Assessing Election Reform Four Years After Florida

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Abstract

In the wake of the controversial 2000 presidential election, Congress passed the Help America Vote Act of 2002 (HAVA) and states have moved to implement election administration reforms. Many counties upgraded to new voting equipment before the 2004 presidential election, and many more are poised to follow suit. This paper documents changes in voting technology around the country and assesses their impact on unrecorded votes in the 2004 election. We also outline an agenda for assessing the intended and unintended effects of HAVA. Preliminary results indicate that replacing punch card ballots substantially reduces the frequency of residual votes, but that not all "new" equipment performs the same. Touch-screen electronic voting machines and precinct-count optical scan systems significantly reduce the number of unrecorded votes in presidential contests. In contrast, full-face electronic voting machines and central-count optical scan systems have a weaker impact on unrecorded votes.

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Introduction

The 2000 presidential election and the recount battle in Florida focused attention on election procedures and problems in the United States. For example, approximately two million Americans went to the polls but failed to cast a valid vote in the 2000 presidential contest. However, the problems in the election went beyond the most visible recount issue. Many voters were unable to cast a ballot because of confusion or discrepancies over their registration status. Some people were registered to vote in more than one location because registration lists were not updated. In response to some of the controversies raised in the 2000 election, Congress passed the Help America Vote Act of 2002 (HAVA). Every state has been required review and update election laws and procedures, and many states acted even before passage of HAVA (Palazzolo 2005). Because of the decentralized nature of election administration, the reforms enacted since 2000 represent the most widespread changes in American election procedures in decades.

In this study we assess the implementation and impact of election reforms as of the 2004 general election, the first presidential election since passage of HAVA. In particular, we focus on changes in voting equipment and residual vote rates.

The Background on Reform Efforts

In the wake of the 2000 election, many states considered and passed election reform legislation. Indeed, in response to problems identified by the 2000 election, around 370 counties replaced older voting technologies with optically scanned ballots or electronic voting machines in time for the 2002 election (Kimball 2003; see also Palazzolo 2005: 5-6). A few states, such as Georgia and Maryland, adopted uniform technology (touch-screen machines) for all counties

within their borders. In most other cases, however, individual counties made their own decisions to switch to new voting technology. While not all states mandated wholesale changes in equipment, federal legislation has most certainly paved the way for more changes.[1] The federal Help America Vote Act (HAVA) was designed to provide funding for the states to help purchase new equipment and compel states to pass reforms ranging from the use of provisional balloting to the adoption of statewide voter registration databases and voting equipment accessible to those with disabilities. HAVA also mandated the use of equipment with both auditability and the ability of the voter to check for errors before they actually cast a vote.[2] Thus, many states and jurisdictions made plans to replace "outmoded" punch card ballots, lever machines, and paper ballots and purchase more "modern" electronic touch-screen computerized equipment or optical scan voting equipment that allowed voters to check for errors at the polling place (precinct count optical scan). HAVA gives states a 2006 deadline if they want to use federal funds to help pay for new voting equipment.

HAVA also imposes several other new requirements on state and local election officials. For example, the law requires each state to develop a statewide centralized voter registration database and institute provisional voting procedures. Several states had implemented provisional voting in advance of HAVA, while many other states implemented provisional voting for the first time in the 2004 election cycle.

However, while some states had taken quick action, especially in the realm of voting equipment, for others, the reform effort was delayed somewhat by implementation issues at the

[1] For example, in election reform legislation passed in May of 2002 (prior to the passage of federal legislation), Missouri did not ban punch card equipment, but rather required that the Secretary of State certify "computerized" equipment. With the passage of federal legislation, Missouri has announced that it will participate in the federal voluntary program to replace the punch card equipment in the state, but even with federal assistance, the cost may make that extremely difficult, given Missouri's budget situation (see Kropf 2004; Mannies 2003).

[2] However, the act specifies that states can get around the necessity of second chance equipment by adopting voter education programs.

federal level. First, the Election Assistance Commission (EAC), the chief federal body charged with implementing HAVA faced a delay in the nomination and confirmation of commission members. The Commission was to be in place in February of 2003, but was not operating until nearly a year later.[3] Since the body was charged with distributing the grant funding portion of the HAVA appropriation (states had to meet various requirements such as publishing state plans for reform in order to obtain the funds), no grant funds could be distributed until the commission was in place.[4]

Second, President Bush's FY 2005 budget fell far short—around $600 million short—of the amount authorized for payments to states for their reform efforts.[5] But, it should be noted that the money authorized by HAVA for new voting equipment (roughly $4,000 per precinct) does not come close to meeting the actual cost of new voting technologies. The recent economic downturn also limited the ability of state and local governments to pay for new voting equipment. Thus, after an initial burst of state reform efforts after the 2000 election, from 2002 to 2004 there was a somewhat lessened appetite for election reform in many states (Palazzolo 2005).

Finally, another factor slowing down the implementation of new equipment dealt with the auditability of electronic machines. Currently, most electronic voting machines do not provide recountable individual records of voter choices, since there are no paper ballots. For some computer security experts, this raises a concern that certain software or other problems in vote tallying may not be correctable. Any system relying on computerized vote tallying, including electronic voting, optical scanning, and punch cards, is subject to both security concerns and the

[3] http://www.electionline.org/index.jsp?page=Newsletter%20May%2027%202004. (Accessed 30 December 2004).
[4] http://www.electionline.org/index.jsp?page=Newsletter%20Dec%2011%202003. (Accessed 30 December 2004).
[5] http://www.electionline.org/index.jsp?page=Newsletter%20May%2027%202004. (Accessed 30 December 30, 2004).

possibility of programming errors. However, voting systems with a paper record are at least auditable. Thus, some argue that electronic voting machines need to be modified to produce some type of paper ballot, but many argue that a paper record for electronic touch-screen machines would increase costs of this equipment, and possibly undermine access for those who are disabled.[6] In early and mid-2003, prominent computer scientists roundly criticized DRE voting machines because the coding on the machines is allegedly easy to tamper with (Kohno et al. 2003; see also http://www.verifiedvoting.org).[7] Following these critiques, Maryland, a state that had already agreed to purchase 11,000 touch-screen machines from Diebold Election System (a contract worth $55.6 million) put the contract on hold, asking for a review of the system's security.[8] Maryland eventually released the hold and bought the DREs.[9] However, other states such as Ohio delayed the implementation of new electronic voting machines because the state legislature demanded that each machine used in the state have a voter verified paper trail.[10] And some well-publicized snafus such as the one that occurred in North Carolina, where a Unilect DRE machine malfunctioned, permanently losing around 4,500 ballots, add fuel to the DRE fire.[11] Some cite these problems as evidence that DREs cannot be trusted. The result is that some state and local election officials have delayed investing in new voting equipment.

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[6] See for example League of Women Voters. 2003. "Direct Recording Electronic (DRE) Voting Machines and HAVA Implementation." Position paper available at http://www.civilrights.org/issues/voting/league%20position%20paper.pdf, June 12, 2003.

[7] For Diebold Election System's official response was the study was flawed. Their news release detailed that, "[i]n the study, a prior version of Diebold's touch screen software was analyzed while it was running on a device on which it was never intended to run, on an operating system for which it was not designed, and with minimal knowledge of the overall structures and processes in which the terminal software is embedded." See http://www.corporate-ir.net/ireye/ir_site.zhtml?ticker=DBD&script=410&layout=-6&item_id=442090, August 19, 2003.

[8] Schulte, Brigid, "Jolted Over Electronic Voting," *Washington Post*, 11 August 2003, sec. A.

[9] Zetter, Kim. "Maryland E-Voting Passes Muster." *Wired News*, September 25, 2003, http://www.wired.com/news/business/0,1367,60583,00.html.

[10] Currently, Nevada is the only state that uses electronic voting machines with a voter-verified paper trail.

[11] "More than 4500 North Carolina Votes Lost Because of Mistake in Voting Machine Capacity." http://www.usatoday.com/news/politicselections/vote2004/2004-11-04-votes-lost_x.htm. (Accessed 30 December 2004).

Election Reform Literature Review

Much research has focused on the effectiveness of different forms of voting equipment. The preponderance of the evidence indicates that punch card ballots perform worse than other types of equipment in terms of residual or unrecorded votes at the top of the ballot (Caltech/MIT 2001; Brady et al. 2001; Bullock and Hood 2002; Knack and Kropf 2003a; Kimball, Owens, and Keeney 2004; Alvarez, Sinclair, and Wilson 2004; Brady 2004).[12] Similarly, voting technologies with an error correction feature, or one that does not allow overvotes, have been found to reduce the level of residual ballots (Nichols and Strizek 1995; Nichols 1998; Caltech/MIT 2001; Kimball, Owens, and Keeney 2004; Knack and Kropf 2002, 2003; Bullock and Hood 2002; Tomz and Van Houweling 2003). Consistent with the academic literature, much of the reform efforts have focused on voting equipment and residual votes.

Other work has focused on equal protection issues, examining the distribution of equipment among the poor and minorities. While conventional wisdom following the 2000 election suggested that minorities and those living below the poverty line used "inferior" voting equipment, evidence indicated that in the 2000 election, African Americans and whites and those above and below the poverty line equally likely to use punch card ballots (Knack and Kropf 2003). Nonetheless, such equal protection concerns are being addressed in state-level legislation. Many states such as Georgia, Maryland, and Nevada adopted the use of electronic equipment

[12] Unrecorded votes are known by many names in the literature, including roll-off, residual votes, lost votes or voided votes. However, they are defined commonly by the difference between total turnout and the number of valid votes cast in a particular contest. Unrecorded votes occur as the result of undervotes (where voters intentionally or unintentionally record no selection) or overvotes (where voters select too many candidates, thus spoiling the ballot).

over the entire state. Other states such as South Carolina intend to purchase electronic equipment statewide in time for the 2006 elections.

There is a growing body of work tracking the pace of election reform, and not just in voting technology. In particular, organizations such as Electionline.org have been tracking the pace of reforms since the 2000 election (Election Reform Information Project, 2004a). Still others, such as Palazzolo and Ceaser (2005) have used a case study approach to explain the pace of reform within states, arguing that the pace of election reforms within a state are determined by the threat of a close election, the capacity of election law, a state's political culture, partisan control of the state legislature, and situational factors such as the creation of a commission to push for reform, the state's fiscal situation or the leadership of a particular policy entrepreneur or interest group (Palazzolo 2005: 7-13; see also Greco 2003).

We are interested in the pace of reforms, but the more important concern is the effects of the reforms, particularly unintended consequences that occur as a result of changes. In thinking about public policy changes, scholars usually speak in terms of policy outputs and policy outcomes. Policy outputs are most generally thought of as the actions actually taken in pursuit of a policy; for example, many states and localities have made changes to voting equipment. Outputs are usually fairly easy to quantify, but not necessarily indicative of policy impact. Outcomes, on the other hand, speak to the actual effects of the policy and include the effects that are both intended and unintended. While outputs are important, we are most interested in outcomes.

For example, by focusing heavily on voting equipment changes and not on other parts of the election administrative process, administrators may not do enough to ensure that voting equipment transparently communicates the will of the electorate. As an example, by changing to

optical scan ballots but failing to factor in ballot formatting and usability issues, election administrators may not prevent certain voting errors (Kimball and Kropf 2004; Niemi and Herrnson 2003). Furthermore, since HAVA strongly encourages states to replace older voting equipment but does not provide funding to cover the entire cost of new equipment, state and local election authorities are exploring ways to minimize the cost of new voting equipment. One option that several jurisdictions have chosen or are considering is to consolidate polling places or reduce the number of voting booths. However, one recent study indicates that reducing the number of polling places may cause lower voter turnout (Brady and McNulty 2004). Consolidation also means greater distances between polling places, which may also reduce turnout (Gimpel and Schuknecht 2003; Haspel and Knotts 2005). In general, fewer pieces of voting equipment and the accompanying longer time it takes to vote may also reduce voter turnout (Kropf and Knack 2004a, 2004b). We are aware of very little work that has explored the unintended consequences of election reforms.

This paper is a part of a continuing effort to assess the impact of implementation of election reforms. However, before assessing unintended consequences, we must first assess intended consequence and what effects changes that have been implemented have caused on the election system. In the present paper, we focus in particular on how many counties have changed their voting equipment at this point, which jurisdictions still use inferior voting equipment and whether certain kinds of equipment continue to be related to residual votes. We leave to future work more analysis of outcomes including that of provisional ballots from the 2004 election and registration database changes that HAVA will require states to fulfill.

Data

Since elections are administered at the county level in all but six states, the data collection includes the number of ballots cast, vote totals for the Presidency, voting technology, and demographic characteristics for each American county in the 2000, 2002 and 2004 general elections. In states where elections are administered by municipalities or townships, we aggregate the vote totals and voting technology data to the county level. In four states (Illinois, Missouri, Maryland, and Virginia), some cities have separate election administration authorities. These cities are treated as separate "counties" in this dataset.[13] Adding the District of Columbia as another "county" produces a total of 3148 geographic units that cover the entire country.

Outputs: The Intended Effects of HAVA

Part of the data collection includes the voting technology used in each county, gathered from state and local election officials. Table 1 provides a short description of each type of voting technology and summary data on the prevalence of each voting method in the 2000, 2002 and 2004 elections. Generally, five different methods of voting are used in the United States: paper ballots, lever machines, punch card machines, optical scan ballots, and direct recording electronic (DRE) machines.[14] Within each of these general categories, further distinctions can be made. Punch card methods are divided between Votomatic varieties (in which the punch card is separate from the booklet listing the offices and issues up for election) and the Datavote system (in which offices and candidates are printed directly on the punch card). Optical scan systems and electronic machines are currently the newest voting technologies. Optical scan systems vary

[13] The state government administers elections in Alaska. Alaska's boroughs are treated as counties for this analysis.
[14] One can find a detailed description of each type of voting equipment in a variety of sources (Fischer 2001; Caltech/MIT Voting Technology Project 2001; Brady et al. 2001).

depending on where ballots are counted: at a central location (like the county courthouse) or at the voting precinct. One advantage of the precinct-count optical scan systems is that they give voters a chance to discover and correct potential mistakes (overvotes and undervotes). The central-count systems do not have such an error-correction feature.[15] DRE machines can be divided into older and newer varieties. Older DREs (such as the Shouptronic 1242, which was designed to mimic lever machines) present the entire full-faced ballot at once and typically use a push-button interface (Caltech/MIT Voting Project 2001). The newer generation of DREs (such as the E-Slate and Accuvote-TS machines) typically use a touch-screen interface and allow voters to scroll through the offices and issues on the ballot (as in Votomatic punch card ballots).[16]

[15] Some counties have precinct-count optical scan balloting but do not activate the error correction feature when scanning the ballots. These counties are coded as central-count systems.

[16] In some counties, particularly in the Northeastern part of the country, not all ballots are cast using the same technology. In those cases, we code the voting technology as the equipment used by at least 75% of the voters. If no single method was used by at least 75% of the voters, the county's voting technology is coded as a "mixed" system. Most of the counties with mixed systems are in states where elections are administered by municipalities or townships.

Table 1
Voting Methods Used in the United States

Technology	Description	Counties using equipment in: 2000	2002	2004
Punch Card – Votomatic	Punch card is inserted behind booklet with ballot choices – voter uses stylus to punch out holes in card. Ballots counted by card reader machine.	513	436	317
Punch Card – Datavote	Ballot choices are printed on punch card – voter punches out hole next to chosen candidate. Ballots counted by card reader.	44	26	13
Lever Machine	Candidates listed by levers on a machine – voter pulls down the lever next to chosen candidate. Machine records and counts votes.	406	292	241
Paper Ballot	Candidates are listed on a sheet of paper – voter marks box next to chosen candidate. Ballots counted by hand.	331	297	288
Older DRE (full-face)	Candidates listed on a full-face computerized screen – voter pushes button next to chosen candidate. Machine records and counts votes.	300	321	313
Newer DRE (touch-screen)	Candidates listed on a scrolling computer screen – voter touches screen next to chosen candidate. Machine records and counts votes.	29	224	356
Optical Scan – Central Count	Voter darkens an oval or arrow next to chosen candidate on paper ballot. Ballots counted by computer scanner at a central location.	897	832	782
Optical Scan – Precinct Count	Voter darkens an oval or arrow next to chosen candidate on paper ballot. Ballots scanned at the precinct, allowing voter to find and fix errors.	545	620	753
Mixed	More than one voting method used.	83	100	85

One of the goals of HAVA is to replace punch card balloting and lever voting machines. As of the 2004 general election, that goal has only been partially met: There are still over 570 counties using either punch cards or lever machines. Nevertheless, Table 1 indicates a movement away from punch cards and lever machines and towards touch-screen DREs and precinct count optical scan equipment over the last four years. Over the same period, there has been little growth in use of the less effective central-count optical scan systems and full-face electronic voting machines. Approximately 367 counties upgraded voting equipment between

2000 and 2002, while 321 counties upgraded between 2002 and 2004. There were only 10 counties that switched during both periods (most adopted a mixed system in 2002 and then a full-blown DRE or optical scan in 2004). Since there was more activity between 2000 and 2002 than between 2002 and 2004, it appears that the immediate aftermath of the Florida recount controversy in 2000 spurred more equipment changes than passage of HAVA did in 2002. Clearly many states and counties are still poised to upgrade voting equipment before the 2006 deadline imposed by HAVA.

Outcomes: Who Uses Inferior Voting Technology?

Previous analyses indicated that the poor and minorities are no more likely than wealthy and white individuals to vote on inferior voting equipment, particularly punch card ballots (Knack and Kropf 2002). The question remains whether the same remains true in 2004. While most counties will be using more modern technology by 2006, we wonder about the distribution of equipment as counties move toward that goal.[17]

In order to understand who uses inferior voting technology, we conduct multivariate analyses to determine whether demographic characteristics are associated with the type of voting equipment used in different counties. The first model in Table 2 examines whether a county used inferior technology in 2004 (punch card balloting or lever machines), and the second model

[17] It should be noted that this analysis is slightly different than that discussed in Knack and Kropf 2002. First, inferior voting equipment in Knack and Kropf is operationalized as punch card equipment, since punch card equipment was cited as a major problem in the 2000 election. However, HAVA defines lever machines as inferior technology, so we include it here as inferior. It should be noted that in the 2002 analysis, African Americans were more likely to use lever machines, but less likely to use punch card machines. Second, the Knack and Kropf article included separate regressions for each type of technology, but did not separate touch-screen and full-face DRE technology. Subsequent research indicates that touch-screen DREs perform better in terms of residual vote rate than do full-face DRE machines (Kimball 2003). In the Knack/Kropf analysis, counties with more African Americans were neither more nor less likely to use electronic machines of either type.

examines whether a county used superior equipment in 2004, precinct count optical scan or touch-screen DRE's, which have the lowest residual vote rates (see Kimball 2003).

Table 2 indicates that demographic variables including race, income, education, and population do not predict voting equipment use very well. the model fit is very low and most independent variables have statistically insignificant coefficients. This is not a surprise given the decentralized nature of election administration in the United States. Even after passage of HAVA, few states have imposed uniform voting technology on all counties within their border. For the most part, voting equipment decisions are still made at the local (county) level, and are most influenced by local budgets and the preferences of local election officials. As a result, the transition away from punch cards and lever machines did not seem to disenfranchise any particular group. However, to the extent that demographics do predict voting equipment selection, counties with more white individuals are actually more likely to use inferior equipment and less likely to use superior equipment than counties with larger percentages of minority residents. If anything, in 2004 minority voters were more likely to vote on superior equipment than white voters.

The one interesting result in Table 2 is that Democrats (based on voting patterns in 2000) were more likely to vote on inferior equipment than Republicans in 2004. On closer inspection, there are some simple non-conspiratorial explanations for this finding. This result is driven by the location of lever machines, which are still used mainly in the upper Midwest and Northeast, regions where Democrats enjoy stronger than average support. The Democratic share of the vote is unrelated to whether counties used punch card balloting in 2004. In addition, several large cities such as New York, Chicago, St. Louis and Pittsburgh have not yet switched to modern equipment, and such urban areas are more likely to vote Democratic. Assuming these cities adopt

new voting equipment by 2006, as expected, then the association between partisanship and voting technology should be insignificant.

Table 2

Multivariate Analysis of Use of Voting Equipment in 2004

Independent Variable	Uses Inferior Equipment	Uses Superior Equipment
Percent White	.029***	-.018**
	(.008)	(.007)
Percent 65 or older	.006	.044
	(.030)	(.029)
Percent with a college degree	-.023	.020
	(.021)	(.016)
Median household income (natural log)	.15	1.04
	(.74)	(.65)
Population in 2000 (natural log)	.092	.075
	(.113)	(.026)
Percent of votes for Gore in 2000	.047***	-.031**
	(.012)	(.010)
Constant	-8.09	-10.16*
	(7.21)	(6.16)
Number of Cases	3148	3148
Model Chi-Square	150.6***	23.6***
Pseudo R^2	.04	.04

The dependent variable is a dummy variable indicating the type of voting equipment used in 2004. Cell entries are logit coefficients with robust Huber/White standard errors in parentheses. Each county is weighted by the number of votes cast for president in the 2000 general election.

***$p < .01$, two-tailed test
**$p < .05$, two-tailed test
*$p < .1$, two tailed *t* test

Outcomes: Does Voting Equipment Reduce Residual Votes?

Journalists are already analyzing the effect of changes on the level of residual votes in the 2004 election as compared to the 2000 election. For example, Scripps Howard News Service analyzed the level of residual votes and found that "[t]he nation's $2.2 billion investment in

voting equipment machines and other election reforms reduced the number of ballots that failed to count in last month's presidential election (Hargrove 2004). The report provided an analysis of residual votes in the states for which data were available; for example showing that Florida had a reduction in residual votes of a about 150,000. The analysis showed that Nevada had the lowest level of residual ballots, followed by Georgia who had the highest level in 2000 and Florida (Hargrove 2004).

Rather than analyze the overall level of residual votes and the statewide changes in the 2004 Presidential election, we analyze the impact of new technology by examining county-level rates of residual votes. To measure the number of unrecorded votes for President in each county, we calculate the difference between the total number of ballots cast and the number of votes cast for Presidential candidates. In most cases, election results were collected from the official canvass provided by each state. However, some states do not maintain data on ballots cast for every county. For several states, we are contacting individual counties to gather data on the total number of ballots cast. Even so, there are some missing observations, as some counties did not have reliable information on the number of ballots cast in recent elections and some states had not yet completed their official canvasses as of this writing.

Thus, we currently have residual vote data for the 2004 presidential election from 36 states. While there is still more data to gather, we can compare 2025 counties on residual vote rates for the 2000 and 2004 presidential elections. The first thing to point out is that residual votes dropped significantly from 2000 to 2004. This set of counties produced 1,414,303 residual votes for president in 2000 and 979,241 residual votes for president in 2004. This represents a drop of over 400,000 residual votes between the two elections. Since there were significantly more people voting in 2004, the percentage of residual votes for president in this set of counties

dropped from 1.8% in 2000 to 1.1% in 2004. The standard deviation in residual vote rates also dropped from 1.6% in 2000 to 0.9% in 2004, another good sign indicating that residual vote rates were more similar across counties in 2004.

Among these counties, residual vote rates follow somewhat familiar patterns by voting technology. The highest rates of residual votes in the 2004 presidential election appeared with punch cards (1.8%), paper ballots (2.0%), and central-count optical scan systems (1.5%). The lowest rates of residual votes appeared on precinct-count optical scan ballots (0.8%), touch-screen DREs (0.8%), and lever machines (1.0%). Based on the data we have so far, full-face DREs (1.2% residual vote rate) did not perform much worse than touch-screen DREs.

We also note that among these counties, 594 switched to new voting equipment before the 2004 election while the other 1431 used the same equipment in both elections. The counties that switched generally used one of the inferior methods in 2000. The data shown in Table 3 give some sense of the motivation for the switch and the outcome. Before upgrading their equipment, the counties that switched had a significantly higher rate of residual votes in 2000. However, after switching to new voting equipment, the residual vote rate in those counties was comparable to the other counties (even slightly lower) in 2004. The drop in residual vote rates between 2000 and 2004 is much more dramatic for the counties that switched to new equipment, which suggests that the new voting equipment succeeded in reducing the frequency of residual votes.

Table 3: How Changing Voting Equipment Affects the Rate of Residual Votes

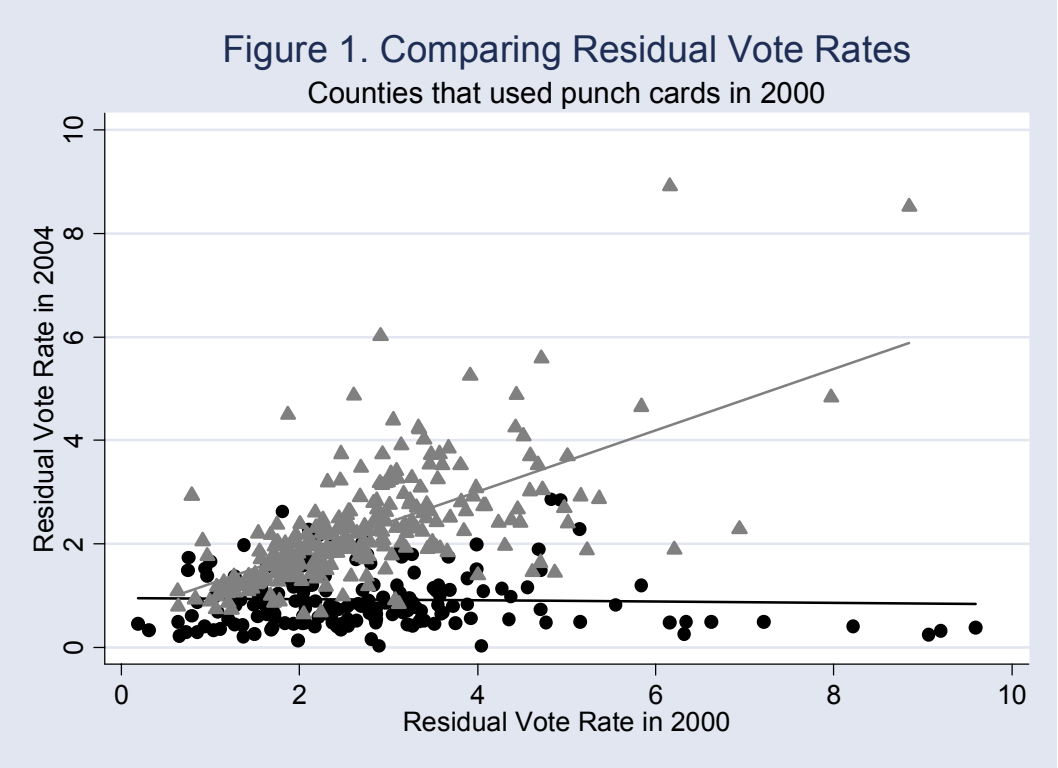
	Residual Votes in 2000	**Residual Votes in 2004**
Counties That Changed Equipment (n=579)	2.4%	1.0%
Counties that Did Not Change (n=1446)	1.5%	1.1%

To take a closer look at the impact of new voting equipment we examine 455 counties that used punch card ballots in 2000. Among these counties, 193 switched to new voting equipment before 2004 while 262 counties continued using punch cards in 2004. The counties that replaced punch cards after 2000 had a higher residual vote rate in 2000 (2.1% for the counties that continued using punch cards in 2004, and 2.7% for counties that upgraded their voting equipment after 2000). Comparing residual vote rates in the two elections for these two groups of counties provides another way to assess the impact of changing voting technology (see Figure 1).[18]

In Figure 1, the grey triangles indicate the counties that used punch card ballots in 2000 and 2004, while the black circles indicate the counties that used punch cards in 2000 but switched to new technology in 2004. The grey line in Figure 1 is the OLS regression line for the former group of counties; the regression line for the latter group is in black. The graph shows that on average residual vote rates dropped dramatically in the counties that abandoned punch card voting in 2004, regardless of how high those rates were in 2000. By comparison, counties that continued using punch cards had higher residual vote rates in 2004, and the frequency of residual votes in 2004 was related to the rates seen in 2000. The counties that replaced punch cards saw residual vote rates drop to 1.1% in 2004. Counties that continued using punch cards saw a smaller reduction in residual vote rates to 1.7% in 2004.

[18] A similar method is used by Brady (2004).

In later work, we will include an analysis of the demographic factors identified in a long line of residual vote analyses to affect the rate of residual votes, controlling for voting equipment. We expect to see that with new voting equipment, demographic factors matter less, indicating that changes in voting equipment have meant changes in equal protection of voters across both counties within states and across states.



What is Left to Analyze? Provisional Voting and Voter Registration Databases

There are other reform outcomes that must also be analyzed in the wake of the 2004 election. First, we are interested in the output side of provisional ballots: we will document the number of provisional ballots cast in each county and the number counted in each county. Second, we are concerned with the outcome—what are the consequences of the way provisional voting is implemented? In particular, we are concerned that the vast differences in how provisional ballots are counted among states may be due to racial inequalities (Election Reform Information Project 2004b). We will continue to analyze the effects of registration databases on the voting process as well, but since most are incomplete at this point, it is too early to analyze them.

Discussion

In this paper, we examine three aspects of election reform progress in the United States. First, which how many counties have changed equipment; second, what is the distribution of voting equipment across demographic groups in this country; and finally, how have residual votes changed over time with these reforms?

Despite delays in federal implementation of the Help America Vote Act, we find in general that states and counties are making progress toward reforms in terms of voting equipment changes. Progress did slow somewhat between 2002 and 2004, but that is not surprising, given the budget situation in many states, and that the deadline for federally-funded changes is not until 2006. Approximately 370 counties changed their equipment between 2000 and 2002, where only about 321 changes their equipment from 2002 to 2004. In terms of reform outcomes, these changes do not appear to benefit one demographic group over another overly

much, though whites are slightly more likely to use inferior technology (levers and punchcards). Finally, we do see an overall fall in the residual vote rate in the counties which have changed their equipment. While this is our initial analysis based on incomplete data, we do not expect these results to change significantly.

This work is part of a larger project analyzing the overall intended and unintended outcomes of election reform. We show that the intended outcomes of equipment changes have begun to be realized in terms of a drop in the residual vote rate, but the Help American Vote Act was about more than residual votes. Changes requiring provisional ballots and statewide database changes both have the potential to disenfranchise and franchise voters; the outcome of these reforms must be further analyzed. Overall, changes in voting equipment, and problems the federal government has had in implementing those changes may also have the effect of reducing voter turnout, but that too, remains to be further analyzed. For now, we acknowledge that a major goal of election reform is and should be ensuring that the will of the electorate is transparently communicated. Whether election reform does so, or has unintended consequences in reducing voter turnout remains to be seen.

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