.

Undercounts and Functional Voter Turnout

There are a myriad of reasons why a voter might not vote in all races on the ballot. The most likely explanation for incomplete ballots—undercounts—is apathy and lack of information about the contesting candidates for many races. There is evidence (Ansolabehere and Stewart, 2005) that some variation in voter undercounts is attributable to voting place administration and voting technology. Column 2 of Table 2 reports a model of self-reported voter undercounts (1 = voted in all races, 2 = vote in more than half, 3 = voted in half, and 4 = voted in less than half). Consistent with previous research, rating of the voting place and prior use of the voting system (from the results in Table 2, Column 2) are significantly related to fewer reported voter undercounts. Younger, poorer, infrequent, and voters reporting longer waits to vote were more likely to report voting in fewer races. Vote centers have a strong and negative effect on voter undercounts. Moreover, the magnitude of this effect on reported undercounts is substantially greater than voters' evaluation of their voting place or ballot system.

Are the results from the exit poll consistent with aggregate data on undervotes? We collected data on election returns from Colorado counties for all statewide elections in 2008. This includes the presidential election, a Senate election, two Supreme Court elections, six appeals court elections, ten constitutional amendments, and four referenda. Since these are all statewide races, the same items appeared in each county, regardless of the method of voting. We calculated the percent of undervotes for each item by calculating the percent of all voters (number of ballots cast in the county) that registered a preference in the race (number of votes in that county for that particular race). Table 3 shows regression estimates for the percent of undervotes in the races. As shown in the Table 3, EDVCs have a significant and negative impact on undervoting, which is consistent with the exit poll results. Not only do EDVCs increase the number of voters (Stein and Vonnahme, 2008, 2011), but the voters that show up cast more complete ballots.

We can further analyze these data by conceiving of undervotes and voter turnout as two component parts of a more general concept of functional voter turnout. If the core function of an election is to allow citizens to register preferences in a democratic decision-making process, then we can consider how many citizens actually register preferences in the available contests. We

TABLE 3

Regression Estimates of Undercounts, Standard Errors in Parentheses

Variable	Coefficient
EDVC	–0.012**
	(0.004)
Vote margin	–0.868***
	(0.022)
Constant	0.465***
	(0.008)
N	1,536
R^2	0.502

*$p < 0.1$, **$p < 0.05$, ***$p < 0.001$, two-tailed.

TABLE 4

Regression Estimates of Functional Voter Turnout; Standard Errors in Parentheses

Variable	Coefficient	*p*-Value
EDVC	0.018	0.139
	(0.012)	
Constant	0.766	0.000
	(0.006)	
N	64	
R^2	0.035	

thus consider each of the individual races on the ballot to be a discrete opportunity for a citizen to register a preference and thus fulfill the basic function of an election. To create our measure of functional voter turnout, we multiply the number of active registered voters by the number of races. Across all of the counties, there were over 63.4 million functional voting opportunities in the state of Colorado in the 2008 general election. Of these, there were a total of 49.7 million votes cast for a functional turnout rate of 78 percent. Comparing functional turnout in EDVC (0.783) and non-EDVC (0.766) counties shows a higher rate of functional turnout in EDVC counties ($p = 0.139$, two tailed).

Conclusion and Discussion

This article focuses on the attributes of Election Day voting places that enhance voter performance and evaluation of their voting experience. We found that voting places that are more accessible and open (i.e., voters can vote at more than one location on Election Day) significantly enhance voter

performance and evaluation. In several instances, this finding is attenuated for infrequent rather than frequent voters. Though both these attributes are more common at Election Day vote centers, Election Day precinct voting places are not immune to greater accessibility.

The results from above suggest that overall EDVCs are rated more favorably than precinct locations. On a battery of four place characteristics, ratings of the voting system, voter confidence, and undercounts, EDVCs performed better than precinct-based locations. That EDVCs were more highly rated by voters than precinct locations is consistent with earlier theoretical arguments and suggest that the effect of vote centers on turnout is likely not attributable to unobserved covariates.

Poll workers might be particularly important as the number of workers is associated with favorable evaluations of the polling places and the voters' experience with different voting systems. The findings did not suggest that lines are a particular problem for voters. While lines were slightly longer at EDVCs, most voters, regardless of their polling place, reported waiting times of less than five minutes. While exceptionally long polling lines may harm voters' evaluations of polling place operations, it appears that minor to moderate waits of 10 minutes or more are both relatively uncommon and not a particularly significant barrier to participation.

Taken together, these findings have a number of implications for the future of EDVCs and election administration more generally. The first is that while EDVCs may have a greater impact on less habitual voters, the results in these analyses are less strong than previously observed. Second, there may be valuable lessons regarding the centralization and location of polling places that could be applied to precinct voting models. Counties might concentrate more attention on adequately equipping polling locations, particularly having a sufficient number of quality poll workers to assist voters with check-in and the voting system as poll worker evaluations are related to evaluations of voting system usability (both paper and DRE ballots), confidence in the election process, and undercounts.

This is not to suggest that this research fully isolates the effects of EDVCs. Even after controlling for the observed characteristics of EDVCs, there is a residual effect on the evaluation of the voting systems, polling places, confidence in the election, and undercounts suggesting that there are greater effects of EDVCs beyond what is accounted for in this research. These additional benefits of EDVCs may be the result of the openness of polling locations or other unobserved factors such as voter mobilization.

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