

The effects of Election Day vote centers on voter experiences

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1. Introduction

Election Day vote centers, first adopted in Larimer County, Colorado in 2003, were used in 21 Colorado counties and a number of counties in Texas and Indiana in the 2008 Presidential Election. Election Day vote centers are intended to make Election Day voting more convenient and accessible and thereby increase voter turnout, especially among infrequent voters. The evidence to date demonstrates that vote centers have had a significant and positive effect on voter turnout, especially among infrequent voters (Stein and Vonnahme 2008; 2009). Why?

In this paper we examine how the attributes of Election Day vote centers shape the voting experience. Our focus is on how different voting systems effect voter satisfaction with voting technology; paper versus direct recorded electronic (DRE) voting machine, the places at which voters 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 and to cast their vote. Our central thesis is that voting, especially for the first time and infrequent voters is an ‘acquired taste.’ Voters rely on a learning mechanism for determining the likely costs and benefits of voting when deciding whether or not to vote. Positive voting experiences reinforce and increase the likelihood that the satisfied voter will vote again.

Three questions motivate our research:

1. Do vote centers provide the voter a better voting experience?
2. Why do vote centers provide a better voting experience?

3. Is the effect of vote centers on the voter's experience different for frequent and infrequent voters?

Section 2 reviews current research on convenience voting and explicates the reasons underlying the adoption of Election Day vote centers and how this method of voting might influence voter satisfaction and voter turnout. Section 3 and 4 presents a research design and measures for testing our hypotheses about how vote centers effect voter satisfaction and participation. We provide the estimation results in section 5 drawing on an exit poll conducted on Election Day 2008 in Colorado. We conclude with a discussion of how experiences with Election Day vote centers might be used in precinct voting systems.

2. The nature of convenience voting

The convenience of voting has long been studied by researchers, but until recently, the effects of convenience on the probability that an individual will vote has not been theoretically well-understood. The problem with earlier theoretical models of voter turnout is that they consistently under-predict observed levels of voter turnout. Recent refinements to these earlier models that incorporate a learning process have been shown to better match observed levels of voter turnout in US elections (Bendor, Diermeier, and Ting 2003; Fowler 2006). There is some disagreement as to the specific learning mechanism that voters might use, but these recent models all suggest that voters condition their future voting behavior on their previous experiences. According to these models if an individual finds that voting is simple and convenient in one election, she is more likely to vote in the following election (Bendor, Diermeier, and Ting 2003; Fowler 2006; Gerber, Green, and Shachar 2003). Some research also suggests that negative

experiences can lead individuals to be less likely to vote in subsequent elections (Bendor, Diermeier, and Ting 2003; Fowler 2006). Simply stated, voting, like many other behaviors, is habit forming if it is positively reinforced.

The existing theoretical models of voter turnout are important for this study in at least two ways. The first is that it provides an existing theoretical basis for linking the convenience of voting to voter turnout. While the connection between convenience and voting seems intuitive and in many contexts is left implicit, this work helps to formally establish the theoretical basis from which our study can build. The second implication of the existing theoretical work is that even after the reform is implemented its full effect might not be immediately realized. Finally this research may uncover the specific attributes of Election Day vote centers that can be implemented at traditional and more widely used Election Day voting precincts. The size, location and accessibility of Election Day vote centers rather than its openness (i.e., allowing voters to vote at any vote center on Election Day) might be applied to traditional voting places with positive effects for voter convenience and participation.

Election Day vote centers

In 2003 Larimer County, Colorado replaced precinct based polling places with Election Day vote centers (EDVC). By 2008 21 Colorado counties had adopted vote centers for Election Day balloting and Indiana, Tennessee had past legislation allowing their counties to adopt or pilot vote centers for the 2008 election.

Election Day vote centers are an alternative means of administering Election Day voting using non-precinct based polling locations. With Election Day vote centers there are fewer sites which are centrally located to major population centers, rather than

distributed among many smaller residential locations (Stein and Vonnahme 2008). Election Day vote centers typically rely on county-wide voter registration databases accessed electronically at each polling site. Voters in the voting jurisdiction (usually a county) are provided ballots appropriate to their voter registration address.

EDVCs are often located in places more proximate to residential and work place locations, the latter often more accessible for voters as they commute to and from work, school, shopping and other activities. Vote centers are often equipped with electronic voting machines and offer trained personnel to assist voters.

Election Day vote centers mark a different approach to increase voter participation, especially among infrequent voters. While previous studies of voter turnout have focused on the time it takes to vote as a main obstacle of voting, voting is not necessarily the only thing that individuals have to do on Election Day. In that way, there is an opportunity cost to voting such that voting takes time away from other activities such as work, lunch, shopping, or recreation. While voting can be thought of as competing with other activities, voting can also be made more complementary, so that all modes of voting will not be equally costly. Focusing on the opportunity costs of voting suggests that there might be alternative ways of administering elections that do not eliminate time costs, but rather makes the act of voting more complementary with other demands on voters' time.

By allowing individuals to vote at any location throughout the county, Election Day vote centers might help make voting more complementary with other routine activities. In that way, the convenience of voting might not directly correspond to the distance between where people live and their polling site. For example, a person might

prefer to vote at a place that is three miles from their house but on the way to work rather than a polling site that is only two miles away but in the opposite direction. That voters are likely to be engaged in other activities on Election Day suggests that voting might be made more complementary with other activities, by locating polling places that are near to workplaces, schools, shopping areas, or major transportation routes so that they are more accessible throughout the day.

We include time to vote in our estimates of voter satisfaction with their Election Day experiences. We do not anticipate the time voters wait in line is determinative of voter's evaluation of vote centers. Vote centers provide individuals with choices about where and when they vote on Election Day. We assume voters want to vote and that by choosing when and where to vote – options afforded voters at vote centers – they can more easily tolerate waits in line to vote. The imposition of longer waiting times at vote centers is thought to be mitigated by the fact that voters can plan for and therefore anticipate the wait to vote at a vote center

As described in previous research, there are two main characteristics of vote centers that allow us to differentiate vote centers from a precinct-based model of election administration. Those two characteristics are openness and centralization (Stein and Vonnahme 2008). Openness refers to the property of vote centers that individuals are allowed to vote at any location throughout the county rather than be assigned to a particular polling location based on their residential address. Openness might increase turnout by lower transportation and information costs as voters can go to any location that is most familiar and convenient for them, as well as other possible positive effects on turnout (Stein and Vonnahme 2008).

The second characteristic of vote centers is centralization. Centralization refers to polling locations that are fewer in number and located in larger and more visible sites. Centralization also exists to varying degrees in precinct-based polling locations. Centralization may have several positive effects on voter participation (Stein and Vonnahme 2008). Larger and more visible sites can reduce informational costs that voters incur when attempting to find a polling location and offer more available parking at the site. Centralization also results in better equipped polling locations to efficiently process voters. With more staff at each polling location, poll workers will be 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.

The latter characteristic of vote centers –centralization- may also be observed in precinct based voting systems, especially in counties that have recently consolidated their voting precincts presumably into a smaller number of larger voting places. We can reasonably assume that counties that have consolidated voting places have done so either to obtain some type of efficiency in their administrative operations (i.e., more effective distribution of voters, poll workers and voting equipment) or to respond to a constraint on resources. One consequence of consolidating voting precincts, though not necessarily intended, may be a more efficient distribution of voting places for both voters and election administrators that also positively impacts the change in voter turnout. 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, machines and poll workers. The availability of such facilities may be limited to locations outside of residential neighborhoods and more proximate to major roadways,

business and commercial areas with facilities that can accommodate the need for larger floor space and parking.

Stein and Vonnahme (2008) found that Election Day vote centers in Larimer Colorado had a positive and substantial effect on individual electoral participation, although results from their sensitivity analysis suggest that alternative explanations cannot be definitively ruled out. Moreover, this effect is substantially greater for infrequent rather than frequent voters. What these authors are unable to do, however, is isolate the specific attributes of vote centers (i.e., centralization versus openness), that might account for vote centers' positive impact on voter turnout. It is unclear from their analysis what each of the two characteristics of vote centers (openness and centralization) contribute to the overall positive effect on turnout.

Juenke and Shepherd's (2007) county level analysis of the turnout effects of vote centers fails to detect a significant positive relationship between the use of vote centers and voter turnout. Moreover, the authors identify a negative, albeit weak and non-robust effect for vote centers on turnout in the 2006 mid-term Congressional election. They conclude "the new thing in Election Day voting appears to be a lot like every other procedure change before it. It is different, unique, and convenient, but at the end of the day it appears to do little to change the size and makeup of the voting population (207:21)." The authors suggest that newness of the this electoral reform requires further analysis to tease out the joint effects of mobilization and vote centers in altering voting behavior .. and test for any demographic changes to the voting population (21)."

The challenge of conducting elections is a problem of service provision. What is the optimal method of voting that offers voters the opportunity to cast their ballot in the

most efficient manner given the limited resources of the voter (i.e., time) and the election administrator (i.e., voting machines, voting places and poll workers)? The task for the election administrator is to site and organize their voting locations and in turn distribute their machines and staff to maximize voter turnout. This is done in a manner that minimizes the time voters spend locating, getting to and casting their ballot at a voting place. Vote centers, however, are thought to increase voter turnout by increasing the accessibility of polling places by locating them closer to where people work, shop and recreate rather than where they live. Furthermore, the positive experience voters have at voter centers is expected to increase the likelihood they will vote in the future.

We hypothesize:

1. Voter satisfaction with their voting experience will be significantly greater for voters balloting at Election Day vote centers rather than at traditional precinct based voting places.
2. Infrequent voters will experience greater satisfaction with their voting experience at Election Day vote center than the infrequent voters who ballot at precinct based voting places.
3. Voter experiences will be more satisfactory at voting places which are more accessible, with a greater number of voting stations and poll workers.

3 Voter turnout

Before analyzing our main hypotheses we first consider whether EDVCs increased voter turnout in the 2008 election as has been demonstrated in previous research. We then

proceed to exam which specific attributes of EDVCs are most related to turnout in section 4. Consistent with previous findings, the results in this part of the paper show that vote centers are associated with higher turnout, although the findings for less engaged voters is somewhat more ambiguous in the 2008 data than in previous analyses as discussed below.

3.1 Aggregate data

The first source of data that we consider are election returns from Colorado counties from the 2008 election. Specifically, we consider turnout rates as the ratio of ballots cast to the number of registered voters. We use the ratio of registered voters as EDVCs are thought to make voting more convenient, but do not affect the registration process. That is, the theoretical expectation is that EDVCs increase the number of registered voters that participate in an election but may not necessarily expand the number of registered voters itself.

To analyze these data, we first regress county turnout in 2008 on an indicator variable for EDVCs. The results are shown in Table 1. From this table, we can see that turnout was slightly higher in EDVC counties. To further assess the effects of EDVCs, we also considered the change in turnout from 2004 to 2008. Adjusting for turnout in the 2004 elections allows us to better account for other county-specific attributes that might also affect turnout rates. The results for the change in turnout from 2004 to 2008 are shown in Table 2. These results also show a positive effect of EDVCs, but are not statistically significant at conventional levels although the samples for these analyses are particularly small. While vote centers were most widely used in Colorado, Lubbock

county, Texas also used EDVCs in the November 2008 elections. Comparing turnout in Lubbock county to statewide turnout suggests a similar effect. Turnout statewide increased by 1.8% over 2004, and by 4.7% in Lubbock.

3.2 Voter file data

3.2.1 Full data and results

While these findings are suggestive they do not account for individual factors that have also been shown to affect turnout. To account for individual-level factors we also analyzed voterfile data from Colorado. The Colorado voter file provides validated turnout data for all registered voters in the state of Colorado. It also provides a measure of voters' age, major party registration status, sex, and prior voting history. By controlling for these additional factors, we can more reliably assess the effects of EDVCs on voter turnout.

The first set of analyses are logit estimates of voter turnout in 2008 from the full Colorado voter file. We used the resident's county to construct a dichotomous variable for EDVCs. Estimates from several models are shown in Table 3. Across the range of estimates the coefficients for EDVCs are consistently positive and significant at conventional levels.

We also assessed whether EDVCs were more efficacious for less habitual voters. For this analysis we interacted EDVCs with prior voting history. Theoretically the interaction term should be negatively signed as the effect should be strongest for the least habitual voters. Contrary to our theoretical expectations, the estimates in the fourth and fifth columns of Table 3, the interaction term is positively signed. To assess whether this

finding might be the result of remaining imbalances in the data on the control variables, we also analyzed a matched sample of registered Colorado voters.

3.2.2 Matched sample and results

To construct the matched sample we randomly selected 10,000 registered voters that were exposed to EDVCs. We then randomly selected a control pool of 60,000 registered voters in counties that used traditional precinct locations. We exactly matched the treated cases to a control case on age (in years), major party registration status, gender, and prior vote history. Of the initial treatment cases, we successfully matched 97.2% to a corresponding control. We did not calculate balance statistics as the exact matching procedure produces exactly balanced samples on the available control variables.

The results from the analysis of the matched sample are shown in Table 4. From this table, we can see that vote centers seem to have a positive effect, which is consistent with the results from the full voterfile. The second column of Table 4 shows the estimates when we include the interaction between EDVCs and prior vote history. The estimate for EDVCs is positive and not significant at conventional levels, although most of the confidence interval covers positive values. The interaction term, however, is positive just as it was in the analysis of the full voter file above.

The positive coefficient for the interaction between EDVCs and prior vote history suggests that the evidence may contradict our theoretical expectations. To assess the substantive effects of these results, the effect of EDVCs was calculated across the range of prior vote history values based on the estimates from Table 4, column 2. The results

are shown in Figure 1. We can see from this figure that there are somewhat mixed results regarding the efficacy of EDVCs for less habitual voters. The graph shows that the effect attenuates with greater voting history which is consistent with previous research. At the very low end of the scale, however, there is a slight increase in the effect. This suggests that while EDVCs might increase voter turnout, it might not be uniformly more efficacious for less habitual voters. This does not directly contradict previous research but it might offset the extent to which EDVCs disproportionately affect less habitual voters and diversify the electorate.

4. Research design and measures

That EDVCs seem to have a positive effect on turnout does not explain which of their characteristics are most important. 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 12 counties that used precinct-based voting places.¹

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

- Usability of the voting system
- Usability 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., under count)

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 was 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.

Usability of voting systems

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.²

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.

Two factor scores were calculated from the six items using a rotated principal components analysis.³ The first factor is comprised of items 1, 2, and 5 and measure the degree of difficulty the voter had in using the voting technology available at their voting place. The second factor, comprised of items 3, 4, and 6, measure the amount of assistance and time needed to learn how to use the voting technology.⁴

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.

Again a factor score was computed for four items using an unrotated principal components analysis.⁵

Our measure of voter under counts (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. Those who reported not voting in all races were coded as having under counted. 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%) agreed with the statement. Finally, we asked voters "how long did you wait in line to vote, if at all?"⁶

5. Findings

Before discussing the hypothesis tests and regression models, it might be useful to examine descriptive statistics for our indices of voting experience by polling place. Table 5a-c reports the difference of means tests for our individual measures of voter experience and voting place attributes by voter center and precinct-based voting place.

As expected, Election Day vote centers are associated with a more positive voter experience than precinct-based voting places. For each measure of usability of the voting system, voters at Election Day vote centers rated their experience with the voting system,

polling place and poll workers more positively than voters in precinct-based voting places. In each instance these differences in ratings are statistically significant at conventional levels ($P < .05$).

Voter confidence that their vote will be counted accurately was significantly greater among voters polling at an Election Day vote center than at a precinct-based voting place. The number of races voters reported voting in (i.e., undercount) is significantly greater among voters casting their ballot at a vote center than at precinct-based voting places. Interestingly, however, the time voters waited in line was significantly longer at Election Day vote centers than at precinct voting places. This finding, however, may be less consequential for voter satisfaction with vote centers. Vote centers voters may readily accept long waits to vote than their counterparts at precinct-based voting places, in part because vote center voters have more choices about where and when to vote.

Election Day vote centers provided voters with more voting machines, parking and poll workers than precinct-based vote places. These differences are statistically significant ($p < .01$). Voters reported that Election Day vote centers were significantly more likely to be closer to where they worked, shopped, and roadways on which they frequently travel and/or commute than reported by precinct-based voters. Precinct-based voters were significantly more likely to report that their voting place was closer to their residence than voters at Election Day vote centers. Of course, an overwhelming majority of all voters – those who voted at both a vote center and precinct voting place – reported the voting place was close to their residences. This finding, however, reflects the fact all Election Day voters must vote in their county of residence.

Our initial findings suggest that the experience of voters who vote at Election Day vote centers is significantly more positive than the voting experience reported by voters at precinct-based voting places. This conclusion is subject to several qualifications from rival explanations for each of our dependent measures of voting experience. To assess the independent effect vote centers had on the voting experience we have estimated several models of voter experiences.

Rating of the voting system

Table 6 reports the regression coefficients for a model of satisfaction with the voting system voters used on Election Day. The independent regressors 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).

Consistent with previous research (Stein et al 2008) satisfaction with voting systems were 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 voter's rating of the type of ballot they used on Election Day. Among voter demographics, only Non-Anglo's had a significant and negative experience with the

voting system they used on Election Day. Infrequent voters are more likely to positively rate their experience with the voting system than more experienced and frequent voters.

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 type 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 not statistically significant (table 7). Contrary to our hypothesis, vote centers do not differentiate the voting experiences of frequent and infrequent voters.

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.

Tables 8 and 9 report two different regression models for the ease voter's had in learning to use the voting system at their polling place. In table 8 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. The specific ballot system used is unrelated to reported time and effort needed to learn how to 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, as observed in tables 6 and 7.

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. As expected, infrequent voters reported more difficulty learning how to use their respective voting system than more frequent voters. Contrary to expectations, however, we find no evidence that vote centers produce a significantly less effortless experience at mastering voting systems than precinct-based voting places. Anglos and better educated voters reported a greater ease with navigating their voting systems than their counterparts.

Table 9 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. Several interaction terms are included in our estimate of voters' ease of learning each voting system including:

- Infrequent voters who voted at a vote center: $\text{Vote history} * \text{EDVC}$
- Vote center voters who voted on a DRE: $\text{EDVC} * \text{Ballot}$
- Infrequent voters who voted on a DRE: $\text{Vote history} * \text{Ballot}$
- Infrequent voters who vote at a vote center on a DRE:

$\text{Vote history} * \text{ballot} * \text{EDVC}$

Voters who voted at a vote center on an electronic voting machine reported significantly greater ease at learning how to use the DRE than all other voters. We do not, however,

find evidence to support our hypothesis that either infrequent voters at vote centers or the same voters who used DREs were more likely to report greater ease at learning to use either DREs or paper ballots on Election Day. Vote centers have a positive effect on voters' facility with their voting systems but only when using electronic voting systems.

Rating of the voting place

Table 10 reports our estimates for voters' rating of the Election Day vote place. As expected, a voter's rating of their experience with the voting system they used strongly influences how they rated where they voted. Independent of this effect, however, voters using electronic voting machines were significantly less likely to positively rate their voting place. Moreover, those who previously used DREs were more likely to negatively rate their voting place experience. As expected, voters rated their experience at vote centers significantly higher than voters at precincts. Infrequent voters, younger voters, males and less educated voters all reported less satisfactory ratings of their vote place. Table 11 reports the test of 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 (Vote 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.

How can we reconcile the finding that voters balloting on electronic machines prefer this voting system, but generally rate their voting place experience more negatively than voters using paper ballots? As discussed earlier, we suspect that vote centers significantly help voters navigate their use of electronic voting machines, a voting technology that is both new to Colorado and many intermittent voters. We test this

expectation by asking whether voters who ballot 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 effect for the EDVC variable in table 12 informs us about the vote place ratings for voters who balloted at 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 all other voters.⁷

We also sought to assess whether characteristics of the polling places were related to voter evaluations. For this analysis, we considered whether the type, location, and operation of the polling places were related to voter assessments. The results are shown in Table 13. From this table, we can see that a number of place characteristics are related to place evaluations. The number of pollworkers is positively related to evaluations, while the number of machines and parking spaces are less strongly related. Other factors such as the proximity of polling places to voter residences, the length of lines, and the type of polling place (EDVC) were also related to place evaluations

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 their vote place and voting system (table 14). Vote centers have a positive effect on voter confidence, but this effect is not significant at the conventional level. Democrats are significantly more likely to believe their vote 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. Infrequent voters' confidence that their ballot will

be counted accurately does not increase when these voters ballot at vote center (see table 15).

Voter undercounts

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. Table 16 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 type of ballot used (i.e., DRE) a 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 is substantially greater than voters' evaluation of their voting place or ballot system. This effect is generalized to all voters and is not specific to infrequent voters at voter centers (see table 17).

Assessing the accessibility of vote centers.

To evaluate the accessibility of vote centers we re-estimated our models of voter evaluations substituting the vote center variable with specific attributes of voting places. Election Day voters in Colorado were asked whether their voting place was close to:

- Your residence (1=yes, 0= no)
- Your workplace (1=yes, 0= no)

- School where you or your children attend school (1=yes, 0= no)
- Shopping (1=yes, 0= no)
- Street that you use often (1=yes, 0= no)

Each location was interacted with the type of Election Day vote place (1= vote center, 0=precinct) so that the estimate of accessibility is measured in terms of the proximity of each location to an Election Day vote center. The main effect for the proximity of voting place to each location represents the effects of proximity to residence and other locations to precinct-based voting places. Our expectation is that if accessibility is a significant feature of vote centers, these measures of accessibility will be positively (negatively) related to the voters' evaluation of their experience with vote place, ballot system and confidence. Specifically we expect a positively signed coefficient for the interaction between EDVC and workplace, street often used, and shopping. A negatively signed coefficient is expected for interaction between EDVC and residence and local school.

Table 18 summarizes the findings for our six dependent measures. The proximity indices appear to be strong substitutes for the effect of a vote center in explaining voter experience with their Election Day voting place and length of time to vote. Other measures of the voting experience appear not to be related to a significant number of indices of proximity to voting place, either vote center or precinct.

As expected, voters who reported that their Election Day vote center was closer to their workplace or school were more likely to positively evaluate their voting place. The same relationship is not true for those who voted a precinct-based voting place. Moreover, those who reported their precinct-based voting place was near their children's school negatively evaluated their voting place experience. These voters are

likely to have voted at a local/neighborhood school with limited parking place, voting machines and poll workers, factors likely to contribute to an unsatisfactory voting place experience.

Length of time to vote appears to be significantly and negatively related to the proximity of a vote center to where the voter shops, travels (i.e., major roadway) and works. The same relationships are either significantly negatively or statistically insignificant for voters who voted at a precinct-based voting place on Election Day. Our findings are suggestive about how vote centers may positively structure the voting experience. These conditions of centrality are not, however, unique to vote centers. The convenience of vote place location is fixed for precinct voting places. Modest changes in where county officials locate their precinct voting places may have a positive effect on voter satisfaction without incorporating other features associated with vote centers like openness i.e., voting at any location on Election Day.

6. Conclusion and discussion

This paper focuses on two general and related research questions. The first is whether we can identify characteristics of Election Day vote centers that are efficacious for turning out prospective voters. This is important not only as a way to better understand and design vote center-based elections, but could also suggest characteristics of vote centers that are applicable to precinct-based elections in order to more generally improve the voting experience. The second related question is whether we can identify intermediate outcomes that are consistent with the theoretical argument to better understand the

process by which EDVCs affect turnout and to determine if the apparent effects of EDVCs could be attributed to unobserved biases.

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 5 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. That is, reducing the total number of sites might not substantially increase the proximity of polling places on average. Also, a slight to moderate increase in wait times

at polling locations appears to not be a significant deterrent to most prospective voters. Furthermore, 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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Table 1: Colorado counties, 2008

VARIABLES	Turnout 2008
EDVC	0.011 (0.011)
Constant	0.884*** (0.005)
Observations	64

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2: Colorado counties, 2008-2004

VARIABLES	Change in turnout
EDVC	0.021 (0.016)
Constant	-0.006 (0.008)
Observations	64

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Full voter file analyses

VARIABLES	(1) Vote 2008	(2) Vote 2008	(3) Vote 2008	(4) Vote 2008	(5) Vote 2008
EDVC	0.021*** (0.003)	0.083*** (0.003)	0.090*** (0.003)	0.059*** (0.004)	0.067*** (0.004)
Age			-0.001*** (0.000)		-0.001*** (0.000)
Female			0.165*** (0.003)		0.165*** (0.003)
Party registrant			0.315*** (0.003)		0.315*** (0.003)
Habit		0.174*** (0.000)	0.170*** (0.000)	0.172*** (0.000)	0.168*** (0.000)
EDVC x Habit				0.010*** (0.001)	0.010*** (0.001)
Constant	1.113*** (0.002)	0.430*** (0.002)	0.204*** (0.005)	0.436*** (0.002)	0.211*** (0.005)
Observations	2920495	2920495	2920495	2920495	2920495

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 4: Matched sample analyses

VARIABLES	(1) Vote 2008	(2) Vote 2008
EDVC	0.067** (0.033)	0.051 (0.042)
Habit		0.196*** (0.008)
EDVC x Habit		0.011 (0.011)
Constant	1.030*** (0.023)	0.377*** (0.029)
Observations	19436	19436

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Figure 1: Effect of EDVCs

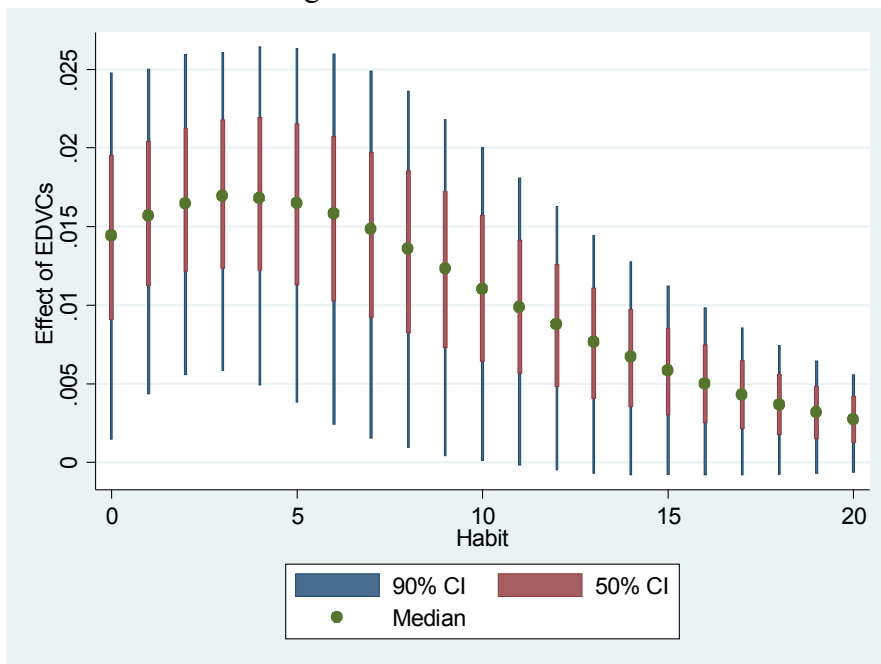


Table 5a
 Difference of Means Test:
 Reported voter experience¹ by voting place

	Vote Place	N	Mean	Std. Deviation
Ballot usability				
System easy to use	Precinct	2065	4.44	0.94
	EDVC	1633	4.64	0.81*
Would use system again	Precinct	2062	4.33	1.04
	EDVC	1633	4.55	0.94*
Felt confident using system	Precinct	2050	4.29	1.11
	EDVC	1623	4.48	1.01*
Learning to use ballot				
System unnecessarily complex	Precinct	2042	1.90	1.23
	EDVC	1628	1.68	1.14*
Need to learn more	Precinct	2039	1.85	1.28
	EDVC	1626	1.64	1.18*
Would need Tech support	Precinct	2038	1.70	1.18
	EDVC	1621	1.57	1.12*
Polling place				
Location easy to find	Precinct	2061	4.51	1.02
	EDVC	1626	4.69	0.88*
Need to go far out of my way to vote	Precinct	2056	1.70	1.21
	EDVC	1624	1.54	1.14*
Parking hard to find	Precinct	2039	1.77	1.24
	EDVC	1614	1.58	1.18*
Poll workers helpful	Precinct	2050	4.48	0.98
	EDVC	1622	4.64	0.86*

* P < .05

1=Strong disagree, 2=Disagree somewhat, 3=Neither disagree or agree, 4=Agree somewhat, 5=Strongly agree

Table 5b
Difference of Means Test:
Reported voter experience by voting place

	Vote Place	N	Mean	Std. Dev.
Voter confidence¹				
Confident ballot was counted accurately	Precinct	2055	4.18	1.12
	EDVC	1623	4.37	0.99*
Waiting to vote²				
How long did you wait to vote?	Precinct	2053	1.83	1.17
	EDVC	1613	2.26	1.41*
Voter undercount³				
In how many races did you vote?	Precinct	2027	1.65	.954
	EDVC	1616	1.52	.889*

* P < .05

1=Strong disagree, 2=Disagree somewhat, 3=Neither disagree or agree, 4=Agree somewhat, 5=Strongly agree

² 1=No line, 2=Less than 5 minutes, 3=5-10 minutes, 4= 10-20 minutes, 5= More than 20 minutes.

³ In how many races did you vote today? 1=all, 2=more than half, 3=half, 4=less than half

Table 5c
Reported voter experience and polling place attributes by voting place

	Vote Place	N	Mean	Std. Dev.
Voting place accessibility¹				
Voting place near residence	Precinct	2066	0.82	0.38
	EDVC	1637	0.76	0.43*
Voting place near workplace	Precinct	2066	0.21	0.41
	EDVC	1637	0.26	0.44*
Voting place need children's school	Precinct	2066	0.12	0.33
	EDVC	1637	0.15	0.36
Voting place near shopping	Precinct	2066	0.11	0.32
	EDVC	1637	0.18	0.39*
Voting place near street traveled	Precinct	2066	0.28	0.45
	EDVC	1637	0.32	0.47*
Voting place attributes				
Voting Machines (#)	Precinct	1746	15.56	9.60
	EDVC	1487	20.89	16.67*
Poll Workers (#)	Precinct	1746	11.00	5.81
	EDVC	1487	15.79	6.54*
Parking Spaces ²	Precinct	1746	3.33	1.59
	EDVC	1487	4.43	0.96*

* P < .05

1=Yes, 0=No.

² 1= Less than 10, 2= 10-20, 3 = 21-40, 4= 41=50, 5= More than 50

Table 6
Regression estimates for rating of voting system

	Beta	Std. Err.	T-value	Sig.
(Constant)	-0.24	0.10	-2.51	0.01
Ballot type	0.12	0.03	3.92	0.00
Used ballot before	0.21	0.03	6.49	0.00
Rate vote place	0.56	0.01	37.80	0.00
Wait to vote	-0.04	0.01	-3.20	0.00
EDVC	0.11	0.03	3.49	0.00
History of voting	0.10	0.04	2.52	0.01
Non-Anglo	-0.06	0.04	-1.82	0.07
Education	0.01	0.02	0.51	0.61
Age	-0.01	0.01	-0.91	0.36
Gender	0.00	0.03	0.07	0.94
Income	0.02	0.01	2.01	0.04
N	3,331			
R ²	.347			

Table 7
Regression estimates for rating of voting system

	Beta	Std. Err.	T-value	Sig.
(Constant)	-0.23	0.10	-2.39	0.02
Ballot type	0.12	0.03	3.93	0.00
Used ballot before	0.22	0.03	6.52	0.00
Rate vote place	0.56	0.01	37.76	0.00
Wait to vote	-0.04	0.01	-3.25	0.00
EDVC	0.09	0.03	2.53	0.01
History of voting	0.06	0.05	1.27	0.20
History of voting * EDVC	0.08	0.07	1.20	0.23
Non-Anglo	-0.06	0.04	-1.84	0.07
Education	0.01	0.02	0.48	0.63
Age	-0.01	0.01	-0.89	0.37
Gender	0.00	0.03	0.06	0.95
Income	0.02	0.01	2.01	0.05
N	3,331			
R ²	.347			

Table 8
Regression estimates for ease of learning voting system

	Beta	Std. Err.	T-value	Sig.
(Constant)	-0.20	0.09	-2.23	0.03
Ballot type	-0.00	0.03	-0.15	0.88
Used ballot before	0.06	0.03	1.89	0.06
Rate vote place	0.61	0.01	44.09	0.00
Wait to vote	0.01	0.01	0.53	0.59
EDVC	0.01	0.03	0.51	0.61
Vote history	-0.09	0.04	-2.62	0.01
Non-Anglo	-0.12	0.03	-3.71	0.00
Education	0.03	0.02	1.80	0.07
Age	0.00	0.01	0.33	0.74
Gender	0.02	0.03	0.69	0.49
Income	0.01	0.01	1.41	0.16
N	3,352			
R ²	.412			

Table 9
Regression estimates for ease of learning voting system

	Beta	Std. Err.	T-value	Sig.
(Constant)	-0.18	0.09	-1.95	0.05
Ballot type	-0.10	0.05	-2.08	0.04
Used ballot before	0.06	0.03	1.93	0.05
Rate vote place	0.61	0.01	43.42	0.00
Wait to vote	0.00	0.01	0.40	0.69
EDVC	-0.02	0.04	-0.44	0.66
Vote history	-0.10	0.05	-1.91	0.06
Vote history*EDVC	-0.09	0.08	-1.16	0.25
Vote history*Ballot	0.06	0.10	0.65	0.52
EDVC*Ballot	0.13	0.07	1.94	0.05
Vote history*Ballot *EDVC	0.10	0.13	0.79	0.43
Non-Anglo	-0.12	0.03	-3.70	0.00
Education	0.03	0.02	1.71	0.09
Age	0.00	0.01	0.31	0.76
Gender	0.02	0.03	0.78	0.44
Income	0.01	0.01	1.48	0.14
N	3,351			
R ²	.411			

Table 10
Regression estimates for rating of voting place

	Beta	Std. Err.	T- value	Sig.
(Constant)	-0.14	0.09	-1.52	0.13
Ballot type	-0.09	0.03	-2.85	0.00
Used ballot before	-0.14	0.03	-4.27	0.00
Rate voting system	0.54	0.01	37.80	0.00
Wait to vote	-0.07	0.01	-6.75	0.00
EDVC	0.16	0.03	5.37	0.00
Vote history	-0.14	0.04	-3.75	0.00
Non-Anglo	-0.10	0.03	-3.01	0.00
Education	0.08	0.02	5.02	0.00
Age	-0.02	0.01	-2.15	0.03
Gender	0.05	0.03	1.74	0.08
Income	0.01	0.01	1.15	0.25
N	3,320			
R ²	.367			

Table 11
Regression estimates for rating of voting place

	Beta	Std. Err.	T- value	Sig.
(Constant)	-0.14	0.09	-1.45	0.15
Ballot type	-0.09	0.03	-2.84	0.00
Used ballot before	-0.14	0.03	-4.24	0.00
Rating voting system	0.54	0.01	37.76	0.00
Wait to vote	-0.07	0.01	-6.77	0.00
EDVC	0.15	0.03	4.47	0.00
Vote history*EDVC	0.04	0.06	0.61	0.54
Vote history	-0.16	0.05	-3.35	0.00
Non-Anglo	-0.10	0.03	-3.02	0.00
Education	0.08	0.02	5.00	0.00
Age	-0.02	0.01	-2.14	0.03
Gender	0.05	0.03	1.73	0.08
Income	0.01	0.01	1.15	0.25
N	3,331			
R ²	.367			

Table 12
Regression estimates for rating of voting place

	Beta	Std. Err.	T- value	Sig.
(Constant)	-0.12	0.09	-1.24	0.21
Ballot type	-0.25	0.04	-5.76	0.00
Used ballot before	-0.12	0.03	-3.83	0.00
Rating voting system	0.53	0.01	37.41	0.00
Wait to vote	-0.08	0.01	-6.86	0.00
EDVC	0.04	0.04	1.23	0.22
EDVC*DRE	0.32	0.06	5.33	0.00
Vote history	-0.13	0.04	-3.59	0.00
Non-Anglo	-0.11	0.03	-3.17	0.00
Education	0.08	0.02	4.94	0.00
Age	-0.02	0.01	-2.05	0.04
Gender	0.05	0.03	1.95	0.05
Income	0.01	0.01	1.19	0.24
N	3,321			
R ²	.372			

Table 13
Regression estimates for rating of voting place

	Beta	Std. Err.	T- value	Sig.
(Constant)	-0.213	0.070	-3.05	.002
EDVC	0.349	0.039	9.03	.000
Voting stations	-0.004	0.002	-2.08	.038
Poll workers	0.018	0.004	4.26	.000
Parking availability	-0.018	0.013	-1.39	.168
Lines	-0.177	0.014	-12.53	.000
Residential proximity	0.372	0.043	8.69	.000
N	3,137			
R ²	.100			

Table 14
Regression estimates for voter confidence

	Beta	Std. Err.	T- value	Sig.
(Constant)	4.12	0.12	35.76	0.00
Ballot type	-0.02	0.04	-0.48	0.63
Used ballot before	0.01	0.04	0.16	0.87
Rating voting system	0.28	0.02	14.15	0.00
Rate vote place	0.31	0.02	15.36	0.00
Wait to vote	-0.01	0.01	-0.44	0.66
EDVC	0.06	0.03	1.81	0.07
Vote history	-0.02	0.04	-0.40	0.69
Party Id	0.08	0.02	4.18	0.00
Non-Anglo	0.00	0.04	-0.03	0.97
Education	-0.02	0.02	-1.21	0.23
Age	0.00	0.01	-0.47	0.64
Gender	0.02	0.03	0.53	0.59
Income	0.02	0.01	1.42	0.16
N	3,296			
R ²	.253			

Table 15
Regression estimates for voter confidence

	Beta	Std. Err.	T- value	Sig.
(Constant)	4.13	0.12	35.77	0.00
Ballot type	-0.02	0.04	-0.46	0.64
Used ballot before	0.01	0.04	0.22	0.83
Rating voting system	0.28	0.02	14.12	0.00
Rate vote place	0.31	0.02	15.35	0.00
Wait to vote	-0.01	0.01	-0.50	0.62
EDVC	0.04	0.04	1.01	0.31
Vote history*EDVC	0.10	0.07	1.29	0.20
Vote history	-0.06	0.05	-1.10	0.27
Party Id	0.09	0.02	4.23	0.00
Non-Anglo	0.00	0.04	-0.05	0.96
Education	-0.02	0.02	-1.24	0.22
Age	0.00	0.01	-0.46	0.65
Gender	0.02	0.03	0.53	0.60
Income	0.02	0.01	1.41	0.16
N	3,296			
R ²	.253			

Table 16
Regression estimates for voter undercount

	Beta	Std. Err.	T- value	Sig.
(Constant)	1.89	0.11	17.65	0.00
Ballot type	-0.05	0.03	-1.40	0.16
Used ballot before	-0.09	0.04	-2.47	0.01
Rating voting system	-0.03	0.02	-1.58	0.12
Rate vote place	-0.06	0.02	-3.22	0.00
Wait to vote	0.04	0.01	2.79	0.01
Vote history	-0.15	0.03	-4.58	0.00
EDVC	-0.41	0.04	9.80	0.00
Party Id	-0.05	0.03	-1.57	0.12
Non-Anglo	0.04	0.04	1.07	0.29
Education	-0.02	0.02	-0.94	0.35
Age	-0.04	0.01	-4.80	0.00
Gender	0.04	0.03	1.30	0.19
Income	-0.04	0.01	-3.45	0.00
N	3,290			
R ²	.104			

Table 17
Regression estimates for voter undercount

	Beta	Std. Err.	T- value	Sig.
(Constant)	1.88	0.11	17.52	0.00
Ballot type	-0.05	0.03	-1.41	0.16
Used ballot before	-0.09	0.04	-2.49	0.01
Rating voting system	-0.03	0.02	-1.56	0.12
Rate vote place	-0.06	0.02	-3.21	0.00
Wait to vote	0.04	0.01	2.82	0.00
Vote history	0.43	0.05	8.17	0.00
EDVC	-0.14	0.04	-3.77	0.00
Vote history*EDVC	-0.04	0.07	-0.62	0.53
Party Id	-0.05	0.03	-1.57	0.12
Non-Anglo	0.04	0.04	1.08	0.28
Education	-0.02	0.02	-0.93	0.36
Age	-0.04	0.01	-4.81	0.00
Gender	0.04	0.03	1.30	0.19
Income	-0.04	0.01	-3.45	0.00
N	3,290			
R ²	.108			

Table 18
 Summary of Estimates for proximity of locations to vote place*

	Election Day Vote Center						Election Day Precinct					
	Ballot	Learn ballot	Place	Confid.	Under count	Time	Ballot	Learn ballot	Place	Confid.	Under count	Time
Residence	+	0	+	0	-	+	-	0	+	0	0	-
Work	0	0	+	0	-	+	0	0	0	0	+	-
School	-	0	+	0	0	0	+	0	-	0	0	0
Shopping	0	+	0	0	0	+	0	+	0	0	0	0
Major Street	0	0	0	0	+	+	0	0	+	0	0	-

* Full results reported in tables 19-24

Key:

+ Significant positive relationship

- Significant negative relationship

0 No significant relations

Table 19
Regression estimates for rating of voting system

	Beta	Std. Err.	T- value	Sig.
(Constant)	-0.11	0.10	-1.13	0.26
Ballot type	0.11	0.03	3.36	0.00
Used ballot before	0.21	0.03	6.23	0.00
Rate voting system	0.57	0.01	37.97	0.00
Wait to vote	-0.04	0.01	-3.41	0.00
Vote history	0.09	0.04	2.44	0.01
Residence	-0.15	0.04	-3.76	0.00
Workplace	0.05	0.05	1.02	0.31
School	0.15	0.06	2.53	0.01
Shopping	-0.12	0.06	-1.80	0.07
Roadway	-0.04	0.05	-0.86	0.39
EVDC*Residence	0.15	0.04	3.70	0.00
EVDC*Workplace	-0.09	0.07	-1.40	0.16
EVDC*Shopping	0.22	0.09	2.58	0.01
EVDC* roadway	0.01	0.07	0.09	0.92
EVDC*School	-0.18	0.09	-2.12	0.03
Non-Anglo	-0.07	0.03	-2.01	0.04
Education	0.01	0.02	0.69	0.49
Age	-0.01	0.01	-0.83	0.40
Gender	0.00	0.03	-0.01	0.99
Income	0.02	0.01	2.00	0.05
N	3,351			
R ²	.412			

Table 20
Regression estimates for ease of learning voting system

	Beta	Std. Err.	T- value	Sig.
(Constant)	-0.17	0.09	-1.81	0.07
Ballot type	-0.01	0.03	-0.18	0.86
Used ballot before	0.06	0.03	1.93	0.05
Rate voting system	0.62	0.01	43.86	0.00
Wait to vote	0.00	0.01	0.21	0.83
Vote history	-0.10	0.04	-2.67	0.01
Residence	-0.03	0.04	-0.74	0.46
Workplace	-0.07	0.04	-1.59	0.11
School	-0.02	0.06	-0.43	0.67
Shopping	0.05	0.06	0.88	0.38
Roadway	0.04	0.04	1.00	0.32
EVDC*Residence	0.01	0.04	0.25	0.80
EVDC*Workplace	-0.01	0.06	-0.15	0.88
EVDC*Shopping	0.16	0.08	1.98	0.05
EVDC* Roadway	-0.06	0.06	-0.90	0.37
EVDC*School	-0.05	0.08	-0.59	0.55
Non-Anglo	-0.13	0.03	-3.81	0.00
Education	0.03	0.02	1.94	0.05
Age	0.00	0.01	0.27	0.78
Gender	0.01	0.03	0.48	0.63
Income	0.01	0.01	1.47	0.14
N	3.351			
R ²	.412			

Table 21
Regression estimates for rating of voting place

	Beta	Std. Err.	T- value	Sig.
(Constant)	-0.32	0.10	-3.36	0.00
Ballot type	-0.05	0.03	-1.65	0.10
Used ballot before	-0.13	0.03	-3.91	0.00
Rate voting system	0.53	0.01	37.97	0.00
Wait to vote	-0.06	0.01	-5.38	0.00
Vote history	-0.13	0.04	-3.59	0.00
Residence	0.21	0.04	5.44	0.00
Workplace	-0.02	0.05	-0.54	0.59
School	-0.19	0.06	-3.35	0.00
Shopping	-0.05	0.06	-0.74	0.46
Roadways	0.20	0.04	4.41	0.00
EVDC*Residence	0.08	0.04	2.18	0.03
EVDC*Workplace	0.16	0.06	2.52	0.01
EVDC*Shopping	-0.03	0.08	-0.36	0.72
EVDC* Roadway	-0.07	0.07	-1.06	0.29
EVDC*School	0.24	0.08	2.93	0.00
Non-Anglo	-0.10	0.03	-3.04	0.00
Education	0.08	0.02	4.63	0.00
Age	-0.02	0.01	-2.20	0.03
Gender	0.05	0.03	1.74	0.08
Income	0.01	0.01	0.84	0.40
N	3,331			
R ²	.382			

Table 22
Regression estimates for confidence vote was counted accurately

	Beta	Std. Err.	T- value	Sig.
(Constant)	4.14	0.12	34.32	0.00
Ballot type	-0.01	0.04	-0.29	0.77
Used ballot before	0.01	0.04	0.26	0.80
Rate voting system	0.28	0.02	14.26	0.00
Rate vote place	0.31	0.02	15.10	0.00
Wait to vote	0.00	0.01	-0.18	0.85
Vote history	-0.01	0.04	-0.28	0.78
Residence	0.00	0.05	-0.11	0.92
Workplace	0.00	0.05	-0.08	0.94
School	-0.10	0.07	-1.52	0.13
Shopping	0.07	0.07	0.96	0.34
Roadway	-0.03	0.05	-0.51	0.61
EVDC*Residence	0.06	0.05	1.37	0.17
EVDC*Workplace	0.13	0.08	1.66	0.10
EVDC*Shopping	-0.15	0.10	-1.53	0.12
EVDC* Roadway	-0.05	0.08	-0.67	0.50
EVDC*School	0.07	0.10	0.69	0.49
Party ID	0.08	0.02	4.16	0.00
Non-Anglo	0.00	0.04	-0.06	0.95
Education	-0.03	0.02	-1.29	0.20
Age	-0.01	0.01	-0.67	0.51
Gender	0.02	0.03	0.72	0.47
Income	0.02	0.01	1.41	0.16
(Constant)	4.14	0.12	34.32	0.00
N	3,296			
R ²	.253			

Table 23
Regression estimates for vote undercounts

	Beta	Std. Err.	T- value	Sig.
(Constant)	1.85	0.11	16.60	0.00
Ballot type	-0.05	0.03	-1.36	0.17
Used ballot before	-0.09	0.04	-2.56	0.01
Rate voting system	-0.03	0.02	-1.70	0.09
Rate vote place	-0.06	0.02	-3.15	0.00
Wait to vote	0.03	0.01	2.68	0.01
Vote history	0.41	0.04	9.79	0.00
Residence	-0.06	0.04	-1.26	0.21
Workplace	0.12	0.05	2.28	0.02
School	-0.08	0.06	-1.22	0.22
Shopping	-0.05	0.07	-0.65	0.51
Roadway	0.10	0.05	1.89	0.06
EVDC*Residence	-0.12	0.04	-2.70	0.01
EVDC*Workplace	-0.13	0.07	-1.71	0.09
EVDC*Shopping	0.02	0.09	0.25	0.80
EVDC* Roadway	-0.04	0.07	-0.59	0.56
EVDC*School	-0.05	0.09	-0.53	0.59
Party ID	-0.05	0.03	-1.48	0.14
Non-Anglo	0.05	0.04	1.24	0.21
Education	-0.02	0.02	-0.87	0.38
Age	-0.04	0.01	-4.56	0.00
Gender	0.05	0.03	1.51	0.13
Income	-0.03	0.01	-3.03	0.00
N	3,290			
R ²	.108			

Table 24
Regression estimates for wait to vote

	Beta	Std. Err.	T- value	Sig.
(Constant)	1.90	0.15	12.85	0.00
Ballot type	0.44	0.05	9.19	0.00
Used ballot before	0.27	0.05	5.34	0.00
Rate voting system	-0.09	0.03	-3.41	0.00
Rate vote place	-0.15	0.03	-5.38	0.00
Vote history	0.19	0.06	3.34	0.00
Residence	-0.27	0.06	-4.37	0.00
Workplace	-0.17	0.07	-2.32	0.02
School	0.11	0.09	1.20	0.23
Shopping	0.07	0.10	0.70	0.48
Roadway	-0.29	0.07	-4.11	0.00
EVDC*Residence	0.15	0.06	2.53	0.01
EVDC*Workplace	0.20	0.10	1.96	0.05
EVDC*Shopping	0.41	0.13	3.13	0.00
EVDC* Roadway	0.24	0.10	2.31	0.02
EVDC*School	-0.03	0.13	-0.22	0.82
Non-Anglo	0.17	0.05	3.16	0.00
Education	-0.02	0.03	-0.86	0.39
Age	0.00	0.01	-0.22	0.83
Gender	-0.04	0.04	-0.97	0.33
Income	0.02	0.02	1.07	0.28
N	3,331			
R ²	.106			

¹Endnotes

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.

² Voters were asked whether they agreed or disagreed with each statement on a scale of one to five, where one indicated ‘disagree strongly’ and five indicated ‘agree strongly.’

³ 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% used a paper ballot and 36% used an electronic voting machine.

⁴ 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 turnout 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.

⁵ A factor analysis of the three items produced one factor with an eigenvalue greater than 1.0.

⁶ The response set to this question was: (1) No line (2) less than 5 minutes (3) 10-20 minutes and (4) More than 20 minutes.

⁷ The number of voters voting at vote center on a DRE is not a trivial proportion of the Colorado electorate in the 2008 Presidential election. Approximately 21% of our sample (N=796) voted on a DRE at an Election Day vote center.