

Engaging the Unengaged Voter: Vote Centers and Voter Turnout

Robert M. Stein Rice University
Greg Vonnahme Rice University

Previous election reforms designed to increase turnout have often made voting more convenient for frequent voters without significantly increasing turnout among infrequent voters. A recent innovation—Election Day vote centers—provides an alternative means of motivating electoral participation among infrequent voters. 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), and rely on county-wide voter registration databases accessed by electronic voting machines. Voters in the voting jurisdiction (usually a county) are provided ballots appropriate to their voter registration address. 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. Since 2003 voters in Larimer County, CO have balloted at one of 32 vote centers. Precinct voting in Larimer ended in 2003. To test the efficacy of Election Day vote centers, we have collected individual vote histories on voters in Larimer and a control county (i.e., Weld, CO) that used precinct voting on Election Day for the years 1992–2004. We find significant evidence to support the hypothesis that Election Day vote centers increase voter turnout generally, and among infrequent voters in particular.

Efforts to increase voter turnout through changes in the administration of elections have focused on several reforms including Election Day registration, relaxed absentee voting, vote by mail, and in-person early voting. These efforts have not significantly increased voter turnout. Why? Fundamental to all of these reforms is the belief that the costs of voting outweigh any measurable benefit individuals obtain from either voting and/or the outcomes from voting. Teixeira (1992) has critiqued this perspective on electoral reform suggesting that costs of voting are exaggerated and that declining voter turnout reflects an increasing lack of perceived benefits from voting and political participation in general. Moreover, the public's declining interest in politics is matched by a reduced effort on the part of candidates and parties to engage the larger electorate in political campaigns, focusing their efforts on a smaller more homogeneous base of core partisan supporters.

In this paper we offer a slightly different perspective on the costs of voting. Like Downs (1957) we believe the cost of voting is largely tied to the time and inconvenience associated with the act of voting. We suggest

that previous electoral reforms may not have effectively addressed this aspect of the cost of voting and thus failed to adequately remedy the “inconvenience” of voting, particularly for infrequent voters. We examine an alternative conceptualization of the cost of voting with a new electoral reform, Election Day vote centers (EDVC). EDVCs are designed to reduce the inconvenience and inaccessibility of Election Day voting.

The Costs of Voting and Previous Electoral Reform

Previous research has identified four major influences on individual decisions to participate—social and demographic traits, psychological resources, electoral rules, and the mobilization efforts of parties and their candidates (Leighley 1995). Electoral reforms directed at increasing voter participation have centered on simplifying voter registration and increasing opportunities to vote (e.g., voting by mail and in-person early

voting). The rationale underlying early voting and related electoral reforms (e.g., Motor Voter and voting by mail) has been the belief that providing more opportunities to vote (i.e., the number of days, hours, or sites at which to vote) increases voter participation.

Reducing the number of days prior to an election in which voters can register to vote and allowing individuals to register to vote when renewing their driver's licenses or at the polls on Election Day has increased voter registration (Squire, Wolfinger, and Glass, 1987; Wolfinger and Rosenstone 1980). But studies of the direct effect of voter registration and balloting reforms on voter turnout suggest minimal responses on the part of the electorate. National legislation (i.e., National Voter Registration Act of 1993) to enable individuals to register to vote when they renew or obtain a driver's license has had only a modest impact on voter turnout (Knack 1995; Rhine 1996). Liberalized voting by mail (Berinsky, Burns, and Traugott 2001) and in-person early voting (Stein 1998; Stein and Garcia-Monet 1997) were also found to have an insignificant or marginal effect on increasing the likelihood an individual will vote.

Empirical evidence regarding who is affected by contemporary electoral reforms is either mixed or weak. Nagler (1991, 1402) concludes that restrictive registration laws do not deter poorly educated individuals from registering any more than the highly educated. This implies that liberalizing these laws may increase registration overall, but will not equalize participation across classes. Conclusions regarding election reforms beyond registration are similar. Stein (1998) reports that resource-poor voters did not benefit from the adoption of in-person early voting, while Berinsky, Burns, and Traugott (2001) find that voting by mail has little effect on the "resource-poor" (2001, 178). Stein (1998) also reports that early voters appear to be more partisan, ideological, interested in politics, and *disproportionately likely to have voted in the past*. Simply put, electoral reforms have mainly been used by those who otherwise would have been most likely to vote without them. Similar findings have been reported for relaxed absentee voting (Berinsky 2005; Karp and Banducci 2000; Oliver 1996).

The modest impact electoral reforms have had on voter participation remains partially unexplained. Teixeira (1992) and Berinsky (2005) suggest an important obstacle to voter participation is voter motivation and interest in the political process. "This suggests that attempts to reconnect Americans to politics should focus especially on ways to encourage psychological involvement in politics and promote a sense that the government is responsive to the or-

dinary citizen" (Teixeira 1992, 156). Berinsky concludes that electoral reforms that make the act of voting easier help to "retain engaged voters" rather than "stimulating the unengaged" voter (2005, 413).

The cumulative evidence to date suggests that electoral reforms have simply made voting more convenient for engaged and frequent voters while doing little to enhance the likelihood that infrequent voters will ballot on or before Election Day. We offer a slightly different perspective on the cost of voting that might provide a less daunting and potentially efficacious institutional remedy for increasing voter turnout, especially among infrequent voters.

The Cost of Access and Inconvenience

The major costs of voting include the resources and time that must be expended to vote. These resources, including time, are scarce and are competed for by other demands and preferences for the use of a person's time. The 2004 *Current Population Survey* asked a sample of U.S. citizens why they did not vote in the 2004 Presidential election. The modal response (20%) was "too busy, conflicting schedule." For most eligible voters voting on a specific day competes unsuccessfully for our time with other demands and preferences. Electoral reforms that focus on lessening the competition between voting on Election Day and other demands and preferences for our time fail to significantly enhance the likelihood voters will ballot. Why? Are there other ways to conceptualize the costs of voting that operate to obstruct voting?

The opportunity costs of voting on Election Day (i.e., the benefits forgone by not pursuing a more valued activity) are sufficient to deter many from voting on Election Day. In-person early voting and absentee voting by mail were designed, in part, to remove or at least reduce the opportunity costs of Election Day voting by allowing the voter to choose the day and time to vote that did not compete with other preferences. As noted, however, this desired effect has not been achieved with either in-person early voting or absentee voting by mail. Why and how does this explain why Election Day vote centers might be more efficacious in mobilizing non-habitual voters? Another obstacle to voting is the inconvenience and inaccessibility of voting opportunities on either Election Day or before. These obstacles or nuisances include waiting in long lines to vote, inaccessible voting places (distance to travel, limited parking, etc.), and unfamiliar voting technology.

Convenience is more influential to the infrequent voter's decision to vote. For the frequent voter convenience influences when they vote (Election Day or before). Since nonhabitual voters are not likely to vote (i.e., early or on Election Day) convenience has a significant and positive effect on their decision to vote, but only on Election Day. The extant literature provides support for this position. Several researchers (Berinsky 2005; Berinsky, Burns, and Traugott 2001; Stein 1998) demonstrate that early voters are significantly more partisan, ideological, interested in politics, and more likely to have voted in past elections. Most importantly, early voters are more likely than Election Day voters to make their vote choice before Election Day. We suspect this is the reason why convenience voting before Election Day, (i.e., in-person early voting, mail-in ballots, and mail-in absentee voting), does not entice infrequent voters to ballot before Election Day. What would happen if infrequent voters were afforded the convenience of early voting on Election Day? Accessible parking, short waiting lines to vote, and an abundance of Election Day workers to assist voters with balloting on electronic voting machines might be a strong incentive for infrequent voters to vote on Election Day. Again, there is supporting empirical evidence to suggest that these costs of voting have a significant negative impact on the likelihood of voting.

Gimpel and Schuknecht find that the geographic accessibility of polling places has a significant and independent effect on likelihood individuals will vote: "even after controlling for variables that account for the motivation, information and resource levels of local precinct populations, we find that accessibility does make a significant difference to turnout" (2003, 471). Dyck and Gimpel (2005) extend this same finding for Election Day voting to the likelihood that individuals will cast an absentee ballot by mail or at an in-person early voting site before Election Day.

Haspel and Knotts report that voting is extremely sensitive to distance between the voter's residence and polling place. They find "small differences in distance from the polls can have a significant impact on voter turnout" (2005, 560). Moreover, Haspel and Knotts find that turnout increases after moving a voter's polling place closer to their residence through the consolidation of polling places. The authors explain that "it appears that the gain in turnout that accrues from splitting precincts outweigh the loss due to any confusion over the location of the polling place" (2005, 569), in part because distance from the new/consolidated polling place was reduced.

Brady and McNulty's study of Los Angeles County's precinct consolidation in 2003 confirms Haspel and Knotts finding. "The change in polling place location has two effects: a transportation effect resulting from the change in distance to the polling place and a disruption effect resulting from the information required to find a new polling place" (2004, 40). These two effects are roughly equal for the voter who had experience an increased distance of about a mile.

Together these findings suggest that the convenience and accessibility of a voter's Election Day voting place is a significant factor to voting. If this assessment is true could Election Day balloting be organized and administered to eliminate this and other obstacles to voting and thus enhance voter turnout especially among infrequent voters? The popularity of early voting (Southwell and Burchett 2000) and other forms of convenience voting (i.e., voting by mail) suggests that many voters prefer the convenience afforded by early voting i.e., accessible voting locations, short-lines, and assistance in using new or unfamiliar voting technologies. There is some reason to believe that voter turnout might increase if we imported these "conveniences" to Election Day balloting, especially for infrequent voters.

Election Day Vote Centers and Convenience

In 2003 Larimer County replaced precinct-based polling places with Election Day vote centers (EDVC). Election Day vote centers are nonprecinct-based locations for voting. The sites are fewer in number than precinct-voting stations, centrally located to major population centers (rather than distributed among many residential locations), and rely on county-wide voter registration databases accessed electronically at each polling site. Voters in the voting jurisdiction (a county) are provided ballots appropriate to their voter registration address.

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

As designed and implemented in Larimer, EDVCs differ from the approach of previous efforts 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 primary cost of voting, going to the polls is not necessarily the only thing that individuals will do on Election Day. Consistent with the discussion above, there is an opportunity cost to voting such that going to the polls leaves individuals with less time for work, lunch, shopping, or recreation. While voting can be thought of as rivalrous with other activities, voting can also be made more or less complementary, so that all modes of voting will not be equally costly. In this way, there might be alternative ways of administering elections that do not eliminate the time costs entirely, but rather makes the act of voting more complementary rather than competing with other demands. Election Day vote centers, by allowing individuals to vote at any location throughout the county, might be more complementary with peoples' daily routines than exclusive precinct locations. If true, 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 polling location that is two miles from their house but on the way to work rather than a polling site that is only a mile away from their house but in the opposite direction. That voters are likely to be engaged in other activities on Election Day raises the possibility that voting might be made more complementary with those other activities, by locating polling places that are near to workplaces, schools, shopping areas, or major transportation routes so that they are more accessible to individuals throughout the day.

Attributes of Election Day Vote Centers

According to our argument, vote centers should be negatively related to the costs of voting, which in turn will lead individuals to be more likely to vote. Thought of this way, vote centers have an indirect effect, operating through convenience, on levels of voter turnout. This section focuses on establishing the relationship between vote centers and convenience.

Conceptually, we argue that there are two features of vote centers that separate them from precinct-based polling locations. The first characteristic is dichotomous and captures whether the polling sites are open to all voters in the county or if they are exclusive to a certain precinct (or combined precincts). We argue that voter centers can be distinguished from precinct sites, as vote centers are open

to all voters in the county, whereas voters are assigned to one particular site with precinct locations. This first characteristic is consistent with the current implementation of Election Day vote centers, in that there have been no restrictions for any individual on where they were eligible to vote on Election Day.

Open polling locations might be related to the costs of voting in several ways. While vote centers are typically fewer in number across the county, they increase the number of sites available to individual voters. Whereas precinct-based voting assigns each voter to a single polling site on Election Day, vote centers allow individuals to vote at any polling site in the county. By allowing individuals to vote at multiple locations, they can choose the site that is most convenient for them and might increase their probability of turning out to vote. This might be particularly important for voters that commute longer distances, as residentially based polling locations might only be accessible in the mornings or evenings, while other polling locations might be nearer to their destination and more accessible throughout the day. This might have at least three different effects. First, by affording voters a choice about where they can vote, it allows them to vote at a time and place that is most convenient for them. Second, Election Day vote centers might also better distribute voter arrival times throughout Election Day. That is, precinct polling sites might be more accessible to individuals at morning and evening peak times. As more people go to the polls at peak times, the load increases on the polling sites which can lead to longer lines and more time voters must spend waiting to vote. If vote centers are more accessible throughout the day, they should reduce the load on polling sites during morning and evening peak times, which might reduce lines and the time that voters spend waiting in line.

Open polling locations might also lower the informational costs of voting, as individuals do not need to have specific information as to their voting district and the polling place that has been established for their particular voting district. Rather, individuals will only need to know which sites are available for county-wide voting. Open polling locations might therefore tend to increase voter turnout by making polling locations more convenient and accessible on Election Day and also reduce informational costs as individuals no longer need to know what particular site was chosen for their voting district, but can vote at any location in the county.

The second characteristic that we argue helps to distinguish vote centers from precinct sites is centralization. This refers to the characteristic that vote

centers tend to be larger and fewer in number than precinct sites. While openness has a binary quality (vote centers are open to all voters in a county, whereas precinct sites are the only permissible location for residents within a designated geography), centralization can occur to a greater or lesser extent depending on how vote centers are implemented. Existing legislation has generally set a minimum number of sites of one vote center per 10,000 active registered voters in the county (Colorado Revised Statutes 1-5-102.7 2006).

Centralization might also have a positive impact on voter turnout as it might increase the convenience of voting through larger and more visible sites. Larger polling sites might also be more accessible from major transportation routes, have more available parking, and reduce informational costs by being located in larger, more identifiable locations. In addition to location effects, centralization might also make voting more convenient by improving voters' experiences with poll workers. Moving from a larger network of smaller sites to a smaller network of larger sites involves placing more poll workers, on average, at a vote center than at a precinct location. By having a larger number of poll workers at each site, the poll workers will be able to specialize in specific tasks such as assisting voters with questions, showing them how to operate voting machines, or checking machines to see that they are operating properly. With greater worker specialization, poll workers are expected to perform their tasks better and more reliably than if they performed a wider range of tasks, which allows the vote center to more efficiently process voters and improve service.

Larimer County was the first county in the United States to employ Election Day vote centers in 2003.¹ Though EDVCs have only been in operation for a relatively short period of time, there is sufficient experience with this mode of balloting for us to attempt a preliminary analysis of their impact on voter turnout in Larimer County.

In the 2002 election Larimer County operated 143 precinct-based polling places on Election Day. In the 2003 election Larimer operated 22 Election Day vote centers. Table 1 reports the proportion of polling places by type of place for 2002 and 2003. In 2002, 73% of precinct-based polling places were located at

TABLE 1 Proportion of Polling Places by Type of Site: 2003 and 2004 (Percent by column)

	2002 Precincts	2003 EDVCs
Schools, fire stations and churches	73%	54%
Hotels, public facilities and apartment complexes	27%	46%
N	143	22

schools, fire stations, or churches. In 2003 this proportion dropped to 54% as Larimer County adopted EDVCs. The proportion of polling places located at larger, more centrally located facilities including hotels, apartment complexes, and municipal activities centers increased from 26% in 2002 to 46% in 2003. Consistent with our conceptualization of convenience voting, EDVCs were located disproportionately at larger facilities centrally located to where people work, shop, and otherwise travel on Election Day.

In 2002 the mean number of workers located proximate to a polling place was 325 persons.² In 2003 this figure increased by 25% to 425 persons. Larimer's adoption of Election Day vote centers moved voting places away from residential population centers and closer to where people travel on Election Day to work, shop, or recreate. In 2003 the mean number of residential households proximate to each polling place was 1,444. In 2003 this figure declined to 1,299 or 10%.³ Finally, the average ratio of voters to poll workers at the sites declined from 102 in 2002 to 76 in 2003, suggesting that implementation of EDVCs actually increased support services for Election Day workers. To date, the evidence suggests that the implementation of EDVC in Larimer corresponds with our conceptualization of convenience voting.

An Aggregate-Level Analysis Election Day Vote Centers

Figure 1 reports voter turnout rates between 1990 and the 2004 for low-turnout primary elections in Larimer County and adjacent Weld County, where

¹In 2004 Weld County, Colorado (adjacent to Larimer) adopted Election Day vote centers. In the 2006 mid-term 19 other counties in Colorado, including the state's largest county, Denver, adopted Election Day vote centers. As of 2007 several states including Washington, Indiana, and Texas are either experimenting with Election Day vote centers or have had legislation introduced in their respective state legislatures to adopt this mode of balloting.

²This analysis is based on the the North Front Range Metropolitan Planning Organizations' *2000 Employment for North Front Range MPO by Transportation Analysis Zone* (http://www.nfrmpo.org/images/2030/maps/employment_full.gif).

³A difference of means test for each of these relationships does not produce a t-value that is statistically significant at conventional levels of significance.

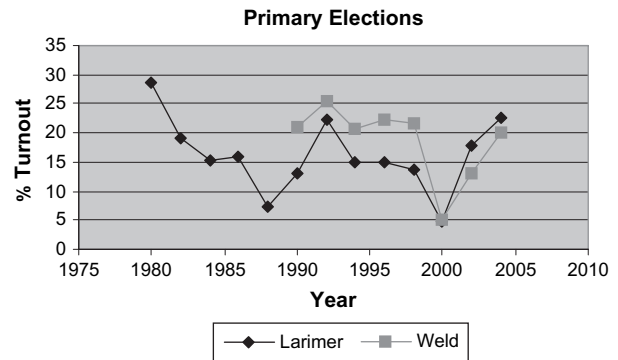
Election Day vote centers did not exist prior to 2004.⁴ By a consistent margin voter turnout was higher in Weld than Larimer County between 1990 and 2000. Between 2000 and 2004 turnout in Larimer County increased at a faster rate eventually surpassing turnout in Weld County in 2004. Note that both Larimer and Weld counties experienced a significant increase in voter turnout for primary elections after 2000, a trend that continued through 2003 when Election Day vote centers were adopted in Larimer. Turnout in Larimer County, however, increased at a faster rate than in Weld County after Larimer County's adoption of Election Day vote centers in 2003. While these results are suggestive, we conducted further individual-level analyses as a way of providing additional evidence regarding the effects of Election Day vote centers on turnout.

An Individual-Level Analysis of Election Day Vote Centers

The aggregate-level findings reported in Figure 1 suggest that EDVCs in Larimer County may account for the increase in voter turnout after 2002. To further assess the impact of EDVCs on turnout we looked at individual-level data in order to better control for potentially confounding variables. The results of the analyses are consistent with the findings reported above. Adjusting for potentially confounding variables, there is evidence at the individual level that Election Day vote centers have led to higher turnout in elections in Larimer County than would have otherwise been the case. Most importantly we find that the effect of EDVC on voter participation is greater for infrequent rather than frequent voters.

⁴The choice of Weld County as a control for our study of EDVCs in Larimer County is based on several factors. First, the two counties are geographically proximate to each other and share several elected representatives. Weld is directly east of Larimer and the two counties share a common border of approximately 75 miles. Portions of both counties are represented in the Colorado state legislature by the same state representative (District 49) and a state board of education representative (District 4). Most of Larimer and Weld counties are included in the 4th Congressional District. This degree of shared political representation is not observed for any other counties adjacent to Larimer. These shared representatives mean that voters in both Larimer and Weld vote for and participate in many of the same contests for public office. Moreover, voters in both counties experience the same campaigns and candidates messages that influence voter turnout. Demographically the two counties are statistically similar on indices of age, homeownership and income. Weld has a larger Hispanic population (28%) than Larimer (10%), and Larimer has a higher percent of adults with a college education (40%) than Weld (22%).

FIGURE 1 Turnout in Larimer and Weld Counties: 1975-2005



In order to control for potentially confounding variables, we analyze data on individual registered voters in Larimer and Weld counties from 1992 to 2004.⁵ The data files included registered voters in the two counties, their age, gender, registration date, major party registration,⁶ election, and the elections each voter participated in since 1992 (N = 22). The dependent variable of interest is whether or not an individual voted in an election. The main treatment of interest is whether or not the election used Election Day vote centers, and the anticipated effect is to increase the probability that an individual votes.

Since a randomized experiment is not possible, and the process by which counties adopt Election Day vote centers is unknown and likely the product of many factors, we use an alternative method of addressing confounding variables. In order to adjust for potentially confounding variables, we first rely on a matching procedure, where subjects that are exposed to Election Day vote centers are matched with corresponding control observations that use precinct-based polling places. We then observe the turnout rates and compare across the treatment and control observations to assess the effects of Election Day vote centers on turnout. The most common adjustment for potentially confounding variables is to include measures of the variables in a statistical model. While this approach has been very useful for existing studies, matching provides for several additional advantages. In particular, matching has been argued to reduce the dependence of the results on model specification and to provide results that are closer to experimental benchmarks than model-based adjustments

⁵We are very grateful to Bob Nelson and Voter Contact Services for providing us access to their data used in this analysis.

⁶Colorado voters have the option to register as a Democrat, Republican or no party.

alone (Dehejia and Wahba 1999; Hill, Reiter, and Zanutto 2004; Ho et al. 2005). By providing a more balanced sample of cases to analyze, matching is also a more intuitive means of studying the causal effects of the reform. While our discussion of the empirical results focuses on the matched-sample analysis, we also found that for this particular study, analyses of the matched and unmatched samples provide similar results. Table 2 reports the logit regression coefficient for a model of voter turnout that analyzes voters in 2003 and 2004, in Larimer and Weld counties. The dependent variable is voter participation in three elections. The main independent variable is location in a county with (Larimer) and without (Weld) Election Day vote centers. Other controls are also included. These findings are consistent with the results from our matched sample and substantively support both our hypotheses; Election Day vote centers increase voter turnout and turnout among less engaged voters.

Measures of gender, age, and party registration are taken directly from the county voter registration database. We confront a problem measuring participation in prior elections with the same database. While we have a record of individuals' votes in Larimer and Weld counties from 1992 to 2004, the records are incomplete, as individuals' vote histories are not portable across counties. That is, we do not have fully observed vote histories for individuals that have voted in another county (or state) before moving to Larimer or Weld.⁷ To address this issue, we begin by screening voters for those that registered in Larimer or Weld counties prior to their 24th birthday. Given the low level of turnout among young voters, this should help to address the measurement problem. By focusing on voters that registered in the county prior to their 24th birthday, we are able to screen for a sample of voters that will have a more fully observed vote history, allowing us to more accurately assess the effects of the treatment across different levels of voting experience.

In our initial individual analysis, we attempt to determine whether or not there is evidence at the individual level regarding the effects of EDVC on turnout. For this analysis, we began by obtaining a random sample of 2,000 treated observations in Larimer County. We then obtained a random sample of 50,000 potential controls from Weld County,

⁷This problem is likely to be resolved as a result of the enactment of the 2000 *Help American Vote Act (HAVA)*. One provision of HAVA is that all states are required to maintain a statewide voter registration data base. When fully implemented in the 50 states, it will be possible to track a voter's participation history as they move within a state.

TABLE 2 Logit estimates of voter turnout

	Coef.	S.E.	p-value	90% Confidence Interval	
				Lower	Upper
Female	.186	.012	.000	.166	.207
Age	-.03	.001	.000	-.032	-.028
Major party	.388	.013	.000	.366	.409
Presidential election	3.103	.017	.000	3.076	3.13
Primary	-.665	.019	.000	-.697	-.634
Previous vote (P)	.367	.004	.000	.361	.374
Treatment (T)	.287	.016	.000	.262	.313
T*P	-.043	.003	.000	-.048	-.037
Constant	-2.431	.031	.000	-2.482	-2.379

N = 200,515
 Log likelihood = -81413.9
 Pseudo R² = .388

which did not use Election Day vote centers. We then exactly matched the subjects on the observed potentially confounding variables, which were age, gender, major party registration status, frequency of prior voting, and type of election. For example, this procedure would attempt to match a 38-year-old female who was registered with a major party and had voted in five previous elections as of November 2003 in Larimer County to a corresponding 38-year-old female who was registered with a major party and had voted in five previous elections as of November 2003 in Weld County. Of the 2,000 initially selected treated observations, 1,930 were exactly matched to a corresponding control observation from Weld County for a match rate of 96.5%.

Using the matched sample of treated and control observations, we found that turnout was 2.6% higher in the treatment than control group, as can be seen in Table 3. The table also reports the p-value for McNemar's test statistic for the null hypothesis of no effect, which we can reject at conventional levels of significance. These results suggest that the treatment has a positive effect on overall levels of voter turnout.

To further assess the effects of vote centers on turnout, we estimated a logit model where the dependent variable was voter turnout in one of three elections,⁸ and the independent variable is the treatment, 1=EDVC and 0=Precinct. The coefficients for this model, reported in Table 4, are positive and statistically significant at conventional levels confirming our first hypothesis that EDVCs have a positive impact on voter turnout.

⁸The elections include the November 2003 local coordinated election; the August 2004 coordinated primary election and the November 2004 Presidential election.

TABLE 3 Voter Turnout by Treatment

	Did not Vote	Voted	Total
Precinct	1,378 (71.5%)	552 (28.6%)	1,930
EDVC	1,327 (68.8%)	603 (31.2%)	1,930
Total	2,705 (70.1%)	1,155 (29.9%)	3,860

p = .08

The substantive effects of EDVC on turnout appear in Table 5. This table shows the effect on an individual’s probability of voting with a 90% confidence band, along with the expected effects on levels of turnout if vote centers had been used in our control county. Again, we observe a 2.6% increase in the probability that a registered voter will ballot in a county using EDVCs. In Weld County, with a population of 114,140 registered voters, the impact of this increase in voter turnout represents close to 3,000 additional voters.

One potential concern with the analysis is that the results might be sensitive to possible unobserved biases.⁹ We used the matching procedure to adjust for the observed possible sources of bias between the treatment and control groups, but as with any observational study, there are other unobserved factors that might also affect our results. While we cannot make direct adjustments for unobserved factors, we did conduct a sensitivity analysis to assess how our results might be affected by different levels of hidden bias. In particular, we consider how an unobserved variable (that is strongly related to voting) might affect our results (Rosenbaum 2002). To conduct the sensitivity analysis, we calculated upper and lower bounds on the p-values for McNemar’s test for different levels of hidden bias. The results are shown in Table 6. The gamma term represents the level of imbalance in the data, so that a gamma of 1.2 indicates that identical observations in our data could differ in their likelihood of receiving the treatment by up to 20% due to an unobserved factor (Rosenbaum 2002). In a perfectly balanced design, the value is equal to one, indicating that there are no differences between observationally identical subjects in the data.

The results of the sensitivity analysis suggest that we cannot rule out the possibility that the results are being influenced by an unobserved variable, but we also note that we have adjusted for individuals’ prior vote history in the analyses. This might provide us with an indirect control for other potentially confounding variables not explicitly included in the

⁹This refers to statistical bias, which if present, can lead to an over or underestimation of the effects.

TABLE 4 Logit estimates of treatment effect on voter turnout

	Coef.	S.E.	p	90% Confidence Interval	
				Lower	Upper
Treatment	.126	.070	.073	.010	.241
Constant	-.915	.050	.000	-.997	-.831

N = 3,860
 Log likelihood = -2353.8
 Pseudo R² = .001

model, as insofar as they are related to voting, our adjustment for prior vote history also helps to control for other related variables. While the matched sample suggests that the treatment has a positive affect on turnout, we are careful not to state our conclusions too strongly in light of the sensitivity analysis. We can see that the results are not necessarily robust to plausible levels of hidden bias. While the positive overall result is encouraging and suggestive, we cannot definitively rule out the possibility that the apparent effects of EDVC on turnout are the result of other factors.¹⁰ We will return to this finding in the conclusion to discuss its implications for future research. In the next section, we attempt to assess whether or not there is evidence that the effect of the treatment varies across individuals’ level of previous voting experience.

In order to assess whether the treatment effects vary across levels of prior voting experience, we estimated a logit model of turnout with our matched sample. The model included a measure for the treatment variable, the number of times an individual had voted previously, and an interaction between the treatment and frequency of voting. The treatment variable is dichotomous, with 1 indicating the presence of Election Day vote centers, and the number of times an individual voted previously ranged from 0 to 22 elections. The results of the logit model appear in Table 7. From these results we can see that the treatment variable is positive and the interaction term is negative, as expected, and both are statistically significant at conventional levels. The negative interaction term indicates that the effect of the treatment is greater for less regular voters as hypothesized.¹¹

¹⁰While our discussion focuses on the possibility that the results overestimate the effect of EDVCs, an unobserved factor would be as likely to lead to an underestimation of the actual effect.

¹¹We also estimated the model adding the female, age, and major party registration variables and obtained nearly identical (though slightly more supportive) results.

TABLE 5 Substantive effects of EDVC on voter turnout

	Lower 5%	Mean	Upper 5%
Change in probability	.001	.026	.050
Change in turnout	114	2,964	5,700

In order to assess the substantive effects of the treatment variable and its interaction with voting history, we simulated the model estimates to obtain the predicted probabilities of voting. The results are presented in Figure 2. This figure shows the effect of Election Day vote centers on individuals' likelihood of voting (the difference in their probability of voting under the treatment and control conditions) across the range of observed values of the vote history variable. The dots represent the median simulated effect along with 90% confidence bands. The figure also includes a rug plot at the bottom that illustrates the distribution of the data over the sample, showing a cluster at lower values of the vote history variable.¹² From this figure, we can see that the effect of EDVC is greatest for less frequent voters, significantly increasing the likelihood an infrequent voter will ballot in a county with an EDVC.

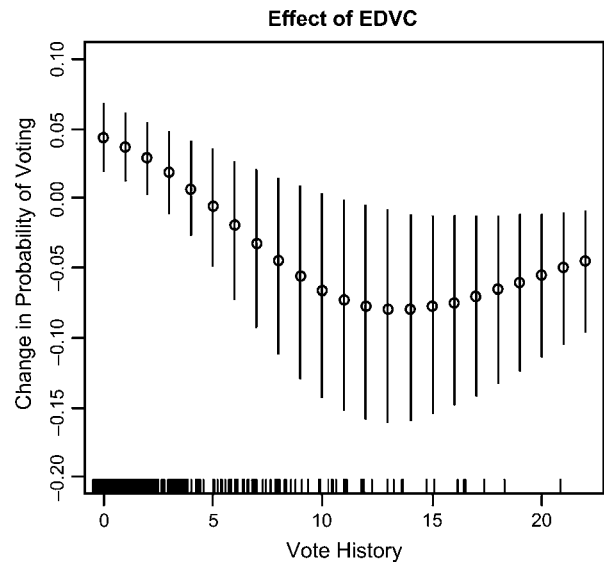
The coefficient estimates in Table 7 also suggest that the overall treatment effect remains positive. Even when infrequent voters are significantly more likely to benefit from EDVC, EDVCs continue to have a positive effect on turnout for the entire electorate in our sample. This finding is consistent with those reported in Table 3. As we noted above, however, the results from the sensitivity analysis suggest that definitive conclusions regarding the effects of EDVC would not be warranted on the basis of these empirical findings. Rather, the results should be interpreted as suggesting that the Election Day vote centers are attractive to less regular voters, and that these findings warrant future research, which we discuss next.

Summary and Conclusions

The results suggest that Election Day vote centers have a positive and substantial effect on individual electoral participation. Moreover, this effect is substantially greater for infrequent rather than frequent voters. This is both a novel and important finding. Previous research (see Berinsky 2005) has shown that

¹²The frequencies used to construct the rug plot were scaled down by a factor of 8.

FIGURE 2 Effect of EDVC with 90% confidence bands



electoral reforms intended to increase voter turnout disproportionately advantage engaged and frequent voters. Existing reforms have effectively made voting more convenient for the frequent voter, while doing little to make voting convenient and more likely for the infrequent voter. One important consequence of the effect of previous electoral reforms is to increase rather than narrow the socioeconomic bias in the composition of the voting public. Our findings are the first to document that an electoral reform positively impacts turnout among infrequent voters, albeit modestly. The modest impact of this reform is offset by its targeted nature, as an increase in the likelihood of an infrequent voter balloting on Election Day at a vote center could lessen the socioeconomic gap between frequent and infrequent voters.

While our results are encouraging and suggest that the use of Election Day voting centers might facilitate individual electoral participation, the results

TABLE 6 Sensitivity analysis

Γ	Lower bound	Upper bound
1	.009	.009
1.05	.001	.031
1.1	.000	.084
1.15	.000	.182
1.2	.000	.322
1.25	.000	.486
1.3	.000	.646

TABLE 7 Logit estimates of treatment effect and vote history

	Coef.	S.E.	P	90% Confidence Interval	
				Lower	Upper
Treatment (T)	.255	.087	.004	.111	.398
Previous vote (P)	.220	.017	.000	.192	.248
T*P	-.057	.023	.013	-.095	-.019
Constant	-1.38	.064	.000	-1.48	-1.27

N = 3860

Log likelihood = -2181.46

Pseudo R² = .07

cannot be taken as conclusive regarding the impact of vote centers, obviating the need for future research. Inferences based on observational data can potentially be affected by hidden biases that cannot be accounted for with the available data. The data used in these analyses are also taken from two counties in Colorado. If there are unique conditions in those counties not universally found elsewhere, then Election Day vote centers could potentially have a different effect than seems to be the case in Larimer. The number of elections using voting centers also covers a narrow time span, making it more difficult to study any potential long-term effects of the use of EDVCs, and also how vote centers might interact with registration drives as there is further evidence that vote centers matter more for younger and less experienced voters. Yet there are potential advantages to using Election Day vote centers that seem to increase individual electoral participation based on the available empirical evidence.

Acknowledgments

Support for this research was generously provided by the James A. Baker III Institute for Public Policy and the Baker/Carter Commission on Federal Election Reform. The authors wish to acknowledge the assistance of Michael Alvarez, Kevin Arceneaux, Beth Miller, Bob Nelson, Scott Doyle, Doug Chapin and the anonymous reviewers for their thoughtful comments.

Manuscript submitted 28 February 2007

Manuscript accepted for publication 22 July 2007

References

- Berinsky, Adam 2005. "The Perverse Consequences of Electoral Reform in the United States", *American Politics Research* 33 (3): 471-91.
- Berinsky, Adam, Nancy Burns, and Michael Traugott. 2001. "Who Votes by Mail? A Dynamic Model of the Individual-Level Consequences of Vote-By-Mail Systems." *Public Opinion Quarterly* 65 (2): 178-97.
- Brady, Henry, and John McNulty. 2002. "The Costs of Voting: Evidence from a Natural Experiment." Prepared for the 2004 annual meeting of the Society for Political Methodology, Stanford University.
- Colorado Revised Statutes 1-5-102.7 2006.
- Dehejia, R., and S. Wahba. 1999. "Causal Effects in Non-experimental Studies: reevaluating the Evaluation of Training Programs." *Journal of the American Statistical Association* 94 (448): 1053-62
- Downs, Anthony. 1957. *An Economic Theory of Democracy*. New York: Harper & Brothers.
- Dyck, Joshua, and James Gimpel. 2005. "Distance, Turnout and the Convenience of Voting." *Social Science Quarterly* 86 (3): 531-48.
- Gimpel, James, and Jason Schuknecht. 2003. "Political Participation and the Accessibility of the Ballot Box." *Political Geography* 22 (4): 471-88.
- Haspel, Moshe, and H. Gibbs Knotts. 2005. "Location, Location, Location: Precinct Placement and the Costs of Voting." *Journal of Politics* 67 (2): 560-73.
- Hill, Jennifer, Jerome Reiter, and Elaine Zanutto. 2004 "Comparison of experimental and observational data analyses." In *Applied Bayesian Modeling and Causal Inference from Incomplete Data Perspectives*, ed. Andrew Gelman and Xia-Li Meng. Hoboken: John Wiley and Sons, Inc.
- Ho, Daniel, Kosuke Imai, Gary King, and Elizabeth Stuart. 2005. "Matching as Non-parametric Pre-processing for Reducing Model Dependence in Parametric Causal Inferences." Working manuscript. Harvard University.
- Karp, Jeffrey A., and Susan A. Banducci, 2000. "Going Postal: How All-Mail Elections Influence Turnout," *Political Behavior* 22 (3): 223-39.
- Knack, Steven. 1995. Does "'Motor Votor' Work? Evidence from State-Level Data." *Journal of Politics* 57 (3): 796-811.
- Leighley, Jan E. 1995. "Attitudes, Opportunities, and Incentives: A Field Essay on Political Participation." *Political Research Quarterly* 48 (1): 181-209.
- Nagler, Jonathan. 1991. "The Effect of Registration Laws and Education on US Voter Turnout." *American Political Science Review* 85 (4): 1393-1405.
- Oliver, J. Eric. 1996. "Who Votes at Home? The Influence of State Law and Party Activity on Absentee Voting and Overall Turnout." *American Journal of Political Science* 40 (2): 498-513.
- Rhine, Staci. 1996. "An Analysis of the Impact of Registration Factors on Turnout in 1992." *Political Behavior* 18 (2): 171-85.
- Rosenbaum, Paul. 2002. *Observational Studies*. New York: Springer-Verlag.

- Southwell, Priscilla, and Justin Burchett. 2000. The Effect of All-Mail Elections on Voter Turnout. *American Politics Quarterly* 29 (1): 72–80.
- Squire, Peverill, Raymond Wolfinger, and David Glass. 1987. "Residential Mobility and Voter Turnout." *American Political Science Review* 81 (1): 45–66.
- Stein, Robert. 1998. Early Voting. *Public Opinion Quarterly* 62 (1): 57–70.
- Stein, Robert, and Patricia Garcia-Monet. 1997. Voting Early, But Not Often. *Social Science Quarterly* 78 : 657–77.
- Teixeira, Ruy. 1992. *The Disappearing American Voter*. Washington: Brookings Institution Press.
- Wolfinger, Raymond, and Steven Rosenstone. 1980. *Who Votes?* New Haven: Yale University Press.

Robert M. Stein is Lena Goldman Fox professor of political science, Rice University, Houston, TX 77251. Greg Vonnahme is a graduate student in political science, Rice University, Houston, TX 77251.