The Outcome of the 2000 Florida Presidential Election: An Econometric Postmortem

by

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I. Introduction

The outcome of the Florida 2000 presidential election was uncertain for 35 days. On the evening of November 7th, after the polls had closed on election day, news organizations first declared that Al Gore, the Democratic presidential candidate, had won the election in Florida. Later that night, they retracted their prediction, announcing that George W. Bush, the Republican candidate, had carried the state of Florida, and had won the presidency. But then the newscasters withdrew that prediction, calling the election too close to call. Recounts started the next day. Debate also began on whether the recount of the ballots should be done by machine or by hand, and whether the recount had to include only particular counties or the whole state. The political debates over the recount were intensified by the fact that Bush's brother, Jeb Bush, was the Republican governor of Florida, and Katherine Harris, the Florida Secretary of State that had to certify the recount, was also a Republican.

On November 21st, 14 days after the election, the Florida Supreme Court ruled in a unanimous 7 - 0 decision that the vote had to include manual recounts done by any county. However, the U.S. Supreme Court stopped this activity on December 4th, asking the Florida Supreme Court to clarify their prior ruling. On December 8th, in a 4 - 3 vote, the Florida Supreme Courted ordered a statewide recount of all disputed ballots. This recount was once again halted by the U.S. Supreme Court on December 9th in a 5 - 4 ruling. Finally, on December 12th, the U.S. Supreme Court ruled in another 5 - 4 judgment that the recount order by the Florida Supreme Court was unconstitutional. On the same day, the Florida legislature approved the slate Republican electors who would vote in the electoral college. These two events assured George

W. Bush the presidency. Gore conceded the election, and Bush declared victory on December 13th.

In analyzing the numerous ballots that were cast incorrectly and not counted, many heard about chads for the first time. If the voting machine embodies punch-card technology, the voter uses a stylus to remove the chad, the small, rectangular piece of paper that is punch out to indicate a vote when read by the machine. However, the chad may fail to be removed completely, and it could be hanging, dimpled, or pregnant. Hanging chad could have one, two, or three corners of the rectangle detached from the ballot. The presence of chad may be one reason why the undervote occurred. An undervote is a ballot where both a machine count and a hand count fail to detect a vote for any presidential candidate.

Alleged flawed ballot designs such as the butterfly ballot or the caterpillar ballot were also analyzed. Poor ballot design or poor voter behavior may have contributed to the overvote. An overvote occurs when both the machine and hand count detects votes for two or more presidential candidates, causing the vote in that race not to be counted. Discomfort over the large numbers of miscast votes caused some to doubt the reliability of the voting machines that used punch cards. However, an overvote could occur with punch-card voting technology or with ballots read by optical scanners.

The election provided comic fodder for late-night talk show hosts, and caricatures of the presidential candidates, Florida elected officials, and the Supreme Court were parodied on national television. Political scientists have studied voting behavior in Florida and the legitimacy of the election. Legal scholars have debated the propriety of the Supreme Court's ruling. Newspapers have analyzed the under- and overvotes, and they have announced their conclusions

on who would have won a recount based on which standard was used during the recount. After the election, statistical analysis of the outcome has grown into a cottage industry.

Using seemingly unrelated equations and county level data, this paper analyzes the outcome of the Florida 2000 presidential election. Six regressions are specified to explain either the odds of an undervote or an overvote occurring, or the odds that the voter would cast his or her ballot for the candidate of the Democrat, Green, Libertarian, Reform, or Republican party. Statistical results indicate the undervotes or overvotes are more likely to occur in counties that used punch-card voting machines. More votes were miscast in those counties that had flawed ballot designs. The occurrence of no votes was directly related to the percentage of minorities in the county, but inversely related to the percentage of college graduates in the county. The odds of voting for a given candidate depended on type of ballot design, socio-economic demographic variables, and the percent of the voters who registered as a party member. In-sample simulations of the estimated model indicate Bush won the election.

Having controlled for those counties that had flaw ballot designs, counterfactual simulations were performed assuming there was the same voter turnout, but no poorly designed ballots. This resulted in fewer under- and overvotes. These simulations show Gore winning the election.

Following this introduction, the second section of this paper briefly reviews the previous econometric literature dealing with election outcomes. Data used in the study are described in the third section of the paper, as is the regression model. The fourth section of the paper reviews the outcome of the empirical estimations and the simulation results. A summary and critique of the results appear in the fifth and final section of the paper.

II. Literature Review: Statistical Studies of Presidential Elections

Studies using national or state data

Several papers report regression results that explain election outcomes using national or state level data. The data set is a time series where each observation is a given election. The dependent variable is usually the percentage of votes garnered by either the Republican or Democratic candidate. The explanatory variables include national economic data, measures of incumbency, and other measures of the incumbent party's political strength. These macro-level studies have included explanatory variables that measure national security concerns, race issues, and other social concerns.[1]

Studies of the 2000 Florida election

After the 2000 Florida presidential election, various statistical studies tried to explain votes for a particular party's candidate. Regressions have explained votes for Bush, Gore, Patrick Buchanan, the Reform party candidate, or Ralph Nader, the Green party candidate. Other studies focused on the level of the residual vote which is equal to the sum of the undervote and the overvote. Several papers analyzed the irregular votes cast in Palm Beach County.[2] Economists such as Bruce Hansen and Robert Shimer have posted papers on their web pages that analyze these issues.[3] The researchers at Sebago have concluded that the irregularities in the voting in the county of Palm Beach were due to the flawed "butterfly" ballot design. Hansen has

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[1]See papers by Fair (1978, 1982, 1988, 1990, and 1996), Campbell (1992), Alesina, Londregan, and Rosenthal (1993), Haynes and Stone (1994), Rosenstone (1983), and Lewis-Beck and Rice (1992).

[2]The consulting business of Sebago Associates, Inc. lists a bibliography of the URLs of the web sites of several papers. The URL of this bibliography is http:/www.sbgo.com/election.htm.

[3]See Hansen's papers at http://www.ssc.wisc.edu/~bhansen/vote/vote.html, while Shimer's work may be found at http://www.princeton.edu/~shimer/election.html.

estimated that overvoting in Palm Beach county cost Gore at least 4,270 more votes than Bush, and as much as 17,710 votes. However, Shimer cautions that conclusions that Palm Beach voted too much for Buchanan may be based on the erroneous assumption of normal residuals.

Regressions using county or precinct level data may include census data to reflect racial differences. Including explanatory variables that measure the percentage of the county's population that was white, black, or Hispanic controls for race effects, but these variables may also capture differences in income and education. Regression studies have controlled for age differences by including explanatory variables that measure the percentage of the county's population that is older than 65 years. Given the large number of retirees living in Florida and their dependence on social security, including this measure of a county's age as an explanatory variable describing election behavior seems appropriate. Some studies have also measured how young a county is by including the percentage of the population between the ages of 18 and 29 as an explanatory variable.

To control for differences in human capital acquisition and income, some studies have included the percentage of the county's population with high school degrees or college degrees as independent variables to explain voting behavior. Differences in education may also capture differences in income. The county's median level of income has been used as an explanatory variable to control for differences in income across counties. Some have alleged certain parties have a gender gap, so studies have included the percentage of the county's population that is female as an independent variable. Finally, to help explain the percentage of votes for the candidate of a given party, some studies have included the percentage of registered voters who had previously registered as a member of that political party.

News media analysis of over- and undervotes

After the election, a group of news organizations hired the National Organization for Research at the University for Chicago (NORC) to analyze 175,010 uncertified ballots from the Florida election.[4] Of these 175,010 ballots, 113,820 were overvotes and 61,190 of them were undervotes. This study has concluded that Bush would have won any hand recount that excluded ballots with overvotes. Excluding the overvote, the study concluded that Bush vote totals were greater than Gore's regardless what standard was used to count voter intentions with hanging chad. It didn't matter whether a vote was counted as official if the chad was completely removed or hanging by one, two, or three corners.

However, if the hand recount included overvotes where the voters' intent was apparent, the news organization concluded that Gore would have run the recount. According to the *St. Petersburg Times:*

> The unprecedented study of ballots that were cast but not counted offers Gore a frustrating point of consolation. More Florida voters clearly intended to vote for him than Bush. But their intentions were thwarted by imperfect voting machines, confusing ballots and fuzzy state law.[5]

III. The Data and the Empirical Model

The data

To analyze the determinants of voting behavior during the Florida 2000 presidential election, six regressions are specified using cross-sectional data from the 67 Florida counties.

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[4]These news organization included *The New York Times*, *The Wall Street Journal*, *The Washington Post*, Tribune Publishing (which includes *Chicago Tribune* and the *Los Angeles Times*), CNN, the Associated Press, the *St. Petersburg Times*, and the *Palm Beach Post*.

[5]See the series of articles published by the *St. Petersburg Times* on February 12, 2001.

The names, transformations, and sources of the raw data are listed in Table 1 of the Data Appendix.[6]

Dependent variables

To proxy the number of overvotes and undervotes in each county, a variable called NO VOTE was constructed. NO VOTE is equal to the turnout of voters in a given county minus the number of counted votes for all the presidential candidates. While NO VOTE includes both the undervote and the overvote, it also includes those who chose not to vote for the presidential race. In addition to the NO VOTE variable, additional variables include each county's votes for Harry Borwne (the Libertarian party's presidential candidate), Buchanan, Bush, Gore, and Nader. County level data on voter turnout, votes, and registered voters comes from the Divisions of Elections of the Florida Department of State.[7]

Six dependent variables were created. The first dependent variable is the number of no votes (NV) as a percentage of voter turnout (TO). Econometric problems occur when the dependent variable is a fraction. The disturbances of the regression are nonnormal and heteroscedastic. The predicted values of the dependent variable are not guaranteed to lie between zero and one, and this could cause problems in simulations. To avoid these statistical problems, the common practice is to take the natural logarithm of the odds ratio. In other words, the transformed dependent variable (lnv) is the natural log of the percentage of no votes divided by one minus the percentage of no votes or

[6]An Excel spreadsheet of the raw data used in this empirical study is available upon request.

[7]See their web page at http://election.dos.state.fl.us/index.html.

$$\text{lnv} = \ln\left(\frac{\text{NV}/\text{TO}}{1 - \text{NV}/\text{TO}}\right). \quad (1)$$

A similar transformation is used for the percentage of the counted votes that were cast for a given party's candidate. Let X be the number of votes cast for a given candidate and let V be the total number of votes for president that were cast and counted in a given county. The dependent variable for each of the five different candidates is the natural log of the odds that the candidate got the vote. The dependent variable for the candidates is the natural logarithm of

$$\left(\frac{\text{X/V}}{1 - \text{X}/\text{V}}\right). \quad (2)$$

Binary variable indicating the county's choice of voting technology

Several explanatory variables are used to describe voting behavior. First, a binary variable named PUNCH is included to control for the type of voting machined used in each county. PUNCH equals one if the county used the punch-card type voting machine, otherwise PUNCH is equal to zero. Those counties using punch-card machines are more likely to have more undervotes caused by hanging chad making the machine unable to detect a vote. Table 2 lists the voting technology used by each of the counties in Florida and the candidate who won each county. After the 2000 general election, use of punch-card voting machines has been discontinued.

Binary variables indicating flawed ballot design

Much of the voting irregularities during the election was blamed on poor ballot design.

Four binary variables are used to indicate four different alleged flaws in ballot design. A list of the different design flaws and the counties that used them is in Table 3. Some claimed that voters were more likely to spoil their ballots when the candidates for the presidential race were printed in two columns. A binary variable called TWOCOL is used to indicate those 16 counties that used this particular ballot design. The two-column design led to an increase in the number of overvotes. New election laws in Florida have prohibited future use of the two-column design.

Another ballot design instructed voters to choose a group of electors. The intent was to have a voter select one candidate, and in doing so, select a group of electors to participate in the electoral college. Instead, confused voters selected a group of different presidential candidates, leading to an increase in the overvote. A binary variable named VOTEGRP indicates the 41 out of 67 Florida counties that used this instruction on the ballots.

The 2000 Florida general election had 12 candidates for president.[8] Consequently, three counties spread the presidential ballot over two pages. This ballot design also leads to overvotes, and a binary variable TWOPAGE was used to indicate the three counties that used this design. The multiple page ballot design of Duval County has become known as the "caterpillar" ballot. Since the Florida 2000 election, the use of multiple page ballots for a given race has been made illegal.

Finally, one county - - Palm Beach - - used the infamous "butterfly" ballot design. This design caused an increase in overvotes that made the ballots invalid. On 5,352 ballots in Palm Beach County, people voted for both Gore and Buchanan. In addition, there were 2,864 double

[8]Florida ballots included candidates from: (1) the Democratic Party, (2) the Republican Party, (3) the Constitution Party, (4) the Socialist Workers Party, (5) the Libertarian Party, (6) the Green Party, (7) the Socialist Party of Florida, (8) the Natural Law Party, (9) the Reform Party, (10) the Workers World Party, and two write in candidates (Chote and McCarthy).

votes cast for Gore and the Socialist candidate. Bush was less adversely affected by the ballot design. There were only 1,700 double votes for Bush and Buchanan. A binary variable BUTTER was included to control for Palm Beach county's ballot design.

Socio-economic and demographic explanatory variables

As indicated in Table 1 of the Data Appendix, four socio-economic and demographic variables are used to control for differences across the 67 counties. A variable named COLLEGE, measuring the percentage of the county's population with college degrees, is included as an explanatory variable, and it controls for differences in human capital across the state. Voting behavior and preferences may vary across races. Therefore a variable named MINORITY measuring the percentage of the county's population that is not Caucasian is also included as an independent variable. To control for any presence of a gender gap in voting behavior, FEMALE is included in the models' specifications, and it measures the percent of females in the county's population. Finally, the impact of the important elderly vote in Florida is controlled by including GE65 which equals the percentage of the county's population that is age 65 or older.

The number of previously registered voters indicating party preference

In explaining the percentage of votes cast for the candidate of a given party, one important explanatory variable is the percentage of previously registered voters who indicated they belong to a given party. Consequently, each regression model that explains the odds that a county voted for the candidate of a given party includes the percentage of registered voters who revealed a preference for that party as an additional explanatory variable.

Specification of the seemingly unrelated regressions

Table 4 lists the initial specifications of the six seemingly unrelated regressions estimated using the variable names defined in Table 1. Seemingly unrelated estimation is used because the error terms of the six equations should be correlated. For example, for a given voter turnout, as the number of no votes increases, the number of counted votes for the various candidates decreases. Likewise, for the same voter turnout, as the number of Democratic votes increases, there are fewer votes for candidates of the other parties.

IV. Estimation and Simulation Results

The six regressions whose specifications are listed in Table 4 are estimated using the linear regression technique of seemingly unrelated regressions. Since the specification of each regression differs by the inclusion of a particular percentage of registered voters, the estimates derived from seemingly unrelated regressions will differ from those estimates derived by estimating each equation separately with ordinary least squares. Table 5, parts 1 and 2, list the seemingly unrelated estimates and their standard errors. Note that Table 5 does not list estimates for all the explanatory variables listed in Table 4. The complete model including every variable in the specification was initially estimated. However, those variables that were not statistically significant at the 10 percent level were omitted from the model, and the model was reestimated. These are the estimates reported in Table 5.[9]

The no vote regression

The regression estimates indicate that the odds of having more no votes are larger in

[9]The results of the initial estimations are available upon request.

counties that used the punch-card voting machine technology. Counties that employed ballots printed in two columns or on more than one page also have larger odds of more no votes. An increased number of no votes were more likely in Palm Beach county with their butterfly ballot. However, ballots that instructed the votes to select a group of electors had no statistically significant effect on the number of no votes. Jonathan Alter, a *Newsweek* columnist, noted that the flawed ballot ballots and poor voting instructions were often the product of Democratic county officials. He writes that the poor ballot design and the faulty voting instructions in Florida climaxed

> a decade of Democrats around the country slitting their own throats by doing nothing to discard the punch-card election system . . . that consistently disenfranchises their most loyal supporters (Atler, 2000).

The number of no votes was proportionally higher among the less educated and minorities, two key Democratic constituencies.

No votes were less likely in counties with a greater percentage of college graduates, but the incidence of no votes was greater in counties with a larger percentage of minorities. Counties with a larger percentage of women voters were no more likely to have more no votes. In addition, increased no votes was no more likely to occur in counties with larger portions of elderly population.

All the estimated coefficients are statistically significant from zero at the five- or one-percent level. While measures of goodness of fit are not as meaningful for models with dependent variables with this logistic structure, the R^2 for this equation was almost 80 percent.

The odds of voting Democratic

According to the estimates reported in Part 1 of Table 5, the odds of a vote being cast for

the Democratic candidate are higher in counties with more college graduates, with more minorities, and with older populations. There was no evidence with counties with a larger female population being more likely to vote Democratic. Thus, the alleged gender bias against the Republican party was not evident in Florida during the 2000 general election. Voting Democratic is more likely in counties with larger numbers of registered Democratic voters.

The choice of punch-card voting technology did not directly adversely affect the number of votes received by the Democratic party. Ballots instructing voters to select a group of electors appear to have cost the Democrats votes. However, voters in Palm Beach county with its notorious butterfly ballot were more likely to vote Democratic.

All the estimated parameters for this equation are statistically significant at the five-percent level or better. However, with an R^2 slightly more than 48 percent, the goodness of fit of this equation does not compare to the no vote equation.

The odds of voting Republican

The odds of voting Republican are inversely related to the percentage of college graduates in the county's population, inversely related to the percentage of minorities in the population, and inversely related to the percentage of the elderly in the population. These results are just the opposite for Democratic votes.

Counties using the "vote for group" instruction where less likely to vote for the Republican candidate. Palm Beach county voters were less likely to vote for Republicans even with the problematic butterfly ballot. Again these effects are the reverse of those observed for the Democratic vote. As expected, those counties with a larger percentage of registered Republican voters were more likely to vote for Bush. Six of the model's coefficients were

significant at the one percent-level, while the slope coefficient associated with the binary variable indicating use of the butterfly ballot was significant at the five-percent level. The model's weak fit, as indicated by the R^2 of nearly 50 percent, is comparable to the fit of the equation that explains Democratic voting behavior.

The odds of voting Reform, Libertarian, or Green

Part 2 of Table 5 lists the estimates of the equations explaining the vote for the candidates of the Green, Libertarian, and Reform parties. Counties with large percentages of female populations were less likely to vote for the Reform candidate, as were counties with a large percentage of college graduates. The Green party was more likely to attract votes from more highly educated, white populations. Counties with more elderly populations were less likely to vote Libertarian. While the percentage of county voters who registered as members of the Green or Libertarian part had a direct effect on the likelihood that voters would select their respective candidates, the percentage of registered Reform Party members failed to be a statistically significant predictor of the odds of voting for Buchanan.

The "vote for group" and butterfly ballot designs appears to have cost the Green party votes. However, both of these qualitative variables were directly related to the likelihood of voting for Buchanan and his Reform Party ticket. The positive coefficient of 1.294 associated with the butterfly ballot in the Reform party regression is statistically significant at the one-percent level, and it does confirm that the flawed ballot design may have contributed to the increased vote for Buchanan in Palm Beach county. The small Libertarian vote appears to be unaffected by each of the four ballot design problems.

Eight of the fourteen regression parameters reported in the second part of Table 5 are

statistically different from zero at the one-percent level of significance. Five of the slope coefficients are statistically different from zero at only the ten-percent level of significance. In terms of goodness of fit, The Reform party equation had an R^2 of almost 55 percent, while the R^2 of the Green party equation was 60 percent. The regression describing the percentage of Libertarian votes has an R^2 of only 20 percent.

In-sample and counterfactual simulations

The model was simulated in-sample to verify its forecasting accuracy. The results of these simulations are in Table 6. The in-sample simulations show that the model under predicts the size of the no vote and the number of Democratic votes, and it over predicts the number of votes received by Republicans. The model predicts that Bush would have won by a margin of 272,806 votes rather than his actual margin of 537 votes. The model predicts that there would have been 163,867 no votes, 14,278 fewer no votes than what actually occurred.

A counterfactual simulation was performed assuming that the voter turnout was the same, and there were no flawed ballot designs, but counties were still permitted to use punch-card voting machines. Since none of the counties were assumed to have one or more of the poor ballot designs, the binary variable for each of the four cases was assigned a value of zero for every county. With all of these binary variables taking a value of zero, the estimated slope coefficients associated with these variables would not affect the forecasted values.

In the case of the no vote equation, the predicted value of the natural log of the odds of getting a no vote was transformed to find the percent of the turnout that would not vote for president in each county. For example, let TO represent the county's voter turnout, and let $\hat{Y}$ be the predicted value of the log of the odds of obtaining a no vote. If $\hat{n}$ is the predicted percentage

of the voter turnout that doesn't vote for a presidential candidate then

$$\hat{n} = \frac{e^{\hat{Y}}}{1 + e^{\hat{Y}}} \qquad (3)$$

and the estimated number of no votes in each county would equal $\hat{N} = \hat{n} \times TO$. The counterfactual simulations indicate that properly designed ballots would reduce the number of no votes to 124,459 votes, a decline of 39,408 compared to what the model predicted would occur with in-sample simulations. Less no votes means more certified votes for the presidential candidates. The corrected number of votes that would actually be counted equals $\hat{V} = TO - \hat{N}$.

The number of predicted votes for each candidate is derived from the transformation of the predicted value from the equations that predict the odds of voting for a given candidate. Assume $\hat{X}$ is the predicted value of the natural log of the odds of voting for a given presidential candidate in a certain county. Therefore, the predicted percentage of the votes received by that candidate equals $\hat{x}$ where

$$\hat{x} = \frac{e^{\hat{X}}}{1 + e^{\hat{X}}} \quad . \qquad (4)$$

The predicted vote for this candidate in a given county equals $\hat{x} \times \hat{V}$.

The counterfactual simulations in Table 6 predict that, given the same voter turnout, Gore would have won the presidency had there been no flawed ballot design, despite continued use of

the punch-card voting machines. The model predicts Gore would have received 3,239,216 votes while Bush only would have garnered 2,995,450 votes, implying a Democratic victory with a margin of 243,766 votes. Votes for the Libertarian and Green party candidates would have increased, but redesign of the Palm Beach butterfly ballot costs the Reform party candidate votes.

V. Summary and critique

Using county level data and seemingly unrelated equations, this paper estimates voting behavior during the Florida 2000 presidential election. For each county, the probability that a no vote was estimated as was the probability that a vote would be cast for one of five different candidates. There is strong statistical evidence that poor ballot design and the use of punch-card voting machines increased the number of no votes. The voting technology by itself did not appear to adversely affect any candidate. But poor ballot design did affect votes for a given candidate. Poor ballot design always cost the Green party votes, and the butterfly ballot in Palm Beach county resulted in more Reform party votes. In-sample simulations of the model predict that Bush would have still won the election. However, if one assumes voter turnout is the same, and if one assumes away poor ballot designs, counterfactual simulations predict that Gore would have carried the state by a 3 percent margin. The counterfactual simulations suggest that flawed ballot design and poor voter behavior in the state of Florida helped cost the Democrats the presidency.

These macro-level results agree with micro-level studies that have analyzed individual over- and undervotes. One way to improve the results is to find or develop an empirical technique that ensures the sum of the predicted number of votes and no votes equals the constant

voter turnout. In the results reported in Table 6, it is possible that the predicted number of votes and no votes in the in-sample and counterfactual simulations result in a greater or lower vote turnout than actual. Nonetheless, this study is meaningful in that it provides additional evidence of the costs of poor ballot design.

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Data Appendix
Table 1
Data: Symbols, Definitions, and Sources

The raw data for the following variables may be found at the Florida Department of State, Division of Elections, at http://election.dos.state.fl.us/index.html.

Variable	Description
$lnv = \log\left(\frac{NV/TO}{1 - NV/TO}\right)$	Log of the odds ratio of not voting for the presidential race. NV = number of no votes. TO = number of voters who turned out for election.
$lnd = \log\left(\frac{D/V}{1 - D/V}\right)$	Log of the odds that a counted vote was cast for the Democratic party candidate. V = number of votes cast for president. D = number of votes cast for Democratic party candidate.
$lnr = \log\left(\frac{R/V}{1 - R/V}\right)$	Log of the odds that a counted vote was cast for the Republican party candidate. V = number of votes cast for president. R = number of votes cast for Republican party candidate.
$lng = \log\left(\frac{G/V}{1 - G/V}\right)$	Log of the odds that a counted vote was cast for the Green party candidate. V = number of votes cast for president. G = number of votes cast for Green party candidate.
$lnl = \log\left(\frac{L/V}{1 - L/V}\right)$	Log of the odds that a counted vote was cast for the Libertarian party candidate. V = number of votes cast for president. L = number of votes cast for Libertarian party candidate.
$lnf = \log\left(\frac{F/V}{1 - F/V}\right)$	Log of the odds that a counted vote was cast for the Reform party candidate. V = number of votes cast for president. F = number of votes cast for Reform party candidate.
RD	Percent of voters who registered as Democrats.
RR	Percent of voters who registered as Republicans.
RG	Percent of voters who registered as Green party.
RL	Percent of voters who registered as Libertarians.
RF	Percent of voters who registered as members of Reform Party.

Table continued on the next page.

Table 1
Data: Symbols, Definitions, and Sources (Continued)

Variable	Description
PUNCH	Binary variable that equals 1 if county used a punch card voting machine; 0 otherwise. Source: Miami Herald (http://www.miami.com).

The source of the raw data for the following variables for the following variables is the St. Petersburg Times (http://www.sptimes.com).

Variable	Description
TWOPAGE	Binary variable that equals 1 if the county's ballots spread the presidential race over two pages; 0 otherwise.
VOTEGRP	Binary variable that equals 1if the county's ballots instructed voters to vote for a group of electors; 0 otherwise.
BUTTER	Binary variable that equals 1 if the county's ballot had the "butterfly" design; 0 otherwise.
TWOCOL	Binary variable that equals 1 if the county's ballot listed the presidential candidates over two columns.

The raw data for the following demographic data come from the "State and County Quick Facts" which may be found on Bureau of Census web page at http://www.census.gov.

Variable	Description
COLLEGE	Percentage of county's population with college degrees.
MINORITY	Percentage of county's population that wasn't classified as "white."
GE65	Percentage of county's population who was 65 years of age or older.
FEMALE	Percentage of the county's population that was female.

Table 2
Voting Systems Used in Florida Counties
During 2000 Presidential Election

Counties Using Punch Card				Counties Using Optical Scanner or Other			
County	Winner	County	Winner	County	Winner	County	Winner
Baker	Bush	Lee	Bush	Alachua	Gore	Levy	Bush
Broward	Gore	Martin	Bush	Bay	Bush	Leon	Gore
Collier	Bush	Miami-Dade	Gore	Bradford	Bush	Liberty	Bush
Columbia	Bush	Osceola	Gore	Brevard	Bush	Manatee	Bush
Desoto	Bush	Palm Beach	Gore	Calhoun*	Bush	Monroe	Gore
Dixie	Bush	Pasco	Gore	Clay	Bush	Okaloosa	Bush
Duval	Bush	Pinellas	Gore	Charlotte	Bush	Okeechobee	Bush
Gilchrist	Bush	Madison	Bush	Citrus	Bush	Orange	Gore
Glades	Bush	Martin	Bush	Escambia	Bush	Polk	Bush
Hardee	Bush	Nassau	Bush	Franklin	Bush	Putnam	Bush
Highlands	Bush	Sarasota	Bush	Gadsden	Gore	Santa Rosa	Bush
Hillsborough	Bush	Sumpter	Bush	Gulf	Bush	Seminole	Bush
Indian River	Bush	Wakulla	Bush	Flagler	Gore	St. Lucie	Gore
Jefferson	Gore			Hamilton	Bush	St. Johns	Bush
				Hendry	Bush	Suwannee	Bush
				Hernando	Gore	Taylor	Bush
				Holmes	Bush	Union*	Bush
				Jackson	Bush	Volusia	Gore
				Lafayette	Bush	Walton	Bush
				Lake	Bush	Washington	Bush

* Calhoun and Union Counties manually tabulated ballots.
Source: *Miami Herald* at http://www.herald.com/archives/elect2000/photoart/systems1113.gif

Table 3
Florida Counties with Alleged Flawed Ballot Design During 2000 Presidential Election

Ballot Design Flaw	Counties
41 counties used the instruction "Vote for Group" of electors	Alachua, Baker, Bay, Bradford, Brevard, Calhoun, Citrus, Clay, Desoto*, Dixie*, Duval*, Escambia, Flagler, Franklin, Gadsden, Gulf, Hamilton, Hendry, Hernando, Holmes, Indian River*, Jackson, Lafayette, Leon, Levy, Manatee, Martin*, Nassau, Okaloosa, Okeechobee, Orange, Palm Beach*, Putnam, Santa Rosa, Seminole, St. John's, Suwannee, Taylor, Union, Wakulla*, Washington
16 counties listed candidates for presidential race over two columns	Bradford, Charlotte, Franklin, Gadsden, Gulf, Hamilton, Hendry, Jackson, Lafayette, Levy, Liberty, Okeechobee, Suwannee, Taylor, Union
3 counties spread presidential race over two pages(i.e., the "caterpillar ballot design")	DeSoto*, Duval*, Nassau*
1 county used "butterfly" design	Palm Beach*

* County used punch card voting machines.

Source: *St. Petersburg Times*: http://www.sptimes.com

Table 4
Specifications of the Seemingly Unrelated Regressions
Included Explanatory Variables Indicated by Yes

	Dependent Variables					
Independent Variables	lnv	lnd	lnr	lng	lnl	lnf
Constant	Yes	Yes	Yes	Yes	Yes	Yes
PUNCH	Yes	Yes	Yes	Yes	Yes	Yes
TWOPAGE	Yes	Yes	Yes	Yes	Yes	Yes
VOTEGRP	Yes	Yes	Yes	Yes	Yes	Yes
BUTTER	Yes	Yes	Yes	Yes	Yes	Yes
TWOCOL	Yes	Yes	Yes	Yes	Yes	Yes
COLLEGE	Yes	Yes	Yes	Yes	Yes	Yes
MINORITY	Yes	Yes	Yes	Yes	Yes	Yes
GE65	Yes	Yes	Yes	Yes	Yes	Yes
FEMALE	Yes	Yes	Yes	Yes	Yes	Yes
RD		Yes				
RR			Yes			
RG				Yes		
RL					Yes	
RF						Yes

Table 5
Seeming Unrelated Regressions Estimation Results: Part 1
Dependent Variables: No Vote, Democratic, and Republican

Independent Variables	Dependent Variables: Log of the Odds Ratio		
	Odds of No Vote	Odds of Voting Democratic	Odds of Voting Republican
Constant	-4.337* (0.213)	-1.283* (0.167)	0.971* (0.161)
Punch Machines Dummy	1.342* (0.139)		
Two Page Dummy	0.636** (0.289)		
Vote for Group Dummy		-0.203* (0.066)	0.190* (0.064)
Butterfly Ballot Dummy	1.080** (0.530)	0.624** (0.284)	-0.609** (0.278)
Two Columns Dummy	1.725* (0.175)		
% Female			
% College Grads	-8.465* (1.817)	3.785* (0.925)	-3.927* (0.902)
% Minority	2.029* (0.599)	1.865* (0.334)	-1.794* (0.330)
% $\geq$ 65 years old		1.857* (0.522)	-1.920* (0.518)
% registered Democrats		0.215* (0.045)	
% Registered Republican			0.328* (0.057)
R^2	0.795	0.484	0.499

* and ** indicate the estimated parameter is statistically different from zero at the 1% and 5% level, respectively, using a two-tail test. Standard errors are in parentheses.

Table 5 (Continued)
Seeming Unrelated Regressions Estimation Results: Part 2
Dependent Variables: Reform, Green, Libertarian

Independent Variables	Dependent Variables: Logs of the Odds Ratio		
	Odds of Voting Reform	Odds of Voting Green	Odds of Voting Libertarian
Constant	-3.850* (0.605)	-4.856* (0.117)	-5.765* (0.149)
Punch Machines Dummy			
Two Page Dummy			
Vote for Group Dummy	0.352* (0.099)	-0.203* (0.066)	
Butterfly Ballot Dummy	1.294* (0.405)	-0.339*** (0.199)	
Two Columns Dummy			
% Female	-2.433*** (1.270)		
% College Grads	-9.197* (1.420)	3.271* (0.839)	
% Minority		-0.427*** (0.244)	
% ≥ 65 years old			-1.192*** (0.680)
% Registered Reform			
% Registered Green		257.249** (96.835)	
% Registered Libertarian			161.487*** (70.244)
R^2	0.547	0.607	0.202

*, **, and *** indicate the estimated parameter is statistically different from zero at the 1%, 5%, and 10% level, respectively, using a two-tail test. Standard errors are in parentheses.

Table 6
Vote in Florida 2000 Presidential Election: Actual, Predicted, and Corrected for Flawed Ballot Design

	Actual Vote		Predicted Vote		Vote Corrected for Flawed Ballot Design	
	Totals	Percent	Totals	Percent	Totals	Percent
Democratic Vote	2,912,253	48.89%	2,752,272	46.53%	3,239,216	50.84%
Green Vote	97,488	1.64	101,159	1.71	104,532	1.64
Libertarian Vote	16,415	0.28	17,899	0.30	18,055	0.28
Reform Vote	17,484	0.29	19,205	0.32	14,053	0.22
Republican Vote	2,912,790	48.90	3,025,078	51.14	2,995,450	47.01
No Votes	178,145	2.90	163,867	2.67	124,459	2.03