Voided Ballot in the 1996 Presidential Election: A County-Level Analysis

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Abstract

This county-level study examines factors associated with the rate of voided presidential ballots in the 1996 elections. Evidence indicates that voided ballots are significantly more prevalent in counties with higher percentages of African Americans and Hispanics. The relationship between voided ballots and African Americans disappears, however, in counties using voting equipment that can be programmed to eliminate overvoting. The rate of voided ballots is lower in larger counties, and in counties with a higher percentage of high school graduates. The rate of voided ballots declines as the number of presidential candidates on the ballot increases, but only up to a point, and then rises with further increases. Lever machines generate the lowest rates of voided ballots among types of voting equipment, with punch card systems generating the highest rates.

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Introduction

In the wake of the 2000 presidential election, Americans learned that the type of voting technology used can influence whether or not one's vote is recorded as intended. Punch card equipment in particular was widely blamed for producing large numbers of "undervotes" (where no selection was indicated) and "overvotes" (where voters marked more than the permissible number of choices), as well as mistaken votes accidentally cast for the wrong candidate. Some elections officials and voting technology experts have long favored banning punch card equipment (Shocket et al., 1992; Saltman 1988: 100-111), and lawmakers, backed by popular opinion,[1] have taken steps to reform the machinery of elections. Florida and other states have prohibited the use of punch cards in future elections, and as of this writing both houses of the U.S. Congress have passed legislation to subsidize replacement of punch card equipment, train poll workers, improve the accuracy of registration lists, and enhance accessibility to polling places for persons with disabilities. Reforms are based generally on two premises: (1) replacing punch cards with more modern technology (namely electronic or optical scanning systems) will reduce the number of invalidated ballots relative to punch cards, and (2) non-uniform equipment across jurisdictions within a state could be construed as a violation of equal protection.

Research on voting and elections in recent years has largely ignored the issue of voting technology, despite a sizeable earlier literature on the impact of voting equipment and ballot configuration on "roll-off" and split-ticket voting. Theory on the incidence of roll-off follows several approaches. First, some scholars argue roll-off is intentional for reasons such as fatigue, lack of a desirable choice or low information (e.g. Wattenberg et al., 2000; Burnham 1965; Bullock and Dunn 1996; Vanderleeuw and Utter 1993; Engstrom and Caridas 1991). Second, other researchers stress accidental roll-off, due to faulty equipment or ballot design (e.g. Darcy and Schneider 1989; Mather 1964; Thomas 1968; Walker 1966; Rusk 1970; Stiefbold 1965; Shocket et al. 1992; Nichols and Strizek 1995; Caltech/MIT 2001a). Third, some scholars have examined roll-off from the standpoint of equal representation, analyzing the relationship between roll-off and variables such as ethnicity, age, or urban-rural differences (Price 1957; Darcy and Schneider 1989; Nichols and Strizek 1995). Some of these studies investigate the interaction of ballot design with demographic factors such as race. For example, Darcy and Schneider (1989) found that more complicated ballot design increased roll-off in lower–placed contests, and that this effect was stronger in precincts with more African Americans and older persons. Other studies have found that racial gaps in roll-off shrink where more African American candidates are listed on the ballot (Vanderleeuw and Utter 1993; Engstrom and Caridas 1991).

We implement all of these three basic approaches in analyzing rates of voided presidential ballots at the county level on the 1996 election. First, we consider sources of voter error, including voting technology. Second, we analyze variables representing voluntary decisions to skip the presidential contest on the ballot. Third, we examine whether rates of voided ballots tend to be higher in counties with more minorities and poor persons. We find that rates of voided ballots are higher in counties with punch card technology, smaller populations, and fewer high school graduates. Voided ballots are less frequent where more presidential candidates are listed on the ballot, but only up to a point, beyond which the decline in deliberate undervoting from more choices appears to be outweighed by more overvotes from crowded and confusing ballots. Counties with more minorities have higher rates of voided ballots. However, the link between African American population share and voided ballots disappears in counties using types of voting technology that can be programmed to prevent overvoting.

Data and Methodology

In most states, decisions about which type of voting equipment is used are made at the county level. Voting equipment data are collected after each general election by Election Data Services (EDS). Each county is classified as using one of the six basic types of equipment in use: punch cards, Datavote (a variation on punch card, with a more powerful punching device and without "chad"), hand counted paper ballots, optically scanned ballots, lever machines, and direct recording electronic (DRE). Counties in which voting equipment varies across municipalities make up a seventh category of "mixed" systems.

This analysis uses data from the 1996 presidential election for two major reasons. First, we seek to determine whether some of the patterns widely noted for the 2000 election (more voided ballots in counties with punch cards, and with high poor and minority populations) generalize to other elections. Second, using 1996 data substantially reduces the number of voters for whom equipment type is miscoded. The number of voters who did not vote at the polls on election day increased from about 10% in 1996 to 14% in 2000.[2] Most of these early and absentee voters do not vote using the same technology as election-day voters residing in the same county, and the available data indicates only the technology used by election-day voters.

Election Data Services also surveys states and counties to obtain data on the total number of ballots cast (i.e. the total number of voters who came to the polls) and the number of valid votes cast in the presidential contest. From these data, the rate of voided ballots is calculated as the percentage of all voters for whom no valid vote in the presidential contest was recorded.[3]

For some states, neither the state nor counties provided data to EDS on the total number of ballots cast, but only on the number of valid votes cast in particular contests.[4] For other states, the data are not available from the state, but only at the county or election board level.[5] For several states (Maryland, North Carolina, Virginia and Tennessee) we contacted the state election boards directly and were able to obtain data on the total number of ballots cast.[6]

For 46 counties, the number of presidential votes reported exceeds the total number of voters. We deleted these counties from all tests, leaving 2,244 counties with data on voided ballots. In most tests, we also excluded four counties with a rate of 0% and 31 others with rates exceeding 10%, many or most of which likely reflect clerical mistakes or other inaccuracies.[7]

We merged the EDS voting equipment and elections returns files for 1996 with demographic data from the U.S. Census Bureau's *USA Counties 1998*.[8] The roughly 800 counties missing from our tests on average have slightly smaller populations, with somewhat fewer minorities and poor persons than counties in our sample. However, the sample spans the full range of these variables, so it is unlikely that our results are not of general applicability. Generalizability is certainly less of an issue for this study than for others using data for only one or two states (e.g. Tomz and Van Houweling 2001; Herron and Sekhon 2001).

Hypotheses

Independent variables in the analysis fall into one (or more) of three categories, representing the various theoretical approaches in the literature on roll-off: (1) sources of accidental undervoting or overvoting; (2) factors associated with deliberate undervoting; and (3) ethnicity and poverty measures, allowing examination of equal representation issues.

Sources of Accidental Voided Ballots

Based on earlier expert assessments (Saltman 1988) and recent experience, the obvious expectation is that punch cards produce more voided ballots than alternative technologies. We therefore designate it as the residual category in our regressions, and include dummy variables for the other six types, to determine whether or not they differ significantly from punch cards.

Transition from one voting technology to another may also increase voter error. Particularly where little training and education occurs, counties in which voters and election workers are using equipment for the first time may have high rates of invalidated ballots. To test this possibility, we construct a dummy variable that indicates which counties switched from one of the seven categories of equipment type to another between 1994 and 1996.

Many of the problems in Florida in the 2000 election were blamed on the unexpectedly high voter turnout rate. Where turnout increases substantially from one election to the next, the share of voters inexperienced with voting equipment is likely to be higher, poll workers may be overwhelmed, and any voters confused by the voting process may find it more difficult to obtain needed assistance. We operationalize unexpectedly high turnout as the change in the counties' turnout rates (as a share of the voting age population) from the 1992 to the 1996 election.

In many states, voters can vote a straight-party ticket simply by pulling one lever or punching one hole, making complex ballots more manageable (for partisan voters, at least). If so, a dummy for counties located in straight-party vote states should have a negative coefficient.

Sources of Intentional Undervoting

Where few other salient contests appear on the ballot, voluntary undervoting in the presidential race is likely to be very low, as most persons taking the time to vote in those circumstances are presumably drawn to the polls by the contest at the top of the ballot. Therefore, voided presidential ballots may be less frequent in counties located in states with no Senate or gubernatorial contest on the ballot.

Less deliberate undervoting may also occur in Nevada, the only state in which "none of the above" is listed on the presidential ballot. In 1996, 1.2% of voters marked this alternative (declining to 0.5% in 2000). This choice counts as a valid vote, while deliberately skipping the presidential contest in other states results in a voided ballot. We therefore include a dummy variable representing Nevada in our analysis (Kimball et al. 2001).

States also differ with respect to the number of presidential candidates listed on the ballot. In 1996, 13 candidates were listed in Colorado, but only 4 were listed in several states (AZ, FL, GA, IN, and WV). Where there are more candidates, voters have more choices, and there may be fewer “alienated” voters who abstain due to inability to find a presidential candidate close to them on the issues. Deliberate undervoting therefore may be lower where more candidates are on the ballot. Beyond some point, however, the marginal effect on deliberate undervoting of additional candidates on the ballot is likely to fall, and voter error may increase, as ballots must list candidates in multiple columns (as in Palm Beach County, FL in 2000) or on multiple pages (as in Duval County, FL).[9] These two effects taken together imply a curvilinear relationship: more candidates will reduce voided ballots by reducing deliberate undervotes, but beyond some point will increase voided ballots by necessitating a more complex ballot layout.

Several other variables also represent a mix of deliberate undervoting and potential for voter error. Residents new to a jurisdiction may care relatively little about state and local contests (Nichols and Strizek 1995),[10] and those who show up at the polls are unlikely to skip deliberately the presidential contest on the ballot. However, new residents are likely to be inexperienced with the voting equipment in their new jurisdictions, given the diversity of voting technology across states and counties. This unfamiliarity may generate more errors. The net impact of residential stability on voided ballots is therefore ambiguous, as deliberate undervoting may be lower, but accidental undervoting or overvoting may be more frequent. The best available county-level measure of residential stability is the percentage of the county's population (age 5 or greater) who have lived in the county for at least five years, with Census data from 1990.[11]

Age and education can also affect the rate of voided ballots through mistakes or through deliberate undervoting. Exit polling data indicate that older voters are somewhat more likely to skip deliberately the presidential contest (Knack and Kropf 2001). Reports from Florida in the 2000 election suggested that elderly voters were particularly likely to make mistakes when confronted with complicated ballots or voting machinery because of reduced manual dexterity or vision problems (also see Shocket et al. 1992: 535). If older voters are more intimidated than younger voters by computers, they might make more mistakes with DRE machines as well.[12] On the other hand, inexperience in voting may lead young voters to make more mistakes. We include two age variables: the percentage of the voting-age population under 25, and the percentage 65 and over.

Low levels of education may increase mistakes, due to limited literacy, poorer reading comprehension, and less experience in following directions to perform administrative tasks. Exit polling data also indicate that deliberate undervoting declines as education rises (Knack and Kropf 2001). Educational quality should affect mistakes and deliberate undervoting in the same way as educational level, but county-level measures of quality are not available, so educational differences are likely measured with some error. Our education variable is the percentage of county residents over 25 years of age who have completed high school, with data from 1990.[13]

County size can influence deliberate undervoting or the frequency of mistakes in several ways. Counties with smaller populations tend to have fewer layers of government and elective offices, and hence shorter ballots. With fewer voters drawn to the polls solely to vote in local contests, deliberate undervoting in the presidential contest may be lower. On the other hand, in small counties more people may know candidates personally, and turn out to vote for them even if they have no interest in the presidential contest, increasing the rate of voided ballots.[14] The tendency for larger counties to have longer ballots can lead to more complex and confusing ballot designs, contributing to greater voter error (as with the "butterfly ballot" in Palm Beach County). There may also be economies of scale in election administration, however, that could have the opposite effect on voter error. For example, the cost per voter (or per poll worker) of voter education efforts, or poll worker training programs, might be lower in larger counties. Election officials in larger counties are more likely to have a travel budget allowing them to attend conferences and meet colleagues from other counties, learning from their experiences about which ballot designs and models of voting equipment have caused problems. On balance, we cannot predict whether larger county size will be associated with higher or lower rates of invalidated presidential ballots. County size is measured by the natural log of population.[15]

Equal Protection Issues

Precinct-level analyses of counties in Florida and elsewhere indicate that the incidence of voided ballots in the 2000 election was substantially higher where there are larger numbers of African Americans and poor persons.[16] However, two of the simple explanations, offered from either end of the political spectrum, prove incorrect. First, a popular belief emerging from the 2000 election was that minorities and poor people were more likely than other voters to live in areas using punch card voting equipment. However, voting equipment is uniform across precincts within counties in Florida (as in most other states), and across the country, punch card counties tend to have below-average percentages of African Americans and poor persons (Knack and Kropf 2002; GAO 2001). Second, the gaps are largely unexplained by differences in deliberate undervoting: exit polling data indicate that these differences between the poor and non-poor, and between ethnic groups, are relatively small (Knack and Kropf 2001).

There are numerous alternative possible explanations, and we are certainly not claiming that ethnicity or poverty causes ballots to be voided. There has been much speculation that educational levels and quality, and experience with voting and other administrative tasks, may be the source of higher rates of voided ballots in heavily poor and minority areas (e.g., Tomz and Van Houweling 2001). The allegation that punch card technology is discriminatory because it produces more voided ballots in areas with more poor and African American voters has a long history (Hoffman 1987: 70; FEC 1982: 21). Higher rates of voided ballots in jurisdictions with more Hispanics may be partly due to an absence of poll workers that are proficient in Spanish or voting instructions displayed only in English.[17] Our data are unable to distinguish well among these and other possible causes of these gaps--most notably, educational attainment does not fully capture differences in educational quality--so we must remain agnostic about their sources. We simply seek to determine whether gaps associated with poverty or ethnicity remain after controlling, to the best of our ability, for differences in voting equipment, education levels, and other factors linked to the prevalence of voided ballots.

We estimate these gaps for the 1996 election using two measures of ethnicity: the percentage of a county's population that is African American, and the percentage that is Hispanic, with data for 1996. Poverty is measured as the percentage of the county population below the poverty line, measured for 1993.

Results

Regression results for all counties are presented in Table 1, while Table 2 shows results separately for counties using each type of voting equipment. In Table 1, equation 2 differs from equation 1 only in deleting 35 counties with extreme rates of voided ballots. Results for most variables differ very little. An exception is the coefficient on turnout change, which drops by two thirds and is significant at only the .10 level. The explanatory power of equation 2 is substantially higher (R^2 of .31, compared to .23 in equation 1), consistent with the view that in most cases the extreme rates of voided ballots reflect clerical errors. Results described below therefore focus on regressions in which the 35 extreme cases are deleted.

Equation 2 shows that the rate of voided ballots is significantly lower in counties using hand-counted paper ballots, lever machines, optical scanning, and mixed-systems than in punch card counties (the reference category). Lever machines appear to perform the best, with a rate of voided ballots 1.2 percentage points lower than for punch card counties.

Surprisingly, increased turnout between 1992 and 1996 is associated with lower, rather than higher, rates of voided ballots.[18] We have no good explanation to offer for this counterintuitive finding, but it is possible that some omitted variable associated with increased political interest simultaneously causes both turnout to rise and deliberate undervoting to fall.

Other variables reflecting voter error were never significant in our tests and are excluded, for space reasons, from regressions reported in tables. These include the straight party vote dummy[19] and the dummy variable for recent changes in voting technology.

Neither Senate nor gubernatorial contests on the ballot significantly affect the rate of voided ballots. As expected, this rate is lower in Nevada's counties, by 1.3 percentage points.

The number of presidential candidates on the ballot has the hypothesized curvilinear relationship with voided ballots. Larger numbers of candidates are associated with fewer voided ballots, but only until there are about 8 on the ballot, beyond which voided ballots increase.[20]

The residential stability coefficient is not significant. Any increase in deliberate undervoting associated with long-term residence (and enhanced interest in local contests) may be roughly offset by fewer mistakes associated with greater familiarity with voting procedures.

Both age coefficients are positive and of similar magnitudes, but only the under-25 variable is significant. Higher education is associated with significantly fewer voided ballots. Each 10-percentage point increase in high school graduates reduces voided ballots by three-tenths of a percentage point.

Larger population size is strongly associated with lower rates of voided ballots. The data of course do not allow us to identify whether this result reflects economies of scale in election administration, fewer close personal ties to local candidates for office, or some other cause.

Percent African American and percent Hispanic are each associated with significantly higher rates of voided ballots. Each 10 percentage-point rise in the share of either minority is associated with an increase of roughly one-fourth of a percentage point in the rate of voided ballots. These are sizeable effects, given that the mean rate of voided ballots is 2.5%. The share of poor persons is not significantly related to the frequency of voided ballots.

Equation 3 differs from equation 2 by adding state dummy variables. These state dummies effectively control for any factors influencing voided ballots that vary by state, such as election administration procedures or methods of recording county-level turnout and presidential vote totals (see Tomz and Van Houweling 2001). The drawback of adding state dummies is that it requires dropping any variables that do not vary across counties within states, including the presence of Senate and gubernatorial contests and the number of presidential candidates on the ballot. Thus, our ability to explain variations in voided ballots substantively, as opposed to statistically, is weakened. Inclusion of the state dummies increases R^2 from .30 in equation 2 to .42 in equation 3, indicating that omitted state-level determinants of roll-off are of modest importance. Several coefficients not significant in equation 2 gain significance in equation 3, including the DataVote dummy, the share of older voters, and the share of poor persons. The mixed-systems dummy and change in turnout are no longer significant. Coefficients on percent African American and Hispanic decline but remain highly significant.

Table 2 uses a specification similar to that of equation 3 in Table 1, but with counties sorted by equipment type. For example, equation 1 of Table 2 analyzes the determinants of voided ballots among only those counties using punch cards. Because equipment type does not vary across counties in these tests, the equipment dummies from Table 1 are dropped.

The most notable finding in Table 2 is the varying relationship between the African-American percentage and voided ballots. In counties using punch cards (equation 1), optical scan without precinct counting (equation 2), and mixed systems (equation 3), there is a significant~~trong~~ positive relationship. However, this relationship disappears in counties where voting equipment can be programmed to prevent overvoting, namely counties using lever machines (equation 4), DRE equipment (equation 5), or precinct-based optical scanning systems that allow voters a "second chance" to correct invalid overvotes (equation 6).[21] These results are consistent with evidence from analyses of individual states in the 2000 election which indicate that these same three voting mechanisms produce lower gaps in the rate of voided ballots between heavily-black and mostly-white precincts than do punch cards or central-count optical scan (e.g. Tomz and Van Houweling 2001; U.S. Commission on Civil Rights 2001). Those analyses were based only on a few southern states, but our results show this pattern holds for the nation as a whole.

The ~~re is no similar~~ relationship between ~~pattern for~~ percent Hispanic and voided ballots across types of voting equipment differs from that for percent African American. Percent Hispanic is unrelated to voided ballot rates in punch card counties. However, it is inversely related to voided ballot rates in precinct-count opti-scan counties. Voided ballots in heavily-Hispanic areas may be driven in large part by language barriers, which likely do not differ much by type of voting equipment. Lever machines are associated with large gaps between Hispanics and other groups in equation 1 of Table 2. However, much of this difference is attributable to the fact that 49% of Hispanics (but only 28% of blacks and 11% of whites) living in lever machine counties reside in New York City, where "sensor latches" intended to prevent accidental undervoting have been disabled, producing far higher rates of voided ballots than in other lever machine jurisdictions. [22] Deleting the five New York City counties from equation 1, the Hispanic coefficient drops to 3.22 and is significant only at the .10 level.

The share of older voters is not significantly related to the rate of voided ballots in counties using DRE or optical scan, despite the likelihood older persons have less experience with these technologies in non-voting applications. Nor is this variable significant in punch card counties, despite the extra importance of manual dexterity and good vision in voting correctly using that technology. The share of under-25 voters is associated with higher rates of voided ballots in punch card counties, consistent with the belief that voter experience matters more where voting equipment is less user-friendly. Educational attainment is associated with lower rates of voided ballots in punch card, DataVote, and non-precinct count ~~both groups of~~ optical scan counties. Surprisingly, the coefficient on the share of long-term residents is significantly positive in punch card counties, where long-term familiarity with voting procedures should be particularly important in preventing mistakes. It is also somewhat surprising that the poverty rate is associated with higher rates of voided ballots in lever machine and precont-count opti-0scan counties. Population coefficients are uniformly negative, and often significant in Table 2. Turnout increases in Florida and elsewhere, coupled with complicated punch card voting equipment, were blamed for high voter error in the 2000 election. However, the coefficient on turnout change is not significant in the 480 punch card counties (equation 1).

Discussion

Results of this study are broadly consistent with all three of the approaches previously employed in the literature on the determinants of roll-off in contests lower down the ballot. A "none of the above" option, and a larger number of candidate choices, reduce the rate of voided presidential ballots, presumably through reducing voluntary undervoting. However, ballots that are too crowded (with more than 8 candidates listed) are associated with higher rates of voided ballots.[23] Punch cards, including its DataVote variant, also contribute significantly to voided ballots through greater voter error. Education is associated with fewer voided ballots, through some combination of reduced error and less deliberate undervoting. Voter error is apparently less frequent in larger counties, which have significantly lower rates of voided ballots.

Previous studies concerned with equal representation across demographic groups have linked higher rates of roll-off to minority status and poverty (e.g. Darcy and Schneider 1989), lower education (e.g. Walker 1966), advanced age (e.g. Shocket et al. 1992) and urban residence (e.g. Thomas 1968). Our findings on voided presidential ballots in Table 1, equation 3 (the test with the strongest set of controls) are consistent with those previous findings, with one exception: we find that voided ballots are lower, not higher, in large urban counties.

Because our results are based on county-level data, they show only that counties with (for example) more minorities have higher rates of voided ballots. Without individual-level data, we cannot infer, based solely on our results, that minorities' ballots have a greater probability of being voided. In theory, higher rates in heavily-minority areas may be generated by non-minority voters. However, such "ecological fallacy" explanations for our results are implausible on theoretical and empirical grounds. There is no argument explaining why living in a heavily-minority area would lead non-minorities to deliberately skip the presidential contest, and survey and other evidence indicates that most voided ballots are the result of mistakes. Also, the link between percent black and voided ballots is confirmed in precinct-level studies of individual counties in Florida (e.g. Herron and Sekhon 2001) and in Louisiana and South Carolina (Tomz and Van Houweling 2001). In many precincts, it is not even arithmetically possible for whites (even if 100% of them voted) to account for more than a tiny share of the invalidated ballots.[24]

A major finding of the study is that the link between percent African American and the rate of voided ballots disappears where voting equipment prevents overvoting, consistent with earlier studies finding roll-off in heavily African American areas was particularly sensitive to complex ballot design (e.g. Darcy and Schneider 1989). Unfortunately, we are unable to provide a substantive explanation for the result that complexity is associated with greater error where more African Americans reside. Because cross-county measures of educational quality are unavailable, and educational attainment is measured only for 1990 (and therefore perhaps with some error), percent African American (which is measured for 1996) may be capturing some of education's effects on voided ballots. Voter experience may also be correlated with percent African American, and it is measured only crudely by percent under 25 and by change in turnout. Survey evidence suggests that on average African Americans feel less in control of their lives and what happens to them.[25] This sense of fatalism or limited efficacy could make some African American voters less assertive about checking their ballots or requesting assistance. We also cannot rule out the possibility that African American voters are less likely than other voters to receive assistance when they do request it. Measures of the quality, training or ethnicity of poll workers do not exist to explore this possibility. In tests of interaction effects not reported in the tables, we found that the effect of African American percent on voided ballots in punch card counties is not significantly larger in southern states, or in counties with a larger share of Republican presidential voters, where one might suppose that a history of discrimination, or a perception that local government is hostile, might intimidate some black voters from requesting or receiving help at the polls.

Regardless of the substantive explanation for the stronger link between percent African

American and voided ballots where technology prevents overvoting, this result suggests that equal protection considerations may provide additional justification for plans to replace punch cards and central count optical scan systems with precinct count optical scan or DRE systems. The goal of minimizing racial disparities could also justify the retention of lever machines, where practical. Of course, minimizing the overall rate of voided ballots, or racial disparities in this rate, must be balanced against other goals, such as minimizing roll-off in other contests, minimizing votes mistakenly cast for the wrong candidate, maximizing turnout, or determining outcomes in a timely manner. Lever machines produce low rates of voided ballots overall as well as low black-white gaps, but they may also deter some people from voting through longer lines, as it is difficult and expensive to provide a sufficient number of machines and to keep them in working order on election day. Similarly, many election officials are wary of potential delays and long lines as befuddled voters try to figure out why precinct-count scanners keep rejecting their ballots.[26] The "best" type of voting technology will differ across jurisdictions, depending on factors such as the number of ballots that must be counted and the number of contests that must be fit on the ballot. Caltech/MIT (2001a) found that hand-counted paper ballots performed best of all, but obviously this finding, based on the experience of small counties, cannot be generalized to large counties, where vote counters would have far less time to examine each ballot.[27] The number and variety (in content and language) of ballots required for a county as large as Los Angeles can make optical scan systems impractical. Election reform proposals should reflect awareness of the tradeoffs among various goals, and of how these tradeoffs differ across jurisdictions.

References

Bullock, Charles and Richard E. Dunn. 1996. "Election Roll-Off: A Test of Three Explanations." *Urban Affairs Review* 32(1): 71-86.

Burnham, W. D. 1965. "The Changing Shape of the American Political Universe." *American Political Science Review* 59(1): 7-28.

Caltech/MIT Voting Technology Project. 2001a. "Residual Votes Attributable to Technology: A Preliminary Assessment of the Reliability of Existing Voting Equipment" (March 30 revision). Accessed at http://www.vote.caltech.edu.

Caltech/MIT Voting Technology Project. 2001b. *Voting: What Is, What Could Be*. Report of the Caltech/MIT Voting Technology Project. July.

Darcy, R. and Anne Schneider. 1989. "Confusing Ballots, Roll-Off and the Black Vote." *Western Political Quarterly* 42(3): 347-364.

Engstrom, Richard L. and Victoria M. Caridas. 1991. "Voting for Judges: Race and Roll-Off in Judicial Elections." In W. Crotty, ed., *Political Participation and American Democracy*. Westport, CT: Greenwood.

FEC (1982). *Voting System Standards: A Report to the Congress on the Development of Voluntary Engineering and Procedural Performance Standards for Voting Systems*. Washington, DC: The National Clearinghouse on Election Administration of the Federal Election Commission.

Fischer, Eric A. 2001. "Voting Technology in the Unites States." *CRS Report for Congress* (March 21 update).

GAO (2001). "Statistical Analysis of Factors that Affected Uncounted Votes in the 2000 Presidential Election." Report to ranking Minority Member, Committee on Government Reform, U.S. House of Representatives, October. Washington, DC: U.S. General Accounting Office.

Herron, Michael C. and Jasjeet S. Sekhon. 2001. "Overvoting and Representation: An Examination of Overvoted Presidential Ballots in Broward and Miami-Dade Counties." Unpublished manuscript.

Hoffman, Lance J. (1987). "Making Every Vote Count: Security and Reliability of Computerized Vote-Counting Systems." Unpublished manuscript, George Washington University.

Kimball, David C.; Chris Owens and Katherine McAndrew. 2001. "Who's Afraid of an Undervote?" Presented at the Southern Political Science Association annual meeting, Atlanta GA, November 9.

Knack, Stephen and Martha Kropf. 2002. "Who Uses Inferior Voting Technology?" *PS: Political Science and Politics* (forthcoming, June).

Knack, Stephen and Martha Kropf. 2001. "Roll Off at the Top of the Ballot: Intentional Undervoting in American Presidential Elections." University of Missouri-Kansas City, unpublished manuscript.

Mather, George B. 1964. *Effects of the Use of Voting Machines on Total Votes Cast: Iowa 1920-1960*. Iowa City: University of Iowa, Institute of Public Affairs.

Nichols, Stephen M. and Gregory A. Strizek. 1995. "Electronic Voting Machines and Ballot Roll-Off." *American Politics Quarterly* 23(3): 300-318.

Price, H. D. 1957. *The Negro in Southern Politics*. New York: New York University Press.

Rusk, Jerrold G. 1970. "The Effect of the Australian Ballot Reform on Split Ticket Voting: 1876-1908." *American Political Science Review* 64(4): 1220-1238.

Saltman, Roy G. 1988. *Accuracy, Integrity and Security in Computerized Vote-Tallying*. National Bureau of Standards Special Publication 500-158.

Shocket, Peter A.; Neil R. Heighberger and Clyde Brown. 1992. "The Effect of Voting Technology on Voting Behavior in a Simulated Multi-Candidate City Council Election." *Western Political Quarterly* 45(2): 521-37.

Stiefbold, Rodney P. 1965. "The Significance of Void Ballots in West German Elections." *American Political Science Review* 59(2): 391-407.

Thomas, Norman C. 1968. "Voting Machines and Voter Participation in Four Michigan Constitutional Revision Referenda." *Western Political Quarterly* 21(3): 409-419.

Tomz, Michael and Robert Van Houweling. 2001. "Who Spoils their Ballots? Voting Equipment and Race in the 2000 Presidential Election." Unpublished manuscript.

USA Counties. 1998. CD-ROM. Washington, DC: Census Bureau.

U.S. Commission on Civil Rights. 2001. *Voting Irregularities in Florida During the 2000 Election*. Washington, D.C. Released June 8.

Vanderleeuw, J.M. and G.H. Utter. 1993. "Voter Roll-Off and the Electoral Context: A Test of Two Theses." *Social Science Quarterly* 74(3): 664-673.

Walker, Jack L. 1966. “Ballot Forms and Voter Fatigue: An Analysis of the Office Block and Party Column Ballots.” *Midwest Journal of Political Science* 10(4): 448-63.

Wattenberg, Martin P., Ian McAllister and Anthony Salvanto. 2000. "How Voting is Like Taking an SAT Test: An Analysis of American Voter Roll-off." *American Politics Quarterly* 28(2): 234-250.

Table 1: Determinants of Voided Presidential Ballots, November 1996

Equation	1	2	3
Intercept	8.75 (1.17)	9.27 (1.30)	--------
Paper ballots	-0.77* (0.32)	-0.99** (0.26)	-1.02** (0.13)
Lever machines	-1.27** (0.29)	-1.24** (0.27)	-1.01** (0.12)
DataVote	0.57 (0.46)	0.24 (0.36)	0.36# (0.19)
Optical scan	-0.56** (0.21)	-0.71** (0.19)	-0.73** (0.10)
Electronic	-0.42 (0.30)	-0.30 (0.29)	-0.24 (0.16)
Mixed systems	-0.62** (0.21)	-0.71** (0.19)	-0.33 (0.22)
Change in turnout rate, 1992 to 1996	-6.13** (1.97)	-2.29# (1.19)	-0.35 (0.75)
Senate contest on ballot	0.13 (0.27)	0.14 (0.28)	---
Governor's contest on ballot	0.27 (0.36)	0.33 (0.38)	---
Nevada	-1.18** (0.25)	-1.28** (0.26)	---
No. of presidential candidates on ballot	-0.97** (0.22)	-0.84** (0.26)	---
No. of candidates on ballot squared	0.05** (0.01)	0.05** (0.02)	---
Lived in county > 5 years %, 1990	0.64 (0.96)	0.11 (0.83)	0.64 (0.58)
Over 65 (% of VAP)	3.28# (1.71)	1.82 (1.33)	2.01** (0.76)
Under 25 (% of VAP)	3.85* (1.85)	1.97# (1.13)	1.38# (0.85)
High school diploma %	-2.62** (0.97)	-3.02** (1.02)	-2.50** (0.66)
Log of population	-0.24** (0.07)	-0.20** (0.07)	-0.17** (0.03)
African American %, 1996	3.05** (0.93)	2.45** (0.74)	0.83** (0.33)
Hispanic %, 1996	3.47** (0.71)	2.80** (0.61)	1.88** (0.52)
Below poverty line, %	0.77 (1.52)	0.17 (1.57)	1.90** (0.76)
R^2	.23	.30	.42

A #, *, and ** respectively indicate significance at .10, .05, and .01 for 2-tailed tests. Standard errors are corrected for heteroskedasticity and non-independence of errors within-states in equations 1 and 2. State dummy variables are included in equation 3, but not shown for space reasons. Sample size is 2244 in equation 1, and 2209 in equations 2 and 3. Mean of dependent variable is 2.68 in equation 1, and 2.53 in equations 2 and 3.

Table 2: Voided Ballots, by Equipment Type

Equation	1	2	3	4	5	6	7	8
Voting equipment	Punch card	Optical scan (non-precinct count)	Mixed	Lever Machine	DRE	Precinct-count optical scan	Paper	DataVote
Change in turnout rate, 1992 to 1996	-0.95 (1.46)	1.59 (1.43)	3.08 (2.29)	-2.66 (2.09)	1.92 (2.73)	-10.80* (4.83)	-2.85# (1.55)	-4.99 (4.71)
Lived in county > 5 years, % (1990)	2.29* (0.98)	-0.41 (1.16)	1.46 (1.33)	0.49 (1.43)	-1.02 (2.11)	0.57 (3.74)	1.44 (1.94)	3.55 (2.88)
Over 65 (% of VAP)	2.07 (1.50)	1.84 (1.33)	1.71 (2.90)	-0.23 (2.05)	2.71 (3.36)	-2.54 (6.15)	5.25* (2.26)	4.40 (3.94)
Under 25 (% of VAP)	3.57* (1.51)	0.50 (1.37)	2.36 (2.24)	-1.42 (1.88)	-1.38 (2.98)	4.45 (5.89)	7.14# (4.08)	8.05 (6.27)
High school diploma %	-2.72* (1.25)	-3.16* (1.31)	-0.04 (1.91)	-0.62 (1.65)	-2.81 (2.51)	-10.31* (4.06)	-1.32 (1.86)	-9.09* (3.83)
Log of population	-0.29** (0.06)	-0.24** (0.06)	-0.33* (0.13)	-0.16 (0.10)	-0.05 (0.15)	-0.27 (0.21)	-0.21# (0.12)	-0.24 (0.16)
African American %, 1996	2.90** (0.76)	2.53** (0.77)	4.79** (1.79)	-0.17 (0.55)	0.21 (1.20)	-1.45 (1.87)	-4.40# (2.47)	2.60 (2.33)
Hispanic %, 1996	1.19 (0.88)	0.83 (0.84)	-1.49 (4.36)	5.17* (2.12)	0.38 (1.21)	-7.94 (5.10)	8.42** (2.72)	-2.98 (2.21)
Below poverty line, %	2.55 (1.58)	2.89* (1.38)	0.61 (2.23)	4.30* (1.97)	-0.57 (2.40)	6.32 (6.43)	1.26 (1.68)	1.61 (5.34)
R^2	.62	.59	.48	.45	.43	.64	.33	.71
N	480	485	103	480	199	112	272	78
Mean, dep. variable	3.01	2.29	1.79	2.16	3.13	2.95	2.31	3.02

A #, *, and ** respectively indicate significance at .10, .05, and .01 for 2-tailed tests. A full set of state dummy variables is included in all equations, but coefficients are not reported for space reasons.

Endnotes

[1] A Washington Post-ABC News Poll indicated that 64% of respondents favored the federal government outlawing punch card systems. See "Public Backs Uniform U.S. Voting Rules," *Washington Post*, 18 December 2000.

[2] Figures are from Caltech/MIT (2001b) and Voter Supplement File, November 1996 Current Population Survey.

[3] Fischer (2001) refers to this rate as "roll-off," while Caltech/MIT (2001a) uses the term "residual votes." Despite the inclusion of deliberate undervotes, media reports and even a GAO (2001) report often use the terms "error rate" or "uncounted votes." Not only do voided ballots include some non-errors (deliberate undervotes), they also exclude many errors (mistaken votes for the wrong candidate).

[4]In most of these cases, the data were not reported to EDS because the states and counties simply do not collect such data. These states include Alabama, Delaware, Mississippi, Oklahoma, and Rhode Island.

[5]These states include Arkansas, Maine, Missouri, Pennsylvania, Texas and Wisconsin.

[6] We also obtained corrected data from Kansas, for which the data on many counties as originally reported to EDS indicated more presidential votes than there were voters.

[7] It is highly doubtful, for example, that all 56,256 voters in Jackson County (MI) cast a valid vote in the presidential contest. More likely, county officials reported the total number of presidential votes when asked to report turnout.

[8] In Alaska, elections are administered through 40 election districts, which in most cases do not

conform to county (borough) boundaries. We aggregated the 40 elections districts and 26 counties as necessary to create 14 larger areas for which the elections data and Census data match very closely.

[9] In Florida in 2000, voter confusion was attributed partly to the fact that 11 candidates were on the ballot, more than in most other states. See, for example, "Spoiled Ballots Favored Gore," *Miami Herald*, 28 January 2001.

[10] Wattenberg et al. (2000) found roll-off in House contests was higher among voters new to their jurisdictions.

[11] Data for 1996 are unavailable, but county-level mobility in 1990 and 1996 are likely to be highly correlated.

[12] Younger (and better-educated) voters might make fewer errors with optical scan technology than older (and less-educated) voters, because of its widespread use in educational testing in recent decades.

[13] The percentage with college degrees was also tried, and found to be always insignificant. It is left out of the regressions we report below for space reasons. Education data for 1996 are unavailable.

[14]Stiefbold (1965) found voided ballots in West German parliamentary contests were more common in rural areas, where lack of anonymity increased social pressures to show up at the polls, even for persons apathetic about the contests on the ballot. Exit polling data for the U.S. in 1992 show no rural-urban differences in deliberate undervoting (Knack and Kropf, 2001).

[15] The natural log of population provides a somewhat better fit than population. Density (population per square mile) was not significant when substituted for population.

[16] See, for example, Herron and Sekhon (2001); Tomz and Van Houweling (2001); U.S. Commission on Civil Rights (2001); "Ballots Cast by Blacks and Older Voters Were Tossed in Far Greater Numbers," *New York Times*, 12 November 2001; "A Racial Gap in Voided Votes," *Washington Post*, 27 December 2000.

[17] Although federal law requires ballots to be printed in multiple languages where English is not spoken by 5% or more of the voting-age population, the requirement is not always implemented. An example from the 2000 election was Osceola County (FL). See "Human Factor at Core of Vote Fiasco," *Washington Post*, 1 June 2001.

[18] This finding is consistent with evidence from Chicago and Cook County in the 2000 election: "contrary to city and county claims that a high turnout of inexperienced voters" was largely responsible for the 6.2% roll-off rate—double the rate for 1996—"records show that the areas of Chicago reporting the most ballot problems also had the highest percentage of experienced voters" ("State Worst in Ballot Errors," *Chicago Tribune*, 29 April 2001).

[19] Consistent with this result, Wattenberg *et al.* (2000) found using survey data that roll-off in House contests was unaffected by the availability of a straight-ticket voting option.

[20] In 1996, states in our sample with more than 8 candidates included CO (13), UT (10), MN (11), NJ, TN, VT, WA (10) and NY (10). Florida had only four.

[21] Many jurisdictions that have purchased and used the precinct-based optical scanners report very favorable results, with voided ballot rates of about 1% or lower in the 2000 elections. However, we found no evidence that this "second-chance" technology reduced the rate of voided ballots overall in the 1996 election. These disappointing results may reflect unavoidable errors in our classifications. In the Election Data Services voting equipment file, many counties merely

report that they use optical scan systems, without identifying the manufacturer or model of the equipment; these were grouped together with the central-count systems. Even for those counties we could identify as having “second chance” capability, we do not know whether the equipment was programmed to check for mistakes. In some counties, election officials do not take advantage of this option because it can slow the voting process substantially, or even because of the cost of printing additional ballots. See “Key to Better Voting,” *Wall Street Journal*, 29 May 2001, and “Human Factor at Core of Vote Fiasco,” *Washington Post*, 1 June 2001.

[22] See “Many Ballots Not Counted in Runoff,” *Newsday*, 18 November 2001. A New York City dummy when added to Table 1 regressions produces a (highly significant) coefficient of about 1, implying that lever machines with disabled sensor latches perform no better than punch cards. Among the five New York City counties, the rate of voided ballots is correlated at .99 with the percentage of African Americans.

[23] In a more recent paper, Kimball *et al.* (2001) find that this curvilinear relationship--and most of our other findings—holds in an analysis of voided ballots in the 2000 election, using a specification similar to the one used for the 1996 election in this paper.

[24] In precinct 0204 in Miami-Dade County, for example, the 22 overvotes and 2 undervotes in the presidential contest represented 8.3% of the 288 ballots cast. Of 400 registered voters in the precinct, 391 were black, 3 Hispanic, 6 “other” and 0 white. Data are from Professor Bruce Hansen’s web site at www.ssc.wisc.edu/~bhansen.

[25] The World Values Survey conducted in 1995 asked respondents: "Some people feel they have completely free choice and control over their lives, while other people feel that what they do has no real effect on what happens to them. Please use this scale where 1 means "none at all" and 10

means "a great deal" to indicate how much freedom of choice and control you feel you have over the way your life turns out." The average response give by whites is 7.61, and for African Americans 7.23. This difference is significant at .0001, and is narrowed only slightly in multivariate tests that control for age, gender, education and income.

[26] See “Key to Better Voting,” *Wall Street Journal*, 29 May 2001.

[27] Paper-ballot counties on average have only about one-tenth the number of voters as other counties. An early study finding roll-off in referenda was lower in paper ballot counties than in lever machine counties argued for uniformity across counties within states, suggesting--ironically, in light of subsequent experience--that “in heavily populated states opting for paper ballots, counting problems can be eased through the use of electronic counting equipment and special ballot-marking devices” (Thomas, 1968: 418).