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Undervoting and Overvoting in the 2002 and 2006 Florida Gubernatorial Elections

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Undervoting and Overvoting in the 2002 and 2006 Florida Gubernatorial Elections

Are Touch Screens the Solution?

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ABSTRACT: In a participatory democracy where every vote counts, voters expect that every vote will be counted. The voting machine is the instrument with which the voting public records its intent and appoints its representatives. In order for the democratic process to function, voting machines must properly function.

Do electronic voting systems that rely on touchscreens work better at reducing undervote and overvote counts than optical scan systems? To answer this question, an analysis of undervote and overvote counts in the 2002 and 2006 Florida Gubernatorial elections was conducted. The undervote and overvote counts across county, voting system, system manufacturer, and election cycle were compared. Mean comparison analyses suggest that counties that primarily used touchscreen technology on Election Day had lower voter error rates than counties using optical scan technology in the 2006 election. Touchscreen technology is associated with less overvoting. Overall, voter error rates were found to be higher in the 2006 election than in the 2002 election for optical scan ballots but not for touchscreen systems.

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INTRODUCTION

This paper examines voter error across Florida's 67 counties in the 2002 and 2006 gubernatorial elections in order to analyze and explain any changes in voter error as represented by undervotes and overvotes across electronic voting systems. The Help America Vote Act of 2002 (HAVA) established a program to provide states with funds to replace punch card voting systems following the 2000 elections. Many argue that some voters were disenfranchised due to poorly designed voting equipment that year (Agresti and Presnell, 2002; Herron and Sekhon, 2003). HAVA passage prompted the enactment of many state laws to facilitate its implementation.

HAVA was meant to re-establish voter confidence in the democratic process. Elections are one of the most important institutions in a participatory democracy. In a system in which every vote should count, voters expect that every vote will be counted. The voting machine is the instrument with which the voting public records its intent and appoints its representatives. For the democratic process to function, voting machines must properly function. Voting systems that are associated with lower voter error ensure public confidence. The integrity of the democratic process is based on the reliability, accuracy, and verifiability of voting systems, and low voter error is an indictor of these factors.

Florida Statutes (F. S.) (Section 101.595) mandate that each county Supervisor of Elections report the total number of undervotes and overvotes in the first race that appears on an election ballot to the Florida Department of State. Pursuant to F.S. Section 97.021, an *overvote* means that a voter designates more than one answer to an office or ballot question, while an *undervote* shows that no choice is properly designated for an office or ballot question. In either case, a vote is not recorded for that office or ballot question. F.S. Section 102.141 mandates a manual recount if a candidate is defeated or eliminated by one-half of one percent or less of the total votes cast for that office. However, if the number of undervotes, overvotes, and provisional ballots is fewer than the number of votes needed to change the election outcome, a recount may not be ordered. In races where the outcome may be determined by just a few hundred votes, the need to reduce error is apparent.

Recent history shows Florida's election process to be contentious and marked with controversy (Yang and Gaines, 2004). Hanging, pregnant, and dimpled chads in the 2000 election, coupled with the more recent incidence of high undervoting in the Congressional District 13 race where a recount was rendered impossible due to the lack of a verified voter paper trail for touchscreen systems (Wegner, 2007), has resulted in growing concerns over the reliability and lack of transparency in touchscreen voting systems. The Florida legislature passed H.B. 537, which requires that all voting be by marksense ballot (optical scan ballot) with exceptions for disabled persons. This law, which takes effect on January 1, 2008, will reduce the total number of counties using touchscreen machines to 14 while it brings the total number of counties with voter-verified paper record legislation (VVPR) to 30. Twenty counties do not require VVPR (including the 14 that still use touchscreens). My findings may be applicable to those 14 counties that continue using touchscreen systems.

The electronic voting systems used in Florida for the 2002 and 2006 elections were based either on optical scan or on touchscreen technologies. These machines were manufactured by one of three companies: Election Systems & Software (ES&S), Diebold, or Sequoia. Following the 2002 elections, only one county made changes to its voting system: Baker County switched from Sequoia Optech to Diebold Marksense systems (Florida Department of State: Division of Elections, 2003). These two systems use the same optical scan technology but are produced by different manufacturers. In the 2006 election cycle, 11 counties used ES&S iVotronic systems software while four counties used Sequoia EDGE systems. These systems are touchscreen-based direct-recording electronic voting systems (DRE). Counties using touchscreen systems also provided optical scan ballots to absentee voters.

In the 2006 election cycle, 31 counties used Diebold Accuvote systems, 14 counties used ES&S M100 systems, and seven counties used ES&S Optech systems (Florida Department of State: Division of Elections, 2007), all of which use optical scan technology. These counties supplemented their optical scan systems with touchscreen systems for both early and Election Day voting in order to accommodate voters with special needs in accordance with HAVA.

HAVA established federal standards for voting systems used in federal elections. These same systems are used in Florida's elections, resulting in federal election standards impacting state races. HAVA requires that voting systems be accessible for individuals with disabilities in a manner that provides them with the same access and participation

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afforded to other voters. HAVA also requires that at least one direct recording electronic voting system or other voting system equipped for individuals with disabilities be present at each polling place.

Fifty-two of sixty-seven counties used optical scan systems in the 2002 election cycle. Of these, 51 counties used the same provider in 2002 and 2006. All 15 touchscreen counties used the same provider in 2002 and 2006. The technology used in Florida counties from 2002 to 2006 stayed constant, with the exceptions of the introduction of touchscreen systems to supplement the optical scan systems in 52 counties, the provider change in Baker County, and ballot design changes made by individual counties. The statistical comparison of under- and overvotes in the empirical analyses is facilitated by so many counties using the same system across elections.

Touchscreen systems are programmed to prevent overvoting while they notify voters when they have undervoted or skipped a ballot item. Optical scan paper ballots rely on voters to check their own ballot for errors. Counties using precinct tabulation systems can tabulate votes immediately and notify voters of any errors, who may then recast their votes using a new ballot. Lower overvoting resulted in both the 2002 and 2006 elections when compared with previous election cycles (Knack and Kropf, 2003). However, such tabulation systems are an incomplete safeguard, as counties using optical scan systems still have some tabulation error resulting from Election Day overvoting.

Focusing on gubernatorial elections provides a standardized variable for measuring voter error. Lower level races may be affected by voter roll-off (Darcy and Schneider, 1989), with voters abstaining from voting in those races listed toward the end of the ballot. The gubernatorial race was first on the ballot for both 2002 and 2006 for all counties. Roll-off effects should have the least impact on the gubernatorial race, allowing for a more accurate comparison of the effects of voting technology on voter error across counties.

In this paper, undervote and overvote counts are compared by election cycle and by county to analyze trends in voter or tabulation error across voting technologies. The error rate for absentee ballots is also compared across counties and election cycles.

LITERATURE REVIEW

Previous research has focused on voter error rates caused by punchcard machines (Knack and Kropf, 2003) across various demographic groups (Alvarez and Sinclair, 2004). These studies focused on mechanical voting systems because they were the most prevalent voting system prior to HAVA. Prior research also shows that lever machines and fill-in ovals (the same technology on which optical scan is based) have much lower error rates than punchcard systems (Bullock, 2002).

These studies find that, when using punchcard systems, African-American and Hispanic voters show higher voter error rates compared to White voters. However, such patterns were not evident where counties used voting equipment that was programmed to eliminate overvoting. Further, larger counties and counties with a higher percent of high school graduates showed lower voter and tabulation error rates.

Optical scan ballots contribute to a black-white voter error gap (the difference between the average voter error rates between blacks and whites) of 4-6% (Tomz and Houweling, 2003). Electronic machines, which prevent overvoting and make undervoting more noticeable and correctable, have been found to cut such discrepancies by a factor of ten (Tomz and Houweling, 2003). However, a 2001 Caltech/MIT study found that voter and tabulation error is highest among counties using electronic machines and punch cards, while it is lowest among counties using lever machines, optical scan paper ballots, and hand-counted ballots (Caltech/MIT, 2001). The researchers conclude that some ballot formats are more confusing than others. Precincts with higher proportions of African-American and elderly citizens are especially impacted by confusing ballot arrangements (Schneider, 1989).

The accuracy and risk associated with electronic voting machines (Foster, 2004) continues to be a subject of academic debate. Computer science experts express concern over the vulnerability of DRE machines (including touchscreen) that lack a voter verified paper trail (Barr and Gondree, 2007). However, the Caltech/MIT Voting Technology Project argues that the 2004 elections went relatively smoothly as electronic voting machines record votes more accurately than paper ballots (Foster, 2004). Election accuracy cannot be independently verified in states that use DRE technology without verified voter paper trails even with an available source code (Barr and Gondree, 2007). Touchscreen counties in Florida shared this experience in both the 2002 and 2006 elections.

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HYPOTHESES

1. What is the effect of technology type on voter error?

Hypothesis 1: Counties that use touchscreen voting systems will have lower voter error rates than counties that use optical scan voting systems. Touchscreens were the sole means of voting in 15 counties on Election Day and for early voting in 2002 and 2006; all else being equal, these counties should have lower voter error rates, even when absentee ballots are included in the total error rate. This hypothesis notes that touchscreen systems allow for additional safeguards against voter error, while optical scan paper ballots require voters to review their own ballots and correct mistakes. Overvoting rates should not be a significant proportion of the total voter error rate. Undervoting rates should be very similar to the total voter error rate in touchscreen counties, but not in optical scan counties. It is predicted that the undervote should be the primary contributor to the total voter error rate.

Hypothesis 2: Touchscreen counties and optical scan counties will have similar undervoting rates for absentee voting. Both touchscreen and optical scan counties use the same technology for absentee voting. If technology is the primary voter error factor, there should be no difference in error rates for absentee ballots emanating from different counties. Voters in touchscreen counties should be equally likely to undervote as voters in optical scan counties.

Hypothesis 3: For absentee voting, touchscreen counties will have similar rates of overvoting as optical scan counties. Absentee ballots have no safeguard to prevent overvoting, other than the voters' ability to properly review their ballots and correct overvoting.

Optical scan paper ballots are used for absentee voting in all 67 Florida counties, although it should be noted that the design of those ballots and ballot instructions might vary by county and ballot manufacturer. Optical scan ballots normally require that voters complete an arrow, or fill in an oval, in order to designate a ballot choice. If an error is made when marking an optical scan ballot, it is the voter's responsibility to identify the error and make corrections or request a new ballot. When the voter has completed an absentee ballot, it must either be mailed or delivered to the Supervisor of Elections office in the county of residence no later than 7 p.m. on Election Day. This means that absentee voters who fail to correct errors on their optical scan ballots risk having their votes voided for that particular office or question. It would be too late to make a correction once the ballot tabulator detects an error.

2. What effect does the manufacturer of the voting system have on voter error?

Hypothesis 4: The rate of voter error for the ES&S optical scan system will be similar to the voter error rate for Diebold optical scan systems. The equipment used limits ballot design; both Diebold and ES&S optical scan systems use the same technology. If counties have correctly designed ballots, the difference in ballot design afforded by these two different systems should not be significant enough to cause a gap in the rate of voter error between them,.

Hypothesis 5: The voter error rate for ES&S touchscreen systems will be similar to the voter error rate for Sequoia touchscreen systems in touchscreen counties. Again, touchscreen systems are limited in their effectiveness by their physical design and programming. The difference in effectiveness between systems should not be significant enough to create a gap in the voter error rate between them. However, voters and counties unfamiliar with touchscreen technology may have higher voter error rates.

Hypothesis 6: The undervoting rate for touchscreen systems will be higher in optical scan (blended) counties than in 100% touchscreen counties in 2006. Counties that supplement their optical scan ballots with touchscreens to accommodate voters with special needs or provide an alternative to paper ballots to some voters will have higher voter error rates. These higher error rates may result from the lack of experience with touchscreen systems in counties that have only recently added the new technology. With new technology comes the need to retrain poll workers and educate voters. It may take some time before such retraining efforts reduce voter error. During this learning curve period, voter error may be higher for these counties than for counties that have been using touchscreen technology for several elections. As previous studies suggest, voter error is associated with voter familiarity with the polling technology in use (Knack and Kropf, 2003).

METHODOLOGY

Data is collected from the Florida Division of Elections and from the Supervisors of Elections offices across the state in order to construct the variables employed. The following is a list of independent and dependent variables, along with the operationalization of those variables. The

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county is the unit of analysis. Data on all variables is calculated independently for the gubernatorial elections of 2002 and 2006, and by county.

Independent Variables

The *Voting System* was created as a nominal variable and was coded as follows: Diebold Marksense, ES&S 100, ES&S Touchscreen, Sequoia Touchscreen, and ES&S Optech. Baker County was coded as Diebold Marksense for both 2002 and 2006; the Sequoia Optech system performed the same in 2006 as similar Marksense systems in Baker County in 2002 (Florida Division of Elections, 2003).

Technology is also a nominal level variable and is defined as Optical Scan or Touchscreen.

Manufacturer is also a nominal level variable and is measured as Diebold, ES&S, or Sequoia.

Dependent Variables

Percent Undervote Absentee 2002 is a ratio level variable, constructed by taking the total number of absentee ballots with an undervote and dividing by the total number of ballots cast in the 2002 election, calculated by county.

Percent Overvote Absentee 2002 is a ratio level variable constructed by taking the total number of absentee ballots with an overvote and dividing by the total number of ballots cast in the 2002 election, calculated by county.

Percent Undervote Precinct 2002 is a ratio level variable constructed by taking the total number of ballots cast on Election Day with an undervote and dividing by the total number of ballots cast in the 2002 election, calculated by county.

Percent Overvote Precinct 2002 is a ratio level variable constructed by taking the total number of ballots cast on Election Day with an overvote and dividing by the total number of ballots cast in the 2002 election, calculated by county.

Percent Total Undervote and Overvote 2002 is a ratio level variable constructed by taking the sum of all ballots (absentee and precinct) with an undervote or an overvote and dividing by the total number of ballots cast in the 2002 elections, calculated by county.

Percent Undervote Absentee 2006 is a ratio level dependent variable constructed by taking the total number of absentee ballots with an undervote and dividing by the total number of ballots cast in the 2006 election, calculated by county.

Percent Overvote Absentee 2006 is a ratio level variable constructed by taking the total number of absentee ballots with an overvote and dividing by the total number of ballots cast in the 2006 election, calculated by county.

Percent Undervote Precinct 2006 is a ratio level variable constructed by taking the total number of undervotes for non-absentee ballots and dividing by the total votes cast in the 2006 election in a given county. For optical scan counties that blend technology, the percent undervote from touchscreen voting is not included to make the variable consistent with its 2002 counterpart. This variable allows precinct ballots cast in a county to be either 100% touchscreen or optical scan.

Percent Undervote Precinct 2006 Touchscreen is a ratio level variable constructed by taking the total number of undervotes cast on touchscreen systems and dividing by the total votes cast, calculated by county for the 2006 gubernatorial election. This variable was constructed for all 67 counties; in optical scan the percent was calculated as the total undervote on touchscreen ballots divided by total votes cast on touchscreen ballots in that optical scan county.

Percent Overvote Precinct 2006 is a ratio level variable constructed by taking the total number of overvotes for optical scan systems and dividing by the total votes cast. For touchscreen counties, a value of 0 was entered (touchscreens are programmed to eliminate overvotes). For touchscreen counties, this variable represents the percent of overvotes produced by touchscreen systems. For optical scan counties (blended), this variable represents the percent of overvotes produced by optical scan systems (the only system capable of producing overvotes that is currently used in Florida counties).

Percent Total Undervote and Overvote 2006 is a ratio level variable constructed by taking the total number of ballots with undervotes and overvotes (including absentee and touchscreens in blended counties), and dividing by the total votes cast, calculated by county. This variable represents the sum of the total percent of undervotes and overvotes in a given county for both optical scan and touchscreen ballots in 2006.

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ANALYSIS

Hypothesis 1: Table 1 shows the mean comparison for percent of undervote and overvote for precinct cast ballots, and for the percent of total voter error for all ballots for the 2002 and 2006 gubernatorial elections. Counties using touchscreen technology have lower voter error rates than counties using optical scan systems for 2006, but the hypothesized relation does not hold true for the 2002 election cycle. According to the independent-sample t-test, the mean difference is not statistically significant at the .05 level for the total overvotes and undervotes in the 2006 elections; there is no significant relation between total voter error and the voting technology used.

In the 2002 elections, touchscreen systems were still a relatively new voting technology. Voters would have been more familiar with systems designed around paper ballots such as optical scan systems. The higher mean percent error for touchscreen systems as compared to optical scan systems may have been due to the lack of voter familiarity with touchscreen voting systems. The decrease in the mean for total error for touchscreen systems of .047 may have been due to increased voter familiarity with touchscreen systems gained between the 2002 and 2006 election cycle, although the difference is not statistically significant.

Counties that use touchscreen voting systems have lower overvoting rates than optical scan counties. This relation between voting technology and overvoting is supported by the mean comparison for 2002, but the mean difference is not significant for the 2006 election (Table 1). The mean for touchscreen counties in both 2002 and 2006 was 0 percent, resulting from the fact that touchscreen systems have been programmed to eliminate overvoting by preventing the voter from designating more than the allowed number of choices for a given ballot question. Optical scan ballots do not have the same stringent safeguards as touchscreen systems to prevent overvoting. The lack of safeguards and the reliance on voters to correct their own mistakes leads to the gap in overvoting between these two systems. There was no statistically significant relation between voting technology and overvoting for the 2006 election; this lack may be the result of several factors, including the use of precinct tabulators at polling sites using optical scan ballots in 2006. As predicted, overvoting in the 2002 and 2006 elections was not a major contributor to the overall rate of voter error in both optical scan and touchscreen counties.

There was no statistically significant relationship between voting technology and undervoting for the mean comparison table (Table 1). According to the t-test, the mean difference is not statistically significant for the percent undervote in the 2006 election, and optical scan counties actually had a lower mean voter error rate in the 2002 election. The undervote was the most significant contributor to overall voter error for both election cycles as predicted. Between the 2002 and 2006 elections, the mean percent error for overvoting on touchscreen systems did fall by .047 percent, and the mean percent error for voting on optical scan systems increased by a mean difference of .4769 percent. The decreased undervoting on touchscreen systems between election cycles may have been a product of increased voter familiarity and awareness of the various safeguards that prompt the voter to correct undervoting on touchscreen systems. The increase in undervoting between election cycles may have been caused by numerous factors, including voter confusion or disinterest in the gubernatorial race.

Hypothesis 2: Table 2 shows the mean comparison for the percent of overvotes and undervotes for absentee ballots in the 2002 and 2006 election cycles. The hypothesized relationship between undervoting on absentee ballots and the primary voting systems used on Election Day was supported by the data for the 2002 election, but not for the 2006 election. The mean difference for percent undervotes in the 2006 election was statistically significant according to the t-test; the mean difference was not significant for the 2002. The mean difference for the percent undervoting on absentee ballots in 2002 was .0892 percent, more than the mean for undervoting on absentee ballots in touchscreen counties in 2002. The mean difference for undervoting on absentee ballots in 2006 was .4664, almost one-half of one percent. F.S. Section 102.141 mandates a manual recount if a candidate is defeated or eliminated by one-half of a percent or less.

The gap in undervoting on absentee ballots between touchscreen and optical scan counties, which use the same technology for absentee ballots, may be explained by ballot design and voter experience. Touchscreen counties are more urbanized and have more voters than optical scan counties. Previous studies have suggested that urbanized and larger counties have lower voter error rates in general compared to smaller, less urbanized counties.

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Hypothesis 3: The hypothesized relationship between overvoting on absentee ballots and the primary voting system used on Election Day was supported by the data (Table 2). The mean difference for overvotes in the 2002 and 2006 elections was not statistically significant. As hypothesized, there was no relation between overvoting on absentee ballots and voting technology used in a county. The mean difference for overvoting on absentee ballots for the 2002 gubernatorial election was .0032; this difference is not very meaningful, although it may be worth noting that optical scan counties had a higher error rate. The mean difference for overvoting on absentee ballots in 2006 was .0111. The mean difference is not meaningful, at only one-hundredth of one percent in 2006 and less than one-hundredth of one percent in 2002. If a recount were ordered, the voter error for overvotes on absentee ballots would have little effect on the outcome.

Hypothesis 4: The hypothesized relationship between voter error for ES&S and Diebold optical scan systems is supported by the data for the 2002 election, but not for the 2006 election (Table 4). The mean differences for overvotes in the 2002 and 2006 election were statistically significant according to the t-test. The mean difference for undervotes and total voter error was statistically significant in the 2002 election, but was not significant for the 2006 election. ES&S optical scan systems do not produce error rates similar to Diebold optical scan systems, as ES&S systems produce higher average rates of both overvotes and undervotes. The mean difference for total undervotes and overvotes in 2002 for the two systems was .5426 and in 2006, it was .2995. For both election cycles, ES&S systems produce higher undervote rates. Clearly, not all manufacturers provide equally accurate systems. Different systems have different restrictions on ballot designs. These restrictions can lead to poorly designed ballots. Poorly designed and confusing ballots can increase voter error as suggested by numerous studies.

Hypothesis 5: The hypothesized relationship between voter error for ES&S and Sequoia touchscreen systems is supported by the data (See Table 4). The mean differences for undervotes and total voter error were statistically significant for both 2002 and 2006; there is no relation between voter error and manufacturer for touchscreen systems. The mean difference for the percent total undervote and overvote in 2002 was .0373, and in 2002, it was .0061. The mean differences are too small to be meaningful; such differences are unlikely to have an effect on the outcome of a recount. In 2002, ES&S systems produced a higher mean percent voter error. In 2006, Sequoia systems produced a higher mean percent voter error. The voter error rates for touchscreen systems are very similar for both manufacturers. Touchscreen systems have fewer limits in terms of ballot designs than do optical scan systems and can therefore be standardized across manufacturers to produce similarly low voter error rates.

Hypothesis 6: The hypothesized relationship between undervoting rates on touchscreen ballots in optical scan and touchscreen counties was not supported by the data (Table 3). The mean difference according to the t-test for undervoting for touchscreen systems for all counties was not statistically significant for the 2006 election, although the mean difference for undervoting on touchscreen ballots between optical scan and touchscreen counties was .424 , almost one-half of one percent. This difference may be explained by lack of voter familiarity with touchscreen systems in counties that previously used only optical scan ballots. For touchscreen counties, a decline in voter error was found between the 2002 and 2006 election cycles for the gubernatorial race. As voters become more familiar with the new technology, and as poll workers gain more experience helping voters navigate new equipment, error rates may continue to decline.

CONCLUSIONS

Are touchscreens the solution? Perhaps. Touchscreens fared better than optical scan systems in 2006 for touchscreen counties in terms of voter error reduction, but many of the mean differences were not significant. The fact that the percent undervoting on touchscreen systems was higher in optical scan counties than in touchscreen counties, and higher than undervoting on optical scan ballots, points to a possible learning curve for touchscreen systems. Touchscreen counties experienced a slight decline in mean percent voter error between 2002 and 2006. It is possible that this trend will continue with increased voter education programs in states still using touchscreen systems. From 2002 to 2006, optical scan systems experienced an increase in total voter error due to increased undervoting on optical scan ballots.

Touchscreens eliminated overvoting on Election Day in 15 of Florida's 67 counties. That fact alone can be seen as a small victory for the technology; however, overvoting is not as important in determining the outcome of an election as the undervote is. Touchscreen systems, if fully utilized, may one day help to render undervoting a non-

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issue. However, the accuracy of these systems can only be confirmed if they are equipped with voter verified paper trails to make it possible for an independent recount to be held.

For optical scan systems, not all manufacturers are created equal (or at least do not provide equally accurate systems). ES&S optical scan systems have higher mean percent undervotes, overvotes, and total voter error rates as compared to Diebold optical scan systems. Thus, the manufacturer should be a factor when selecting a voting system. If counties should reinvest in optical scan systems, it may be wise to consider manufacturers carefully in order to ensure the best experience for voters.

In terms of touchscreen systems, the manufacturer seems to be of little consequence when comparing Sequoia and ES&S machines. Both systems produce a similar mean percent voter error. The main disadvantage to touchscreen systems used in Florida was the lack of a voter verified paper trail, which made it impossible to conduct independent recounts.

Absentee voters in touchscreen counties fared better in recording their intent than did voters residing in optical scan counties for the 2006 election cycle. This curious phenomenon can be explained by previous studies, which have found that large urbanized counties have lower error rates (Sinclair and Alvarez, 2004). Touchscreen county populations are, on average, larger and more urban than are optical scan counties.

Finally, touchscreens were increasingly becoming the system of choice for many counties. This was due in part to new FEC and HAVA regulations, which emphasize reducing voter error through improved technology. However, touchscreens still have many limits and with the current legislative ban will have a very marginal place in the electoral landscape. These limits include overheating, a vulnerability to hackers, and the lack of a verifiable paper trail.

Many newer versions of DRE machines are equipped with printers allowing for a verifiable paper trail. As touchscreen technology develops and these issues are resolved, it may reappear in Florida, if changes are made to the legislative framework. As consumers, counties should continue to demand more from voting equipment manufacturers to produce auditable systems that can be easily tailored to a county's needs. Voter error may never be a thing of the past, but it can at least be rendered inconsequential through better ballot design and technology. The bottom line of any election is the accurate interpretation of the voting public's intent; therefore, whatever technology a county chooses to use, that technology must have safeguards to ensure the highest standards for our democracy.

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REFERENCES

Agre, P. E. (2001). Legitimacy and reason in the Florida election controversy. *Social Studies of Science (Sage), 31*(3), 419.

Agresti, A., & Presnell, B. (2002). Misvotes, undervotes and overvotes: The 2000 presidential election in Florida. *Statistical Science, 17,* 436-440.

Altman, M., & Klass, G. M. (2005). Current research in voting, elections, and technology. *Social Science Computer Review, 23,* 269-273.

Barr, E., Bishop, M., & Gondree, M. (2007). Fixing federal E-voting standards. *Communications of the ACM, 50,* 19-24.

Caltech/MIT Voting Technology Project. (2001). Residual votes attributable to technology: A preliminary assessment of the reliability of existing voting equipment. Retrieved March 12, 2007, from http://www.vote.caltech.edu.

Danielsen, C. S., & Zimmerman, M. (2005). Electronic voting. *Human Rights: Journal of the Section of Individual Rights & Responsibilities, 32,* 9-11.

Dubin, J. A., & Kalsow, G. A. (1996). Comparing absentee and precinct voters: Voting on direct legislation. *Political Behavior, 18,* 393-411.

Florida Department of State: Division of Elections (2003). Analysis and report of the overvotes and undervotes for the 2002 general elections. Retrieved January 15, 2007, from http://election.dos.state.fl.us/reports/electreports.shtml.

Florida Department of State: Division of Elections (2007). Analysis and report of the overvotes and undervotes for the 2006 general elections. Retrieved January 20, 2007, from http://election.dos.state.fl.us/reports/electreports.shtml.

Foster, A. L. (2004). Experts remain at odds over E-voting. *Chronicle of Higher Education, 51,* A19-A19.

Herron, M. C., & Sekhon, J. S. (2003). Overvoting and representation: An examination of overvoted presidential ballots in Broward and Miami-Dade counties. *Electoral Studies, 22,* 21.

Jewett, A. (2001). *Explaining variation in ballot invalidation among Florida counties in the 2000 election.* American Political Science Association.

Kimball, D., & Kropf, M. (2004). *Early and absentee voting and unrecorded votes in the 2002 midterm election.* Midwestern Political Science Association.

Knack, S., & Kropf, M. (2003). Voided ballots in the 1996 presidential election: A county-level analysis. *Journal of Politics, 65,* 881-897.

Knack, S., & Kropf, M. (2002). Who uses inferior voting technology? *PS: Political Science and Politics, 35,* 541-548.

Nagler, J. (1991). The effect of registration laws and education on U.S. voter turnout. *American Political Science Review, 85,*1393-1405.

Nichols, S. M. and Gregory A. S. (1995). Electronic voting machines and ballot roll-off. *American Politics Quarterly, 23,* 300-318.

Shocket, P. A., Heighberger, N. R., & Brown, C. (1992). The effect of voting technology on voting behavior in a simulated multi-candidate city council election: A political experiment of ballot transparency. *Western Political Quarterly, 45,* 521-537.

Sinclair, D.E., & Alvarez, R. M. (2004). Who overvotes, who undervotes, using punchcards? Evidence from Los Angeles County. *Political Research Quarterly, 57,* 15-25.

Songini, M. L. (2007). Diebold flaws pose election risks in Fla. *Computerworld, 41,* 10-10.

Tomz, M., & Houweling, R. P. V. (2003). How does voting equipment affect the racial gap in voided ballots? *American Journal of Political Science, 47,* 46-60.

Wegner, M. (2007). Task force considers probe into disputed Florida election. *CongressDaily,* 9-9.

Yang, E. M., & Gaines, K. (2004). Voting technology and the law: From chads to fads and somewhere in between. *Social Education, 68*(6), 401-407.

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APPENDIX - TABLES AND FIGURES

Table 1: *Mean Comparison for Percent Undervote and Overvote for Precinct Ballots, and Percent Total Undervote and Overvote in 2002 and 2006 by Technology.*

Optical Scan or Touchscreen		Percent Undervote Precinct 2002*	Percent Overvote Precinct 2002*	Percent Total Undervote and Overvote 2002*	Percent Undervote Precinct 2006	Percent Overvote Precinct 2006*	Percent Total Undervote and Overvote 2006
Optical Scan	Mean	.4952	.0385	.7446	.9721	.0733	1.0810
	N	52	.52	52	52	52	52
	Std. Deviation	.29323	.05367	.47120	.52182	.08798	.56850
Touchscreen	Mean	.9247	.0000	1.0373	.9200	.000	.9480
	N	15	15	15	15	15	15
	Std. Deviation	.21464	.00000	.25550	.23649	.00000	.22288
Total	Mean	.5913	.0299	.8101	.9604	.0569	1.0512
	N	67	67	67	67	67	67
	Std. Deviation	.32977	.04986	.44781	.47196	.08323	.51322

* p < .05

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Independent Samples Test		Levene's Test for Equality of Variances				
		Sig.	Sig. (2–tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Percent Undervote Precinct 2002	Equal variances assumed	.286	.000	–.42947	–.59231	–.26664
	Equal variances not assumed		.000	–.42947	–.56972	–.28923
Percent Overvote Precinct 2002	Equal variances assumed	.001	.007	.03846	.01064	.06629
	Equal variances not assumed		.000	.03846	.02352	.05340
Percent Total Undervote and Overvote 2002	Equal variances assumed	.053	.025	–.29272	–.54669	–.03874
	Equal variances not assumed		.003	–.29272	–.47992	–.10552
Percent Undervote Precinct 2006	Equal variances assumed	.045	.709	.05212	–.22595	.33019
	Equal variances not assumed		.584	.05212	–.13784	.24207
Percent Overvote Precinct 2006	Equal variances assumed	.000	.002	.07327	.02766	.11888
	Equal variances not assumed		.000	.07327	.04878	.09776
Percent Total Undervote and Overvote 2006	Equal variances assumed	.063	.381	.13296	–.16794	.43387
	Equal variances not assumed		.178	.13296	–.06235	.32828

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Table 2: *Mean Comparison Table for Percent Undervote and Overvote for Absentee Ballots in the 2002 and 2006 Gubernatorial Elections*

Optical Scan or Touch-screen		Percent Under-vote Absentee Ballot 2002	Percent Overvote Absentee Ballot 2002	Percent Under-vote Absentee Ballots 2006*	Percent Overvote Absentee Ballots 2006
Optical Scan	Mean	.1652	.0219	1.2317	.0958
	N	52	52	52	52
Touchscreen	Mean	.0760	.0187	.7653	.1067
	N	15	15	15	15
Total	Mean	.1452	.0212	1.1273	.0982
	N	67	67	67	67

* $p < .05$

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Independent Samples Test		Levene's Test for Equality of Variances				
		Sig.	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Percent Undervote Absentee Ballot 2002	Equal variances assumed	.078	.164	.08919	-.03726	.21564
	Equal variances not assumed		.017	.08919	.01669	.16170
Percent Overvote Absentee Ballot 2002	Equal variances assumed	.076	.682	.00326	-.01255	.01906
	Equal variances not assumed		.604	.00326	-.00938	.01589
Percent Undervote Absentee Ballots 2006	Equal variances assumed	.003	.038	.46640	.02650	.90629
	Equal variances not assumed		.000	.46640	.22181	.71098
Percent Overvote Absentee Ballots 2006	Equal variances assumed	.653	.917	-.01090	-.21928	.19749
	Equal variances not assumed		.871	-.01090	-.14427	.12247

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Table 3: *Mean Comparison for Touchscreen Voting in Optical Scan and Touchscreen Counties Percent Undervote Precinct 2006 Touchscreen*

Optical Scan or Touchscreen County	Mean	11
Optical Scan Counties	1.3440	52
Touchscreen Counties	.9200	15
Total	1.2491	67

* p < .05

Independent Samples Test		Levene's Test for Equality of Variances				
		Sig.	Sig. (2–tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Percent Undervote Precinct 2006 Touchscreen	Equal variances assumed	.155	.068	.42404	-1.22104	2.06912
	Equal variances not assumed		.344	.42404	-.46633	1.31440

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Table 4: *Mean Comparison for Percent Undervote and Overvote for Percent Undervote, Overvote and Total Voter Error for Precinct Ballots in 2002 and 2006 by Manufacturer and Voting Technology*

Manufacturer and Technology		Percent Undervote Precinct 2002	Percent Overvote Precinct 2002	Percent Total Undervote and Overvote 2002	Percent Undervote Precinct 2006	Percent Overvote Precinct 2006	Percent Total Undervote and Overvote 2006
Diebold Optical Scan	Mean	.4013	0113	.5255	8616	.0326	9600
	N	31	31	31	31	31	31
	Std. Deviation	.20808	.01628	.23001	.45074	.02620	.44994
ES&S Optical Scan	Mean	.6338	.0786	1.0681	1.1352	.1333	1.2595
	N	21	21	21	21	21	21
	Std. Deviation	.34709	.06413	.55002	.58543	.11115	.68140
ES&S Touchscreen	Mean	.9273	.0000	1.0473	.9291	.0000	.9464
	N	11	11	11	11	11	11
	Std. Deviation	.23837	.00000	.28398	.23881	.00000	.22571
Sequoia Touchscreen	Mean	.9175	.0000	1.0100	.8950	.0000	.9525
	N	4	4	4	4	4	4
	Std. Deviation	.15966	.00000	.18565	.26413	.00000	.24891
Total	Mean	.5913	.0299	.8101	.9604	.0569	1.0512
	N	67	67	67	67	67	67
	Std. Deviation	.32977	.04986	.44781	.47196	.08323	.51322

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Independent Samples Test for Diebold Optical Scan and ES&S Optical Scan		**Levene's Test for Equality of Variances**				
		Sig.	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Percent Undervote Precinct 2002	Equal variances assumed	.286	.000	-.42947	-.59231	-.26664
	Equal variances not assumed		.000	-.42947	.56972	-.28923
Percent Overvote Precinct 2002	Equal variances assumed	.001	.007	.03846	.01064	.06629
	Equal variances not assumed		.000	.03846	.02352	.05340
Percent Total Undervote and Overvote 2002	Equal variances assumed	.053	.025	-.29272	-.54669	-.03874
	Equal variances not assumed		.003	-.29272	-.47992	-.10552
Percent Undervote Precinct 2006	Equal variances assumed	.045	.709	.05212	-.22595	.33019
	Equal variances not assumed		.584	.05212	-.13784	.24207
Percent Overvote Precinct 2006	Equal variances assumed	.000	.002	.07327	.02766	.11888
	Equal variances not assumed		.000	.07327	.04878	.09776
Percent Total Undervote and Overvote 2006	Equal variances assumed	.063	.381	.13296	-.16794	.43387
	Equal variances not assumed		.178	.13296	-.06235	.32828

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Independent Samples Test for ES&S Touchscreen and Sequoia Touchscree		**Levene's Test for Equality of Variances**				
		Sig.	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Percent Undervote Precinct 2002	Equal variances assumed	.308	.941	.00977	-.27113	.29067
	Equal variances not assumed		.930	.00977	-.23681	.25635
Percent Total Undervote and Overvote 2002	Equal variances assumed	.397	.813	.03727	-.29642	.37097
	Equal variances not assumed		.775	.03727	-.25130	.32585
Percent Undervote Precinct 2006	Equal variances assumed	.832	.815	.03409	-.27480	.34298
	Equal variances not assumed		.830	.03409	-.35452	.42270
Percent Total Undervote and Overvote 2006	Equal variances assumed	.869	.964	-.00614	-.29786	.28559
	Equal variances not assumed		.967	-.00614	-.37233	.36006

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Figure 1: *Bar Graph of Means for Percent Undervote, Overvote, and Total Voter Error in the 2002 and 2006 Election*