Long Lines at Polling Stations?
Observations from an Election Day Field Study[1]

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ABSTRACT

This paper details the design and implementation of an Election Day field study targeting the operation of polling stations. This pilot study represents the first systematic attempt to determine how common lines are on Election Day, at what times of day lines are most likely to form, bottlenecks in the voting process, and how long it takes an average citizen to cast his or her ballot. We collected data during the 2008 presidential primary election in California measuring the efficiency of the operational components of 30 polling stations across three counties. During the Election Day, voter arrivals peaked twice: in the early morning and the early evening. Our data suggest that experienced poll workers are not more efficient than first-time poll workers. We also find that voters who used a DRE machine took a 1 minute 40 seconds longer to cast their ballot than voters marking paper ballots that were subsequently scanned. This study highlights the importance of evaluating polling station operations as a three-step process: voter arrives, voter is served by poll workers, and voter interacts with a voting machine. This study also illustrates the need for further and more extensive data collection about the operation of polling stations to better help election officials make critical decisions on the allocation of capital, labor and other resources.

INTRODUCTION

The success of America's electoral process hinges on the performance of hundreds of thousands of polling places housed in schools, churches, municipal buildings, and neighbors' garages. Local elections officials are charged to manage a process that empowers the poll workers in charge of each station to appropriately administer the service of voting. When this process breaks down, it is critical for these local officials to both identify what is wrong and to adopt effective solutions. Too often, these officials lack the data they need to ensure that they effectively measure both what is wrong and how a policy change will lead to better performance. For example, long lines at polling stations are a visible indication that something is wrong, yet there is very little data to explain the operational inefficiencies that lead to lines at polling stations or to guide policymakers in their choice of remedy.

On February 5, 2008 we dispatched 120 data collectors to 30 California polling stations as part of a study to collect data on the inner-workings of polls and to measure how variations in the voting process may contribute to the formation of a line during an election. This study demonstrates that election day field studies do not necessarily require vast sums of money, armies of volunteers, or complicated research designs. The research also provides a framework for future data collection of this kind on a larger scale.

Voters have long complained about standing in line to vote, but in 2004 the issue garnered national headlines and became the subject of popular concern. In the presidential election of 2004, long lines were reported to have formed in Ohio, Pennsylvania, and Florida – some as long as 10 hours.[4] States attempted to solve the problem of long lines in different ways – early voting, new voting machine technology, revised registration procedures, public service

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[4] Michael Powell and Peter Slevin, "Several Factors Contributed to 'Lost' Voters in Ohio," *Washington Post*, December 15, 2004.

announcements, etc. – by making quick policy decisions without much evidence to predict the outcomes of these decisions. The results were not positive. Long lines were one of the major problems reported by voters during the 2008 election cycle.[5] According to a new MIT survey, these lines may have disenfranchised up to 2.6 million people.[6] Among those who braved long lines to vote, African Americans were twice as likely to report standing in line for more than half an hour than white or Hispanic voters.[7] To confirm these reports, reliable data on actual waiting times and the contributing factors to waiting times is necessary for elections officials to make appropriate adjustments to prevent long lines from forming in future elections.[8]

Unfortunately, there are very little data to explain how the location, personnel, and organization of polling stations affects the flow of voter traffic, the time it takes people to vote, or whether these two variables are related in any way aside from simple post-election, self-reported interviews.[9] This study represents the first systematic attempt to determine how common lines are, at what times of day lines are most likely to form, moments in the voting process where lines might form, and how long it takes the average citizen to cast his or her ballot. This pilot study demonstrates that this kind of data collection is viable and feasible and

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[5] Adam Berinsky et al., "2008 Survey of the Performance of American Elections," (Boston: 2009).. See also Zachary S. Markovits, *Election 2008 Dispatches: Florida* (Pew Charitable Trusts, November 4 2008 [cited March 1 2009]); available from http://www.pewcenteronthestates.org/template_page.aspx?id=45626#Florida., reporting that in Florida, early voting centers experienced lines of over five hours every day in the week before the election.

[6] Berinsky et al., "2008 Survey of the Performance of American Elections."

[7] 29% of black voters stood in line for more than thirty minutes compared to 14% of white voters and 15% of Hispanic voters *Ibid*., 38.

[8] During the long lines that were prevalent during the early voting period of the 2008 Presidential Election, MSNBC host Rachel Maddow suggested that long lines were a modern version of a poll tax, emphasizing the cost of missing work to stand in line and suggesting that minority populations disproportionately stood in longer lines. Although these authors do not take a position on this debate, Michael Peshkin's article summarizes the argument behind Maddow's assertion: http://www.inthesetimes.com/article/4068/are_long_lines_the_new_poll_tax/.

[9] While exit polling is almost exclusively focused on turnout and voter preference, some interviewers ask voters how long they stood in line. See Ryan L. Claassen et al., ""At Your Service": Voter Evaluations of Poll Worker Performance," *American Politics Research* 36, no. 4 (2008).; Berinsky et al., "2008 Survey of the Performance of American Elections."; Robert M. Stein and Greg Vonnahme, "Voting Technology, Election Administration and Voter Performance," *Election Law Journal* 7, no. 2 (2008).

ought to also provide a framework for future data collection of this kind of a larger scale.

Much of the field research on elections focuses on activities that take place before elections, such as voter registration and poll worker training, and uses information that is available after the election, such as turnout and election results, but treat the polling station as a black box. We capture data related to voter arrivals, poll worker availability, voting machine operation, and the length of lines. Our driving independent variable is voting technology although we also analyze how various poll worker characteristics affect the time it takes people to get served at a polling station. This study departs from prior research on elections by peering inside the black box and focusing on the internal operation of polling stations.

One major reason why polling place inefficiency has yet to be adequately addressed is that the administration of elections in the United States is extremely complicated. Each state creates its own rules, budgets its own money, and constructs its own election processes. In some states, local jurisdictions have autonomy over election administration. In addition, the Constitution preserves the right of Congress to supersede state laws when regulating the management of elections for federal office. The result is a complex web of overlapping jurisdictions and 10,071 government units that administer elections each year.[10] To complicate matters further, authority in all jurisdictions is ceded to hundreds of thousands of poll workers on election day who govern the election process and, ultimately, who control the success or failure of each election.

Our study makes two strong contributions to the literature on elections administration. First, we break down the voting experience into a three-step process that is common to all jurisdictions regardless of local rules. Less precise characterizations of the voting process may

[10] "2008 Voting Equipment Study," (Election Data Services, 2008).

fail to account for important variables or lead to unreliable survey responses. Second, we create reliable measures for the arrival rate of voters and the service time of the poll workers and voting machines, respectively. Using these measures, we are better able to predict when voters will arrive at the polls, and to evaluate the efficiency of various poll worker protocols and the effects of different voting technology.

PREVIOUS RESEARCH

Lines form when the supply of a service cannot meet the demand to be served. By increasing the efficiency of voting services, elections administrators may decrease the likelihood of lines forming at polling stations during an election. Unfortunately, elections administrators do not often think of polling stations as operation centers, and much of the research about elections treats the polling station as a black box. Operations research is not prominent in the election literature, although it is extensively employed in the private sector when businesses are looking for ways to boost efficiency or cut costs. More specifically, firms apply the methods of "queuing theory" to study the efficiency of assembly line production, computer processors, and customer-oriented services.[11]

Although operations research is common to private sector research, it has yet to be broadly applied to the study of elections. This study makes a case for doing so and illustrates how to use the framework of queuing theory to improve the voting process.

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[11] For example, in 1997, IBM teamed with Air Canada to apply queuing models to decrease customer wait times for pre-flight services like check-in, security checks, and boarding. They developed a model that allowed Air Canada to run various "what if" simulations. Thus, Air Canada could project the performance outcomes of different resource allocations, such as changing the number of customer service agents or introducing electronic check-in machines. See J. L. Snowdon et al., "IBM Journey Management Library: An Arena System for Airport Simulations," *The Journal of the Operational Research Society* 51, no. 4 (2000).

Lines and Operations

Our study tests the basic assumption of queuing theory that lines form when the rate of service being provided cannot keep pace with arrivals. In every polling station, two services are provided: identity verification and balloting. Thus, we analyze the voting process in three steps: 1) arrival at the polling station, 2) Service One (check-in and identity verification), and 3) Service Two (balloting). See Figure 1.

<Insert Figure 1 about here>

This schematic with serial services illustrates that there are two potential causes of polling station congestion: 1) when Service Two (casting a ballot) takes significantly longer than Service One (checking in), and 2) when either the rate of Service One *or* Service Two cannot keep up with the arrival rate of voters.

The literature that examines polling station congestion and its implications is exhausted in three recent articles. In each of these articles, election day lines are treated as a calculation based on several assumptions of voter behavior rather than observed voter behavior. Two of these articles analyze the 2004 presidential election in Franklin County, Ohio and use proxies for line length that relate solely to Service Two. Ben Highton relies on voting machine allocation as a proxy for variation in line length.[12] Ted Allen and Mikhail Bernshteyn use both machine allocation and ballot length as proxies for line length and also point to after-hours service at polling stations as evidence that long lines persisted throughout the day.[13]

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[12] B. Highton, "Long Lines, Voting Machine Availability, and Turnout: The Case of Franklin County, Ohio in the 2004 Presidential Election," *PS: Political Science and Politics* (2006). Two other online reports also look at the relationship between machine allocation and turnout in Franklin County during the 2004 election; see E. Liddle, "Votes Lost Due to under-Provision of Voting Machines in Franklin County, Ohio," (2009).; and J. Knapp, "Effect of Voting-Machine Allocations on the 2004 Election – Franklin County, Ohio," (2009).
[13] T. Allen and M. Bernshteyn, "Mitigating Voter Waiting Times," *Chance* 19, no. 4 (2006).

These articles illustrate how various administrative decisions can negatively affect voter participation. Indeed, both articles predict that more than 20,000 votes were suppressed in Franklin County because of long lines. However, this research is limited in its scope and by the assumptions upon which it is based. First, by focusing solely on voting machines and ballot length, the authors fail to account for variation in the first service provided to voters at the check-in table and its effect on line length. Second, both articles assume that the arrival rate of voters is randomly distributed throughout the day. Our study aims to both broaden the scope of observation and to use data to test general assumptions about voter behavior.

The third article in the literature of polling station operations employs a simulative queuing model to predict the distribution of average wait times during an election. Using constant arrivals (x) as a base, Bill Edelstein assigns a value of $2x$ to arrivals between the hours of 8:00-9:00 a.m., 12:00-1:00 p.m., and 6:00-7:00 p.m. With this data, Edelstein simulates 10,000 elections to generate a graph of peak wait times based on numerous allocation scenarios of voting machines, and various assumed ballot completion rates.[14] Edelstein's models are a welcome contribution to the field of election operations, and his graphs are a good example of how information about the process might empower voters to make an informed decision about when to go to the polls. Edelstein's simulations are informative as a heuristic measure of the comparative magnitude between different elections scenarios; however, there are missing data that prevent Edelstein from linking his models to actual election day circumstances and voter behavior.

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[14] W. A. Edelstein and A. D. Edelstein, "Touchscreen Voting Machines Cause Long Lines and Disenfranchise Voters," (2008). See also W. A. Edelstein, "New Voting Systems for NY—Long Lines and High Cost " *New Yorkers for Verified Voting* (2006).

Our goal in designing this study is to bring actual data related to the operation of polling stations to bear on these models and to identify not just *when* a line may form, but exactly *where* the process breaks down. Every election administration jurisdiction runs their elections differently, thus our study is certainly not a comprehensive analysis of this issue, nor can it necessarily be universally applied. However, we believe that our dataset is valuable in that it describes the actual processes that underlie how a polling place operates.

STUDY DESIGN

Setting

Voting technology was initially our targeted independent variable and the framework for our study's setting. California is home to 12% of the country's registered voters and in 2006, these voters cast their ballots on one of 13 different models of voting platforms.[15] The many makes and models of voting systems are generally organized into one of three categories – DRE machines, precinct-based optical scanners, and centrally scanned paper ballots. This variation in voting technology between counties provided a natural setting for our study to evaluate the effects of voting technology on line formation and length. On February 5, 2008, one hundred and twenty data collectors monitored the flow of voter traffic at 30 polling stations – 10 polling stations in each of three neighboring Bay Area counties. Each county employed different voting technology: Alameda County voters submitted paper ballots into optical scanners at each polling station, San Mateo County voters used the Hart Intercivic eSlate DRE machine, and Napa County voters cast paper ballots that were collected and later scanned at a central location.

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[15] "Voting Systems Used by Counties," California Secretary of State website. Available at: http://www.sos.ca.gov/elections/voting_systems/systemsinuse_110606.pdf. Last accessed February 1, 2009.

In 2007, California Secretary of State Debra Bowen conducted a "top-to-bottom review" of several voting systems and withdrew her approval for the use of several voting machine models whose manufacturers had failed to meet the Secretary's published standards.[16] Secretary Bowen's decertification of touch-screen DRE machines affected 19 counties who were forced to find new technology within four months of the 2008 presidential primary election. As a result, we were unable to include any touch-screen DRE machines in our sample.[17] The DRE machines that we observed were manufactured by Hart Intercivic and require the voter to spin a rotary "SELECT Wheel" – much like an iPod track wheel – to scroll through the on-screen selections. This DRE, called an eSlate, represents less than 20% of all DRE users nationwide and is used in only twelve states. Although we do not believe that there are significant differences between the efficiency of these two DRE technologies, we are cautious in externalizing the results from our data to all DRE machines.

<u>Selection</u>

There are 58 counties and 25,090 precincts in California. Our sample of ten polling stations in each county allows us to observe small effects among the variables between each county.[18] The thirty polling stations were selected in geographic clusters that were stratified by income. The decision to organize our sample into clusters rather than strict randomization was purely economical. The clusters were arranged such that the transport and support van could

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[16] "Top-to-Bottom Review," California Secretary of State website. Available at: http://www.sos.ca.gov/elections/elections_vsr.htm. Last accessed February 1, 2009.
[17] Touch-screen DRE machines currently service 31% of the total U.S. voting population. See "Fact Sheet: The Different Types of Voting Systems," from the *National Association of Secretaries of State*, citing *electionline.org*. October 22, 2008. Available at: http://nass.org/index.php?option=com_docman&task=doc_download&gid=439. Last accessed February 1, 2009.
[18] Our assumptions going into this power analysis – using Cohen's effect size conventions – were overly conservative. We underestimated the overwhelming turnout that occurred on February 5th, an error that strengthened our data's robustness.

make a stop at each polling station in less than an hour. We stratified our precincts by income to produce an adequate sample of lower income communities in Napa and San Mateo counties and then randomly chose precincts within these strata that were representative of different income levels.[19] The result is a binary variable – "high income" and "low income" – where "high income" is defined as median household income greater than or equal to California's three-year-average median household income of $55,864.[20]

The geographic clusters and the income strata did not perfectly overlap. Thus, each geographic cluster contained at least one "high income" and at least one "low income" polling station. As far as feasible, we selected polling stations within each geographic cluster that represented the heterogeneity that existed in the county as a whole.

Data Collection

The study was structured to record 1) the arrival rate of voters, 2) the attrition rate of the line, 3) the rate of Service One, 4) the rate of Service Two, and 5) general poll worker characteristics.

Our design called for two data collectors (see Figure 2). The first data gatherer recorded the arrival of voters in ten-minute intervals from the opening of the polls at 7:00 a.m. to their close at 8:00 p.m. We noted the arrival of 11,858 people. In addition, we recorded the number of people that reneged. "Reneging" is the technical term for a person who arrived, stood in line, and then left without voting. In our sample, 225 people reneged (1.89% of all arrivals).

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[19] Since Napa County has both a significantly higher median income and, more interestingly, a significantly more polarized income distribution than either of the other two counties, we were careful to prevent this from driving our results.
[20] The 3-year-average was calculated from 2005-2007, in current 2007 dollars, as reported by the U.S. Census Bureau. "Three-Year-Average Median Household Income by State: 2005 - 2007," (U.S. Census Bureau, 2007).

The second data collector noted the exact time in seconds that every fifth voter made contact with the poll workers at the check-in table, physically left the check-in table, physically arrived at the voting booth or station, and physically left the voting booth or station. In Alameda County, the time was noted when the voter scanned his or her ballot. Thus, we were able to calculate the service times for 2,160 voters.

<Insert Figure 2 about here >

Our data gatherers also administered a short questionnaire to 153 poll workers (89%) with simple demographic and poll worker history information.[21] This allowed us to link the characteristics of each poll worker to the voters they assisted and, thus, to measure the effects of a poll worker's age, race, sex, income level, employment status, education level, and experience on their rate of service.

FINDINGS

Our study yielded data on actual line lengths at the polls, the arrival rate of voters, an attrition rate, the number of minutes voters spent at Service One and the number of minutes voters spent at Service Two. This data begins to shed some light on the processes inside the walls of a polling place.

We found that voter arrivals are not randomly distributed across the day and, more importantly, that Service One and Service Two are more or less constant throughout the day and do not respond to changes in the rate of voter arrivals (see Figure 3).[22]

<Insert Figure 3 about here>

[21] See Appendix A.
[22] We observed one small change: ballot completion (Service Two) took slightly *longer* as the day went on (Alameda R^2 = 0.08758; Napa R^2 = 0.08766; San Mateo R^2 = .04918).

This suggests that there is a threshold of arrivals beyond which the constant service rate in our sample could not accommodate. Figure 4 illustrates that lines were most likely to form in our sample during the afternoon hours of 5:00 p.m. and 7:00 p.m.

Line Length

Indeed, the lines in our sample were longest between the hours of 5:00 p.m. and 7:00 p.m. Figure 4 represents the cumulative line lengths in each county. Thus, the highest data point of 33 represents the number of people standing in line in all of San Mateo County. Across our sample, the median line length was zero and the longest line of the day comprised thirteen people. Just fifty-one voters waited in line longer than 10 minutes.

<Insert Figure 4 about here >

We are therefore forced to extrapolate how and when lines will form from a sample in which lines did not form. We are able to do this using the basic model of queuing theory that a line forms when arrivals exceed the polling station's service capacity. Thus, our data on arrivals and service rates is useful for identifying bottlenecks in the voting process that lead to long lines. Our data reveal key variables for improving the service rates, should voter arrivals cross this threshold.

Voter Arrivals

Voters arrive at a polling place in some measurable variable rate throughout the course of an election day. Knowledge about this flow of traffic is critical for any local election official attempting to make allocation decisions about poll workers, voting machines and other resources. Most officials look to general data on turnout when allocating resources for election day, but there is very little data that describes when voters actually arrive throughout the day.[23] We discovered that the arrival rate of voters is not constant throughout the day. Figure 5 shows the density function for the number of arrivals in our sample.

<Insert Figure 5 about here >

The uniformity we observed both within and between counties suggests that the arrival rate of voters may be predictable. This is not to say that all jurisdictions would see this same double-humped pattern; however, some discernible pattern is likely.[24] In our sample, voters arrived at approximately the same rate: a small surge during the first hour of operation, then a noticeable dip during the lunchtime hours of 12:00-2:00 p.m. followed by a wave of voters (~150% increase) between 5:00-7:00 p.m. Arrivals sharply declined after 7:00 p.m. and just 3% of voters cast a ballot in the final 30 minutes of the day.

In addition to providing poll workers a better sense of traffic flow, this information about arrivals is important for political reasons. In 2001, for example, Karl Rove complained that

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[23] Gary Smith, Election Director in Forsyth County, Georgia, and Matt Damschroder, Deputy Election Director in Franklin County, Ohio both reallocated voting machines and poll workers based on the number of people who had voted early in particular precincts. By comparing the percentage of registered voters in each precinct to the number of people who had voted early in those precincts, they were better able to determine what precincts would have higher traffic flow on Election Day.

In addition, there are a few examples of states attempting to collect arrival data. In Maryland, state officials used 5,500 electronic poll books for the September 2006 primary election that could track the time people checked in at the registration table. These data are somewhat different from an arrival rate as they do not account for voters who arrive when there is a queue, nor gauge line attrition (See Dan Seligson, "How Data Has Improved Election Management," in *Data For Democracy* (Washington, DC: Pew Center on the States, 2008).

[24] We are cautious about the external validity of our findings; anecdotal reports from Florida during the November 2008 general election suggest that lines were consistently longer in the early morning hours, but consistently very short in the late afternoon and evening. However, there is evidence that voters in other jurisdictions arrive in a pattern quite similar to what we observed. For example, Magelby and Christensen found a similar, double-humped pattern of arrivals in Utah, Walla Walla County, WA, Los Angeles County, CA, and Alameda County, CA from data that span almost 10 years of elections. See Magelby, D. and H. Christensen. “When People Vote and What Difference It Makes.” Prepared for presentation at the Annual Meetings of the American Political Science Association, New York, New York, September 1-4, 1994. Furthermore, in 2006 the commissioner of elections in Columbia County, New York (pop. 63,000) recorded the number of voters who arrived in each of the two-hour intervals throughout Election Day. Twenty to twenty-five percent of all voters arrived at the polls between 4:00 p.m. and 6:00 p.m. and that there was very little variation between the 56 reporting districts. See K. Dow, "Study of Voter Flow at the 2006 General Election, Columbia County, NY," (New Yorkers for Verified Voting, 2007).

15,000 voters were deterred from voting in Florida's panhandle in 2000 after several network news programs called the election for Al Gore ten minutes before the polls closed.[25] Rove was convinced that a large percentage of voters procrastinated until the final hour before going to the polls.[26] Our data suggest that that may not have been the case.

Most importantly, however, is that data on voter arrivals is not reliably available to most election administrators, yet it is simple to capture and is critical in order to properly allocate poll workers, voting machines, and other resources.

Attrition

Other important, yet missing data relate to the deterrent effect of lines. In our sample of 11,858 voters, 225 people (1.89%)[27] "reneged" which is queuing theory parlance for somebody who arrives at the polls, stands in line for a period of time, and then leaves without voting (See Figure 6).[28] There were two small, yet noticeable reneging peaks during the day: the first during the lunch hour when many voters are constrained for time, and the second between 5:00 and 7:00 p.m. when lines were at their longest.

<Insert Figure 6 about here >

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[25] K. Jamieson and P. Waldman, eds., *Electing the President, 2000: The Insiders' View* (Philadelphia: Univ. of Pennsylvania Press, 2001). p. 232.
[26] Early media projections of Ronald Reagan's victory in 1980 angered voters in California where the polls were still open for more than 2 hours. See Field Institute. "Attitudes Toward Media Coverage of the November 1980 Presidential Election." San Francisco, CA: The Field Institute. 1981. There is some evidence of depressed turnout when media projections are substantially early, i.e. 2 or more hours before the polls close. See Crespin, M. and R. Vander Wielen. "The Influence of Media Projections on Voter Turnout In Presidential Elections from 1980-2000," Prepared for presentation at the Annual Meetings of the Midwest Political Science Association, Chicago, IL, April 25-28, 2002.
[27] The percent of lost votes due to reneging is likely conservative due to the public's high interest in voting for Hillary Clinton or Barack Obama in the primary election as well as the fact that there were generally very short lines in our sample.
[28] We were unable to track people once they left the polling station. Our data collectors were instructed to note an instance of reneging only if the person who left the line did not return. In practice, however, if a person left the line and was gone for several hours, our data collectors likely did not remember who they were and they were tallied as having arrived twice and reneged once.

Assuming that people who renege do not all belong to the same party, our finding suggests that the votes lost because of reneging may have an effect on the outcome in races or ballot measures decided by less than 1%. Since 1998, one statewide primary race in California was decided by less than 1% and six state senate and state assembly member primary races were decided by less than 1%.[29] Furthermore the vote differentials in 21 counties were less than 1% in nine ballot measure elections and six political races (all for a minor party nomination). This suggests that data on reneging is important as a measure of both the internalized cost of standing in line as well as the effect of long lines on turnout and election results. With more information from a sample where long lines were present, we may be able to determine with more confidence how the length of an election day line affects the outcome of a close race.

Service One

Service One includes all of the activities that occur at the check-in table such as checking ID, looking up the voter's name in the voter registration book, and producing a ballot or voting card. These tasks aim to verify the voter's identity and provide him or her with either a voting card for a direct recording electronic (DRE) voting machine or a blank paper ballot. The most important independent variable in Service One is the poll worker. The components that directly affect the performance of a poll worker should have a measurable effect on the efficiency of Service One and thus the voting process at large.

Table 1 shows the results of four ordinary least squares regressions that model the Check-in Service Time of voters in our sample on a host of relevant factors, both operational and social. The reported standard errors are robust standard errors, clustered by polling station. The first

[29] See Appendix B for information on California election returns.

variable in the table is a dummy variable that shows if the poll worker that served the voter at the check-in table was over 55 years old. The second variable is a dummy variable that shows if the poll worker that serves the voter has experience as a poll worker. In order to show robust significance, we also include an interaction variable between age and experience as well as an interaction variable between age and the San Mateo County dummy variable, which is toggled on and off. Because earlier studies have shown that older poll workers are generally less comfortable with DRE machines than younger poll workers, we include this interaction to account for the possibility that this discomfort would be driving a resultant slower service time.[30] We do not include an interaction between the San Mateo dummy and experience because this election was the first time San Mateo County used these voting machines so any interaction between these dummies would be coincidental.[31]

<Insert Table 1 about here >

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[30] Initial assessments have found that poll workers are not particularly confident in their ability to avoid mistakes. A post-primary survey of poll workers in Cuyahoga County, Ohio found that only 42 percent were satisfied with their own performance on election day (see Karen Frakas, "Study: Poll Workers, Not Machines, Build Voter Confidence," *The Plain Dealer*, February 21 2007. Another study has shown that as poll workers get older they become less confident that the ballots cast are actually counted. This is mediated a bit if they are comfortable using the Internet, but not enough to diminish the effect of their age (See R. M. Alvarez, M. Llewellyn, and T. E. Hall, "Are Americans Confident Their Ballots Are Counted? ," in *VTP WORKING PAPER #49* (Caltech Voting Technology Project, 2006).R. M. Alvarez, M. Llewellyn, and T. E. Hall, "Are Americans Confident Their Ballots Are Counted?," in *VTP WORKING PAPER #49* (Caltech Voting Technology Project, 2006). Such diminished confidence is typically driven by poll workers' discomfort with newer machinery. Hall et al.'s study asserts that the older poll workers have trouble understanding and working with new electronic voting machines. They found that poll workers over the age of 55 were significantly more likely to have start-up or shut-down problems with electronic machines than younger poll workers (see T. Hall, J. Q. Monson, and K. D. Patterson, "Poll Workers and the Vitality of Democracy: An Early Assessment," *PS: Political Science and Politics* (2007).

Poll workers also identify as "unhappy" with their job when they are unprepared, a fact consistent across all gender and racial groups. This has an impact on the quality of the work that poll workers do. It seems that many perform this job out of a sense of civic responsibility or duty and not out of enjoyment or for financial gain (as the compensation rates are typically quite small). As such, unhappiness with their job could lead to a shirking of responsibility and a diminished attention to detail. Hall et al. suggest that these issues arise from a lack of training.

[31] These county dummy variables are acting as proxies for machine type. It is certainly possible that this could be picking up other variation between the counties, but each regression includes local demographic characteristics, such as population density, education, and family income, as well as election characteristics, such as arrival rate, provisional balloting, and absentee drop-offs to control for alternative explanations for the variation.

Several of our early assumptions were confirmed by our data. With a check-in baseline of 1 minute 50 seconds, disabled voters required 43 more seconds of the poll worker's time. Voters who cast provisional ballots were at the table twice as long as traditional voters – two minutes and thirty-seven seconds – while absentee voters stood at the table for half the time of traditional voters – fifty-six seconds. There was a significant increase in poll worker efficiency at polling stations in high-income neighborhoods. For each additional $10,000 of median household income in the Census block group most closely aligned to the precinct, voters could expect to shave off eleven seconds of standing at the check-in table. Thus, voters in some neighborhoods of Napa County where median household income is $46,000 can expect to wait at the check-in table for two full minutes longer than voters in other neighborhoods of Napa County where median household income exceeds $200,000.

Two findings surprised us and were completely contrary to our *a priori* hypotheses. First, experienced poll workers were not necessarily more efficient. Poll workers who had worked one or more elections spent, on average, twenty-three additional seconds with each voter than their counterparts who were working as poll workers for the very first time. This finding was statistically significant at the $p < 0.001$ value. When we controlled for age, using a dummy variable for poll workers 55 years of age or older, the coefficient for experienced poll workers increased to thirty-one seconds, but lost its significance ($p = 0.054$). In any event, we cannot reject the counterintuitive hypothesis that experienced poll workers are less efficient. With all of the changing rules and regulations between elections, it may be the case that poll workers with experience are more likely to become confused about applying a rule that has changed several times. It may also be the case that experienced poll workers are just more relaxed and likely to visit with voters whom they have served over the past several years.[32] In any case, we did not expect a positive coefficient of nearly 30 seconds for experienced poll workers.

Second, we found that number of poll workers in our sample is positively correlated to the length of the lines that we observed. There is almost certainly some level of simultaneity between the variables so we are uncertain whether additional poll workers get in each other's way or, if upon seeing a long line forming, additional poll workers run to the table to help their co-workers.[33] In our model, additional poll workers did not make the process any more efficient. Thus, regardless of why additional poll workers are positively correlated to a longer line, extra human capital may not be the most efficient solution to the operational problem of long lines. One possible explanation is that poll workers are poorly trained; researchers have recently evaluated poll worker training programs as a way to assess poll worker efficiency.[34] A more complex, but probably more realistic explanation is to view poll worker inefficiency as the product of a system design failure. In a polling station, the tasks at the check-in table are very

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[32] Poll workers in Utah and Ohio reported that "being with people I enjoy" was the third most important motivating factor for their service (behind "doing my share" and "it is my civic duty"). In Franklin County, OH, 78.9% of poll workers reported that the social opportunity of being a poll worker was either very important or somewhat important. In Summit County, OH, 80% said it was important and across the state of Utah 85.1% said social opportunity was important. See Monson, Q. "Evaluating the Quality of the Voting Experience: A Cross Panel Pilot Study of the November 7, 2006 Election in Franklin County, OH, Summit County, OH and the State of Utah." *Center for the Study of Elections and Democracy*, 2008.

[33] We regressed line length on the number of poll workers at the check in table, controlling for service time, county effects, poll worker demographic effects, arrival and reneging rates only to find a 0.095 positive correlation ($p<0.05$). Yet when we reversed the two variables of interest – regressing number of poll workers on line length and the host of other variables – we saw a similar 0.036 positive correlation ($p<0.025$).

[34] The EAC, for example, created a briefing book of "best practices" for poll worker trainings based on surveys they conducted of local elections officials throughout the states. Although it proves to be a valuable and extensive guide to the practices used throughout the United States, the methodology used to test efficiency is mostly anecdotal (See U.S. Election Assistance Commission, "Successful Practices for Poll Worker Recruitment, Training and Retention," (Washington: 2007).). Researchers from Brigham Young University and the University of Cincinnati assessed the impact of online training in improving potential poll workers' knowledge of various election rules in Delaware and Butler Counties, Ohio. Prospective poll workers were randomly assigned into two groups, one receiving only in-person training, and the other receiving both in-person and online training. In an assessment of pre- and post-training assessments, those that received both online and in-person training scored better on both questions they were trained on and questions that they were not (See Stephen T. Mockabee, J. Quin Monson, and Kelly D. Patterson, "Evaluating on-Line Training: A Study of Poll Worker Training in Butler and Delaware Counties, Ohio for the March 4, 2008 Presidential Primary Election," (Provo: Center for the Study of Elections and Democracy (CSED) at Brigham Young University, 2008).

simple, and not well suited to many operators. For example, it only takes one person to scan for a voter's name on an alphabetized list of registered voters. Thus, an additional poll worker may actually hinder the process. Rather than designing a system that encourages the use of quickly trained, potentially uneducated volunteers, we tend to treat these volunteers as full workers with significant institutional knowledge and some innate ability to properly allocate human capital.[35]

Service Two

The second server in the voting process is a voting platform. This service encompasses the voter's complete interaction with the ballot, including the technological medium through which this interaction takes place.

Service Two incorporates the length and design of ballots, the design and model of a voting machine, and the number of voting machines or privacy booths in use. For every voter, a unique ballot is marked, verified, and tabulated. Different voting technologies combine these processes in different ways. For example, most voters in the United States mark a paper ballot that they feed into an electronic optical scanner. This scanner combines the process of verification and tabulation. In a growing number of jurisdictions, voters use direct recording electronic (DRE) machines that combine all three processes into one act.[36]

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[35] See Appendix B for more information on the management of poll workers.

[36] In the aftermath of the 2000 presidential election in Florida, the United States Congress enacted the Help America Vote Act which, *inter alia*, requires states to replace old voting systems (specifically the problematic punch card system) with new, electronic voting machines that allow voters to verify their ballot before it is officially counted. The result has been a nationwide trend toward optical scanners and DRE machines. In 2000, 41.9% of registered voters lived in a county that used either an optical scanner or DRE machine (See "Voting Equipment Summary by Type as of 11/07/2000," (Election Data Services, 2004). In 2008, that number increased to 88.8% (See "2008 Voting Equipment Study." See *supra* n. 9). Electronic machines have not been implemented uniformly within states, however. For example, in Idaho some counties use punchcard machines, other counties use optical scanners, and still others hand count paper ballots (*Ibid*). In California, most counties use precinct-based optical scanners, although a few counties employ DRE machines, and two counties used a countywide central scanner in 2008. While this variation within states is potentially problematic from an equal protection standpoint, it provides a natural setting to compare the impact of the three most common voting technologies on the voting process.

Voting technology is our key independent variable on waiting times. Each county we observed employed a different voting platform. In Alameda County voters used paper ballots ("complete the arrow") that were scanned at each polling station. Napa County also used paper ballots, but stored them to scan at a central location at the end of Election Day. San Mateo County used DRE machines manufactured by Hart Intercivic.

Voters in Napa County spent about three minutes in the voting booth. Voters in Alameda County spent an extra 25 seconds in the voting booth while voters in San Mateo County required 90 additional seconds each to complete their ballot, an increase of 150% (see Figure 7). This finding contradicts the claims that by combining vote recording, vote verification, and vote counting on state-of-the-art machines, the process becomes more efficient.

<Insert Figure 7 about here>

How much is the technology itself to blame? There are several factors that might contribute to this disparity, notably the tendency to cast an incomplete paper ballot, the length of the ballot, and the various socio-economic characteristics that differ by county.

Undervoting

One possible explanation for why DRE machines could take longer to use is that DRE users voted for more ballot issues than paper ballot voters. When a voter using a paper ballot decides to skip one or two measures, he or she can still submit the ballot to the scanner without incident. On a DRE machine, if a voter decides to skip a measure, he or she will be reminded that the ballot is incomplete and given the opportunity (with the press of a button) to go back and complete the ballot. Therefore, the process of casting a complete ballot on a DRE is simpler and less costly in terms of time and energy. One possible explanation for longer vote times at DRE machines may be that a larger ratio of voters cast a *complete* ballot than those who vote via paper ballots. If true, the observed inefficiency of the DRE machines may be justified for the sake of thoroughly capturing the preferences of voters. However we did not observe a disparity in ballot completion rates between counties.

<Insert Table 2 about here >

The biggest difference between precincts is the percent of ballots cast for major party presidential candidates. This entire difference can be explained by the fact that voters in Alameda County were more than four times as likely to vote for Green Party candidate Cynthia McKinney and twice as likely to vote for a Libertarian candidate than voters in the other two counties. Among the seven state ballot initiatives, there was less than 1% difference in votes cast between counties and three of the seven ballot propositions saw a higher overall percent of votes among paper ballot voters in Alameda County than among voters using a DRE machine in San Mateo County (See Table 2).

Thus, while it is more time consuming to cast an incomplete ballot using a DRE, it does not appear to be the case that ballot completion rates are driving the difference in service times.

Ballot Length

One very obvious reason that voters would take longer to vote in one county over another is that the ballot is longer. There were seven measures on the ballot in both Alameda and San Mateo counties, and four measures on the ballot in Napa County. Holding the number of races and ballot measures constant, we estimated an ordinary least squares regression to measure the effect of ballot length on voting time (see Table 3). Controlling for ballot length resulted in a 10 second increase in the difference between San Mateo DRE voters and Napa paper ballot voters. Thus, it is not the case that the differences in ballot lengths explains the extra time required to vote on a DRE machine.

Socio-Economic Status Effect

In addition to mechanical differences between counties – undervotes and ballot length – demographic dissimilarities may be a good predictor of how long it takes to vote and provide a better sense of the contributing effect of voting technology. For each of our 30 monitored precincts, we gathered Census data on precinct-level median household income, percent with a bachelor's degree or more, population density, and the percent of voting age population that is African American, Hispanic, and Asian. Furthermore, we know the sex of each voter in our sample and whether he or she used voting equipment reserved for the disabled. We added several mechanical control variables such as machine errors, provisional ballots, arrival rate, number of poll workers, number of voting booths, San Mateo voters that used paper, and controlled for ballot length in order to analyze the effect of these operational and socio-economic factors on voting time (see Table 3). In order to account for possible variation caused by a mixture of data from distinct units of analysis, we report robust standard errors that are clustered by each polling station.

<Table 3: Model of Factors Affecting Voting Time >

None of the socio-economic characteristics themselves have a significant effect. However, the cluster of polling stations in neighborhoods that exceeded California's median household income saw voters cast their ballots on average 32 seconds faster than those who live in neighborhoods that fell below California's median household income of $55,864. Regardless, after controlling for 14 operational and social variables, including ballot length, voters who used a DRE took on average 1 minute 40 seconds longer to vote than voters using paper ballots. Thus, it is likely that the technology of the voting machine *itself* explains much of the variation in voting times. To test this hypothesis, we compared DRE voters in San Mateo with their in-county peers who opted to use paper ballots. On average, DRE voters spent 2 minutes 48 seconds longer to cast their ballots than their paper ballot counterparts. The difference is so distinct that even with a small sample (n=34), the significance was very high ($p < 0.000$).

This finding is important in light of the fact that DRE machines are significantly more expensive than paper ballot privacy booths and which may lead to fewer stations for voters in DRE jurisdictions.[37] Thus, not only does it take longer to use a DRE machine, but there may be fewer of them than privacy booths available to paper ballot voters. In this case, a polling station that employs DRE voting machines would be more likely to see a line form on election day.

DISCUSSION AND FUTURE RESEARCH

This study presents the first comprehensive look at the inner working of the polling place. This study highlights the importance of evaluating polling station operations as a three-step process: voter arrivals and a serial service. The bulk of research on lines focuses on the voting machine, and how their poor allocation may be correlated with depressed turnout. This research fails to account for the very important step – and potential bottleneck – of checking in. Additionally, post election surveys often ask questions related to "voting" that may lead to unreliable responses. For example, the question "how long did it take you to vote" may elicit responses that relate to the time a voter spent in the voting booth, or time she spent inside the polling station, or the time she spent away from work. Our goal was simply to improve on earlier studies that either collected partial information or made assumptions about unobserved voter behavior by filling in data gaps and offering a compelling case for evaluating the voting

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[37] In extreme cases, the cost of DRE machines is so high that states are forced to consolidate precincts and yet still face a shortage of voting stations on election day. The implications of this downsizing was apparent in Utah County during the 2008 primary election where 107 precincts were consolidated into 59. See Rigert, M. "Long Waits at the Polls Mark Election," *Daily Herald*, February 7 2008.

process in a more specific way. In doing so, we have collected the most comprehensive data to date on the operations and inner workings of the polling place.

Recently, election administration issues have been propelled into the national spotlight. The Pew Center on the States held a conference in May 2008 dedicated to the better use of data in administering elections. From that conference came a report, “Data for Democracy,” and a sustained effort to seek better performance in government when it comes to conducting elections. In her new book specifically on this topic, Heather Gerken digs into the operation of elections by noting that although we spend a lot of time thinking about what is wrong with our election system and about possible solutions, we spend very little time determining how to get from the problem to the solution.[38] Part of the bridge between those two points is collecting and using data to analyze our system so that we begin to adopt the policy tools, management techniques, and fiscal discipline in our nation’s elections that we expect from good government.

Our data is a good start, but it is limited in important ways and we are reserved about their external validity. Elections vary from jurisdiction to jurisdiction and from election year to election year. Our findings paint an introductory picture and illustrate the need for further and more extensive data collection about the operation of polling stations if we are going to have any idea of how the process actually works. If our study was replicated on a larger scale and across many different election cycles, the data yield would prove invaluable for local election officials charged with administering our country’s elections.

[38] Heather K. Gerken, "The Democracy Index," (Princeton: Princeton University Press, 2009).

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FIGURE 1: Collecting Data on the Three Steps of the Voting Process

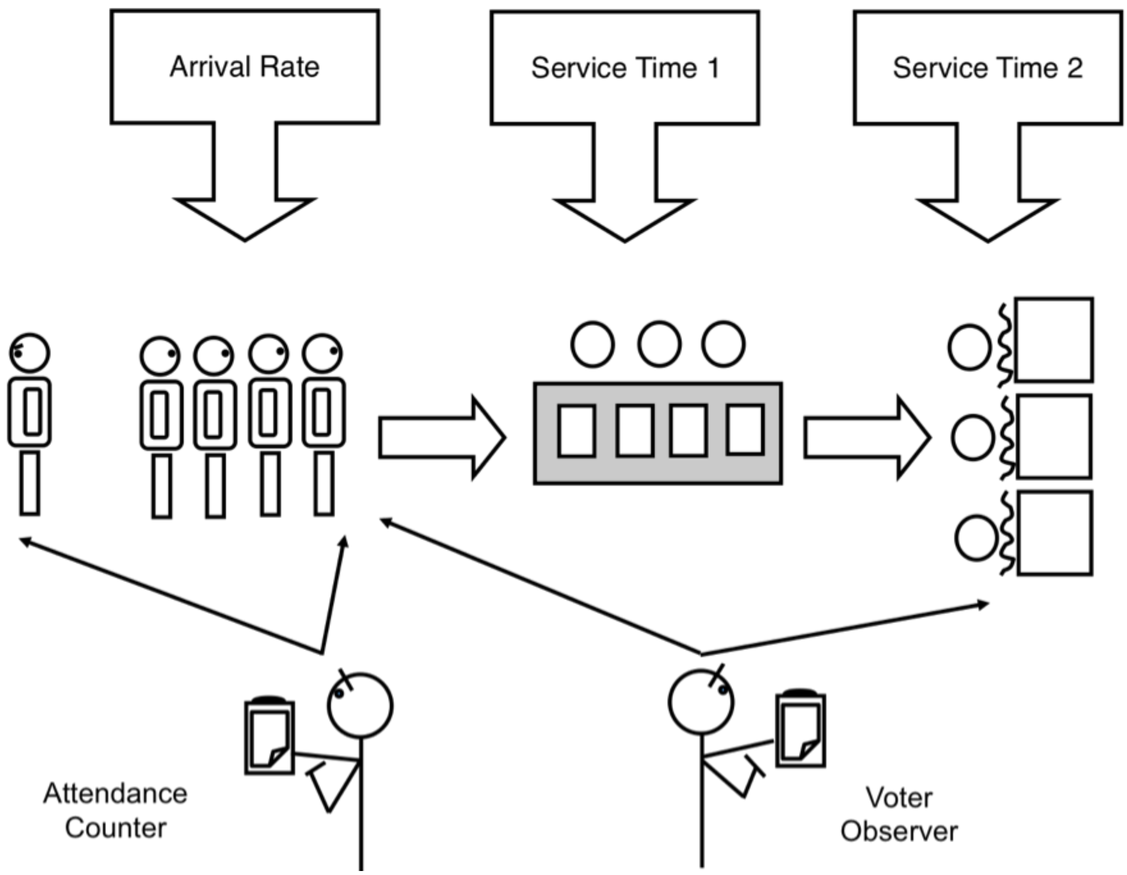

FIGURE 2: Rates of Service Over the Rate of Voter Arrivals

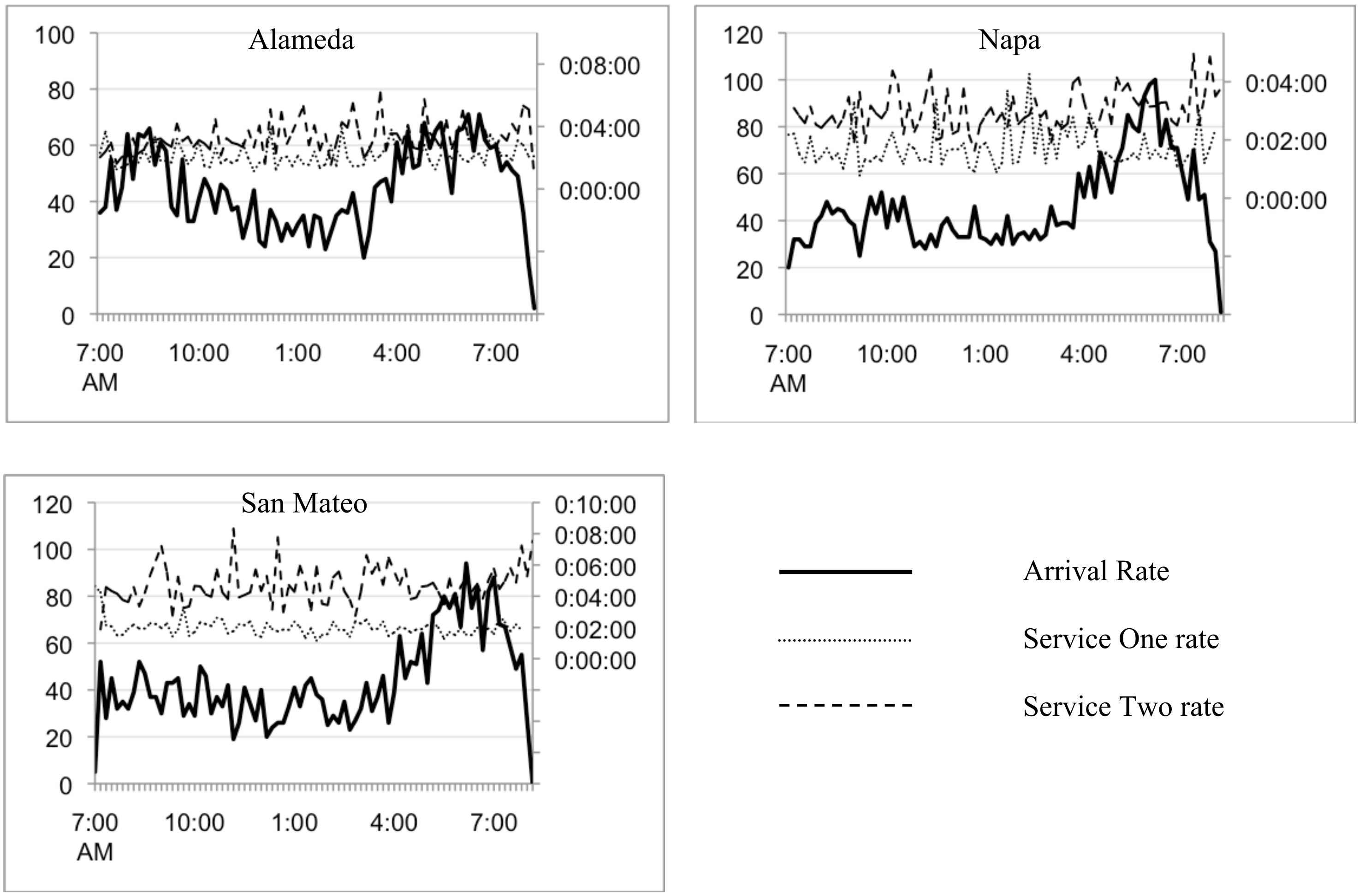

FIGURE 3: Number of People in Line by County

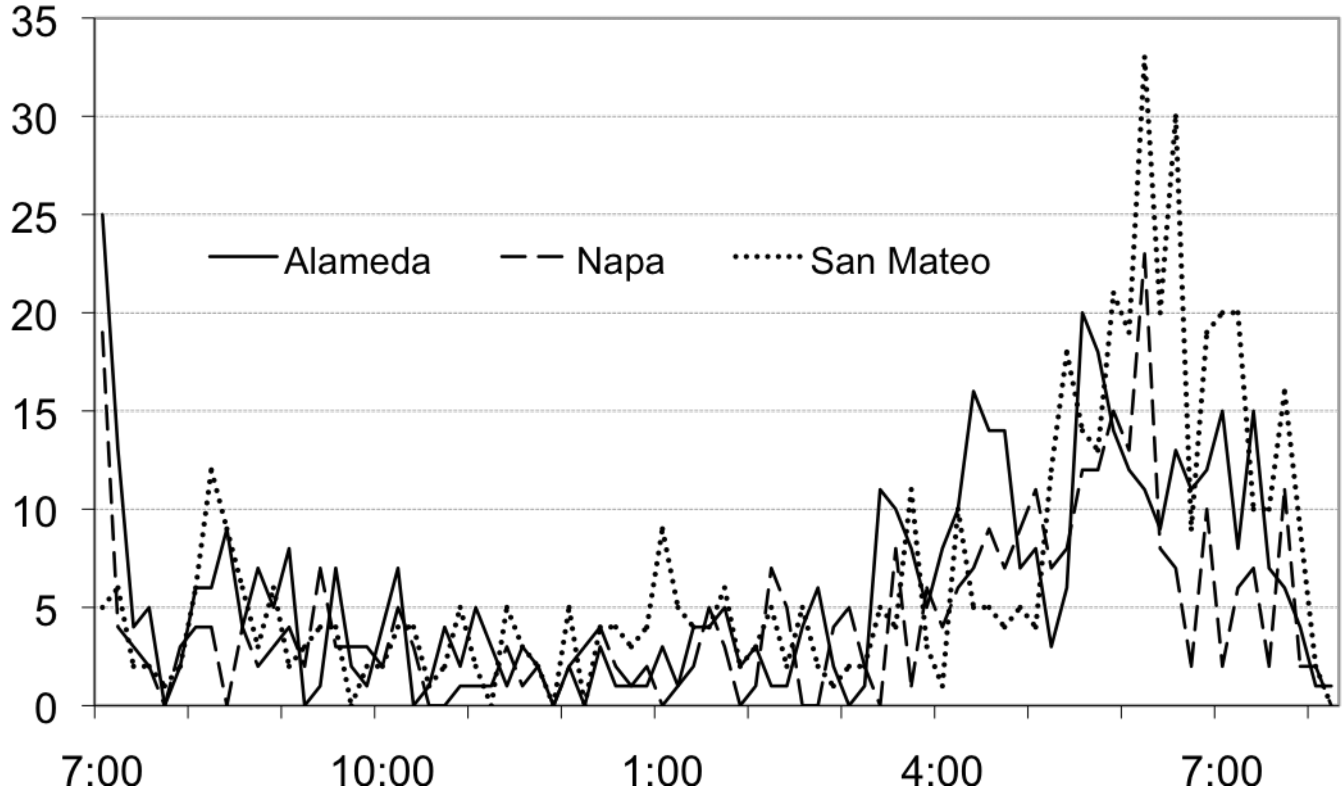

FIGURE 4: Arrival Distribution by County

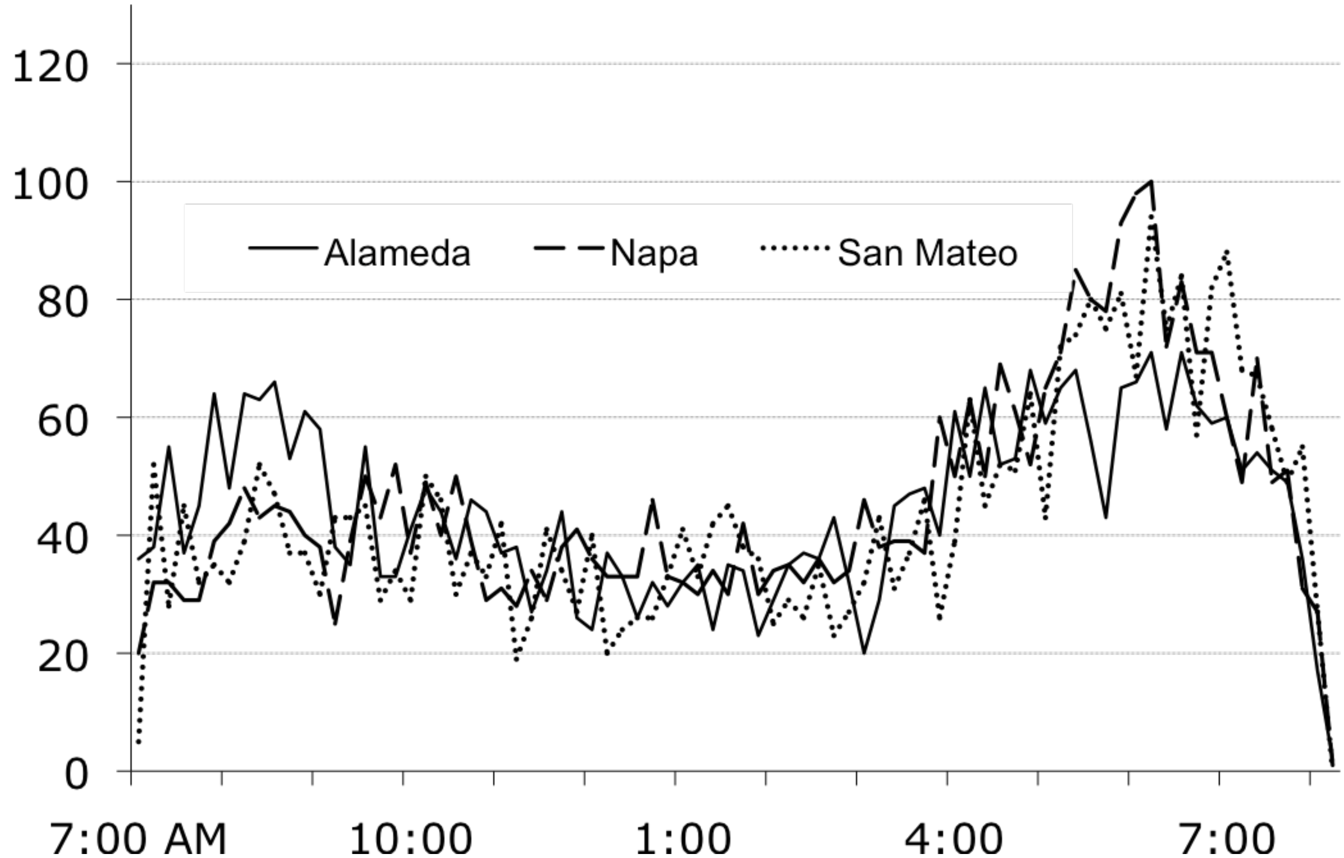

FIGURE 5: Number of people who reneged

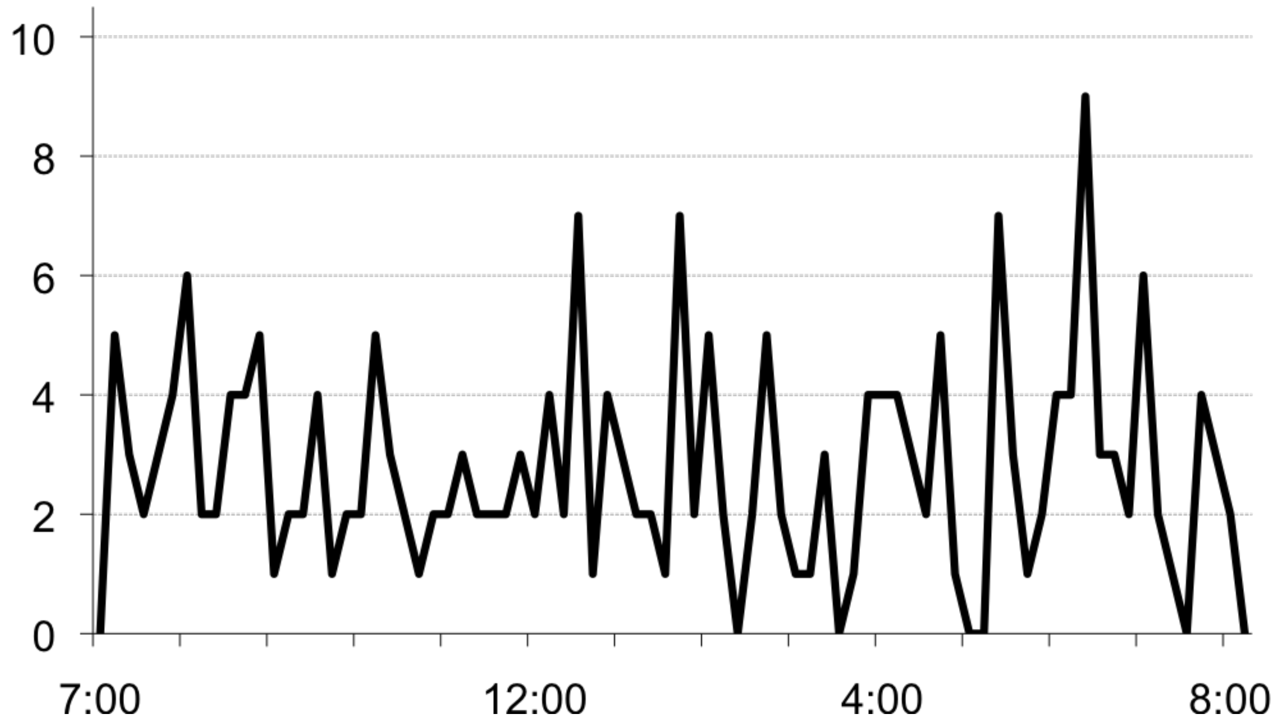

FIGURE 6: Time Required to Cast a Ballot (in minutes)

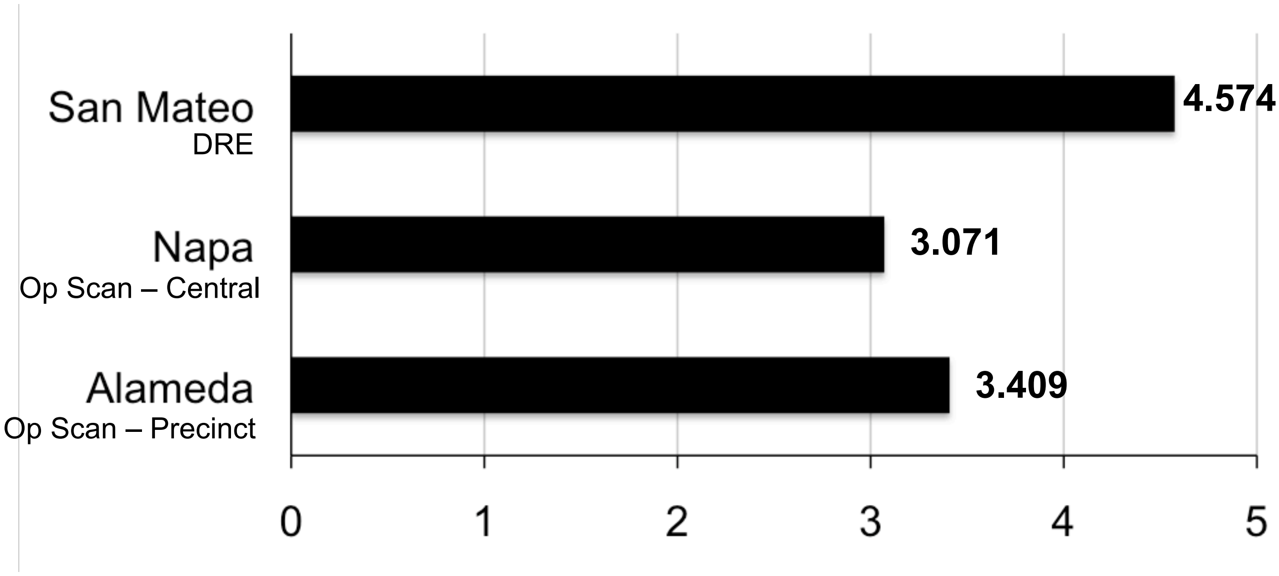

TABLE 1: Model of Factors Affecting Service One

	Regressions			
Variable	(1)	(2)	(3)	(4)
Poll Worker is Over 55	-.272* (.134)	-.183 (.151)	-.108 (.187)	-.244 (.179)
Poll Worker has experience	.379** (.131)	.441** (.138)	.518 (.256)	.408 (.238)
Disabled Voter	.692*** (.168)	.705*** (.174)	.711*** (.169)	.693*** (.166)
Absentee	-.868* (.367)	-.898* (.371)	-.902* (.245)	-.869* (.368)
Provisional	1.752*** (.448)	1.77*** (.448)	1.778*** (.447)	1.753*** (.447)
% of Voting Age Pop. African American	-.036** (.013)	-.037** (.012)	-.038** (.012)	-.036** (.013)
% of Voting Age Pop. Hispanic or Asian	.001 (.007)	.003 (.008)	.003 (.008)	.001 (.008)
Median Household Income (per $10k)	-.183*** (.034)	-.183*** (.03)	-.185*** (.031)	-.183*** (.035)
Alameda County Dummy	.861 (.45)	.934 (.419)	.959* (.42)	.87 (.253)
San Mateo County Dummy	.201 (.434)	.545 (.386)	.587 (.385)	.213 (.442)
Interaction of Age & Experience	--	--	-.122 (.273)	-.048 (.26)
Interaction of Age & San Mateo Dum	--	-.449 (.248)	-.466 (.253)	--
Constant	1.99*** (.418)	1.856*** (.413)	1.839*** (.399)	1.986*** (.408)
R^2 (Adj)	.1755	.1781	.1783	.1756
N	1,420	1,420	1,420	1,420

Other non-statistically significant control variables in the model:

- Voter experienced ballot error later
- San Mateo voter opted for paper ballot
- % of pop. with bachelor's degree or higher
- Population density
- Number of people arriving
- Number of people reneging
- Number of poll workers at the Check-in table
- Number of people standing in line at the Check-in table
- Number of voting stations/privacy booth set up for use.

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Robust Standard Errors, clustered by polling station, in parentheses

TABLE 2: Difference Between % of Ballots Cast

	TOTAL Ballots cast	in precinct on E.D.	major party presidential candidate	Prop 91	Prop 92	Prop 93	Prop 94	Prop 95	Prop 96	Prop 97
SAN MATEO	211,697	54.24	82.24	89.24	92.02	93.65	94.63	94.61	94.26	94.26
ALAMEDA	428,930	51.48	81.21	89.57	92.24	93.12	94.28	94.18	94.12	93.70
Difference			0.97%	-0.33%	-0.22	0.53%	0.35%	0.43%	0.14%	-0.56%

Source: Alameda and San Mateo Registrars of Voters' websites, 2008.

TABLE 3: Model of Factors Affecting Voting Time

Variable	Coeff.	Robust SE clustered by polling station	t-score	P > |t|
Alameda Dummy	(dropped)			
San Mateo Dummy	1.6679	.4715	3.54	0.002
Ballot length	-.1297	.1659	-0.78	0.442
Arrival rate	.0017	.0142	0.12	0.903
# of poll workers	.0223	.0664	0.34	0.740
# of privacy booths (or DRE machines)	-.04	.0617	0.65	0.523
Voter experienced machine error	.7021	.9456	0.74	0.465
Male or Female	-.0246	.1491	-0.17	0.870
Voter used disabled voting equipment	1.8349	3.1165	0.59	0.561
Voter cast a provisional ballot	1.2695	.3304	3.84	0.001
Voter cast a paper ballot in San Mateo	-2.7985	.2008	-13.94	0.000
Median Household Income ($10K)	-.0482	.0517	-0.93	0.360
% of precinct with BA degree or more	.0126	.0066	1.89	0.071
% Voting Age Pop. African American	.0352	.0188	1.87	0.073
% Voting Age Pop. Hispanic or Asian	-.0054	.0101	-0.54	0.596
Population density (per sq. km.)	-.0273	.0736	-0.37	0.714
Constant	3.6913	.66	5.59	0.000
R^2	.1106			
N	1,485			

APPENDIX A
Poll Worker Questionnaire

Survey Research Center
UNIVERSITY OF CALIFORNIA, BERKELEY

Thank you very much for agreeing to answer this brief questionnaire for this election study. The information collected on this sheet will not be shared with outside sources and will be used solely for the purposes of this study. These questions are optional, but each answered question will significantly help the ultimate results. Thank you again.

Please circle one answer for each question.

1) Are you male or female?
   a) Male
   b) Female

2) Which of the following age groups do you fit into?
   a) 15 – 24
   b) 25 – 34
   c) 35 – 44
   d) 45 – 54
   e) 55 – 64
   f) 65 – 74
   g) 75 – 84
   h) 85 or above

3) Including today, how many times have you worked as an election official?
   a) 1
   b) 2-3
   c) 4-5
   d) 6 or more

4) Do you live in the precinct of this polling place you are stationed at?
   a) Yes
   b) No

5) What is your current occupational status?
   a) Employed full-time
   b) Employed part-time
   c) Unemployed
   d) Retired
   e) Student

6) What is the highest level of education you have completed?
   a) Some High School
   b) High School/GED
   c) Some college
   d) 2-Year College Degree (Associates)
   e) 4-Year College Degree (Bachelors)
   f) Masters Degree
   g) Doctoral Degree
   h) Professional Degree (JD, MD)

7) What is your current marital status?
   a) Single, Never Married
   b) Married
   c) Separated
   d) Divorced
   e) Widowed

8) What is your race?
   a) White
   b) African American
   c) Hispanic
   d) Asian/Pacific Islander
   e) Native American
   f) Other

Thank you so much for your time!

PW# _____

APPENDIX B
Informational Supplement

Close California election returns (*footnote 29*)
Source: California Secretary of State's Statements of Vote, 1998-2008

Statewide race

1998

Secretary of State – Peace & Freedom Party

Feuer	50.20%
Palvos-Story	49.80%
Difference	*0.40%*

District races

2006

State Senate District 30 – Democratic Party

Calderon	50.40%
Bermudez	49.60%
Difference	*0.80%*

State Assembly Member District 51 – Democratic Party

Price	50.30%
Bradford	49.70%
Difference	*0.60%*

State Assembly Member District 80 – Democratic Party

Clute	50.20%
Oden	49.80%
Difference	*0.40%*

2004

State Senate District 13 – Libertarian Party

Laursen	50.20%
Webster	40.80%
Difference	*0.40%*

1998

Equalization, 2nd District – Democratic Party

Santos	50.16%
Micallef	49.84%
Difference	*0.32%*

Senate, 20th District – Democratic Party

Alarcon	50.02%
Katz	49.98%
Difference	*0.04%*

County Vote Differentials

Political races

1998

Governor (Peace & Freedom Party) – San Diego County

La Riva	50.48%
Feinland	49.52%
Difference	*0.96%*

Attorney General (Peace & Freedom Party) – Fresno County

Kast	50.20%
Evans	49.80%
Difference	*0.40%*

Attorney General (Peace & Freedom Party) – Inyo County

Kast	49.65%
Evans	50.35%
Difference	*0.70%*

Attorney General (Peace & Freedom Party) – Mendocino County

Kast	50.27%
Evans	49.73%
Difference	*0.54%*

Attorney General (Peace & Freedom Party) – Santa Clara County

Kast	50.08%
Evans	49.92%
Difference	*0.16%*

Attorney General (Peace & Freedom Party) - Sutter County

Kast	49.66%
Evans	50.34%
Difference	*0.68%*

Insurance Commissioner (Peace & Freedom Party) – Calaveras County

Condit	50.22%
Ramos	49.78%
Difference	*0.44%*

Insurance Commissioner (Peace & Freedom Party) – Del Norte County

Condit	50.46%
Ramos	49.54%
Difference	*0.92%*

Ballot measures

2008

Prop 94	Yes	No	Difference
Butte County	49.50%	50.50%	1.0%
Contra Costa County	49.60%	50.40%	0.80%
Glenn County	49.80%	50.20%	0.40%
Shasta County	49.80%	50.20%	0.40%
Tehama County	50.40%	49.60%	0.80%
Prop 95			
Butte County	49.50%	50.50%	1.0%
Contra Costa County	49.50%	50.50%	1.0%
Glenn County	49.80%	50.20%	0.40%
Shasta County	49.80%	50.20%	0.40%
Prop 96			
Butte County	49.60%	50.40%	0.80%
Contra Costa County	49.60%	50.40%	0.80%
Glenn County	49.90%	50.10%	0.20%
Shasta County	49.80%	50.20%	0.40%
Prop 97			
Butte County	49.60%	50.40%	0.80%
Contra Costa County	49.50%	50.50%	1.0%
Glenn County	49.80%	50.20%	0.40%
Shasta County	49.80%	50.20%	0.40%

1998

Prop 220	Yes	No	Difference
Kern County	49.78%	50.22%	0.44%
Prop 223			
Riverside County	49.78%	50.22%	0.44%
San Bernadino	50.05%	49.95%	0.10%
San Diego County	49.57%	50.43%	0.86%
Prop 224			
Alpine County	49.80%	50.20%	0.40%
Mono County	49.82%	50.18%	0.36%
Prop 225			
Santa Cruz Count	49.55%	50.45%	0.90%
Sonoma County	49.80%	50.20%	0.40%
Prop 226			
Riverside County	49.53%	50.47%	0.94%
Stanislaus County	50.29%	49.71%	0.58%

Poll worker management (*footnote 35*)

A symptom of a system design failure, and another possible explanation, is poor management. Local elections officials face a seemingly intractable combination of the two management systems. Like a production manager, they are faced with an institutional system with history and rules governing its operation. The people they hire to work at the polls fill the role as organizational employees, needing to internalize the history and rules of the organization and then apply them in a consistent, efficient fashion. These people (i.e. the poll workers) need training, monitoring, and motivation to do their job effectively and efficiently. Like a production manager, LEOs want to consistently produce a service of efficient and accurate voting.

However, the challenges LEOs face on election day more closely resemble the characteristics needed by project management. Elections happen at most a few times per year and require temporary employees working on a deadline. Like a project manager, the LEO hires the poll workers and then controls their activities from afar; this leaves them to complete the work on the ground by themselves. Yet these poll workers, the "specialists" needed for the project, are typically untrained workers unfamiliar and unable to be fully trained in the breadth of rules or history needed to work at a polling place. This directly impacts their ability to complete the complex interrelated tasks that are required at a polling station. The disconnect between supervisor and employee alongside the employment problem of unskilled versus specialist poll workers have come together to form substantial problems in most current election administration offices.

Michael Alvarez and Thad Hall have explored the inherent principal-agent problems that arise in such management, especially in regards to the adverse selection and moral hazard issues that may arise (See Adverse selection problems arise because LEOs do not know if a potential poll worker is the right person for the job or they type of person they want representing the EAJ. Employers try to avoid adverse selection by carefully screening candidates and selecting employees with the best skills for the job. However LEOs typically face a shortage of poll worker applicants that can limit this ability and heighten the likelihood of adverse selection.

Forty-eight states require a minimum number of poll workers, ranging from three to six per precinct. Yet over 51% of EAJs nationwide had significant problems recruiting enough poll workers to meet this minimum requirement. This limits the ability of local election officials to adequately screen poll workers for both background and competence. LEOs are forced to take what they can get, exacerbating general adverse selection concerns.

Additionally, poll workers compensation is very small. Typically, it ranges from between $50 to $150 per day for shifts that last as long as 16 hours. Some jurisdictions in New York claim the highest stipend in the country with poll workers earning $325 for the day, but this is unusual. Two of counties studied on February 5th paid $120 for the 13-hour long election day, but this did not include set-up in the morning and closing down the polls at the end of the election day. One of these counties only paid $100, up from $50 per day just a few months before. Currently, seven U.S. states dictate the exact pay for poll workers, 14 states tie it to the state or federal minimum wage (although some EAJs elect to spend more), 13 states establish a minimum pay not linked to the minimum wage, and 17 do not specify.

Recruitment gets harder as the EAJ gets larger. LA has over 5,000 polling locations and a significant difficulty-recruiting people to work at the polls. GAO reports that and estimated 24 percent of large counties – population over 100,000 people – contract with recruiters to find and hire poll workers for them.

Thus, even if a system is designed correctly, with distinct roles for each poll worker, poor ground level management can cause the system to work inefficiently and ineffectively.